

The Macroeconomic Determinant of Economic Growth in Nigeria (1990 - 2018)

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Abstract:- This study investigates the Macroeconomic Determinants of Economic Growth in Nigeria during the period from 1990 to 2018. The primary objective of this research is to assess how macroeconomic variables impact Nigeria's economic growth. The specific goals include analyzing the patterns of capital, economic openness, foreign direct investment, gross domestic product (GDP), and interest rates concerning economic growth in Nigeria. Additionally, this study seeks to examine the long-term relationships among these economic growth variables. Data for this research were obtained from the World Development Indicators, as well as the annual reports and statements of accounts from the Central Bank of Nigeria spanning the years 1990 to 2018. The variables considered include foreign direct investment, economic openness, capital, GDP, and interest rates. The study employs quantitative data analysis tools, adhering to standard econometric principles. Estimation techniques applied include the Philip Perron unit root test, auto-regressive distributed lag analysis, and Error Correction Model (ECM).

The findings indicate that there is no long-term relationship among the variables related to economic growth. Furthermore, all the variables exhibit a positive association with economic growth in Nigeria, with the exception of foreign direct investment. The results also suggest that capital has significantly contributed to economic growth in Nigeria. The study recommends a deliberate focus on increasing economic openness to foster a conducive environment for both foreign and domestic investments, given their substantial impact on economic growth.

Keywords:- Macro Economic determinants, Interest rate, Foreign Direct Investment, Openness, Economic growth.

I. INTRODUCTION

The role of government encompasses the provision of goods and services to the public to achieve diverse economic and social objectives. However, the efficiency with which governments deliver these goods and services holds significant importance for macroeconomic stabilization, economic development, and informed policymaking. A profound understanding of macroeconomic variables plays a pivotal role in the functioning of any economy, whether developed or underdeveloped. It aids in harnessing, synchronizing, and stimulating economic growth.

Nigeria's economic performance since gaining independence in 1960 has been notably lackluster, despite abundant foreign exchange resources, primarily from oil and gas reserves discovered in 1956. Various strategies have been employed, including internal and external borrowing, to achieve macroeconomic objectives like price stability, full employment, exchange rate stability, and balance of payment equilibrium. Unfortunately, these objectives have remained elusive, with persistent issues like increasing poverty rates, consistent inflation, and a soaring exchange rate.

The fundamental objective of any sovereign nation, including Nigeria, is to enhance the living standards of its citizens and foster economic growth and development. This underscores the continuous emphasis on growth in government development policies. However, the lack of sufficient domestic resources, savings, and investment presents a substantial hurdle to economic development. A substantial gap exists between savings and investment, hampering the nation's growth potential. Increased savings can boost capital formation and production activities, subsequently creating employment opportunities and reducing government's external borrowing.

Since independence, Nigeria has faced the challenge of achieving robust economic growth to alleviate extreme poverty, improve healthcare, reduce illiteracy, enhance political stability, and attract international investment. Yaqub (2011) observed that Nigeria's economic growth has been sluggish compared to emerging economies globally. Policymakers and the government have implemented various macroeconomic policies to address these issues, ranging from monetary and fiscal policies to export promotion and import substitution strategies. These policies aim to achieve price stability, balance of payments equilibrium, employment promotion, output growth, and sustainable development.

Economists hold differing views on which policies are most beneficial for long-term growth. While some argue for the necessity of macroeconomic policies, others emphasize the greater impact of monetary over fiscal measures on economic activity. Moreover, investment in human capital, such as education and training, is highlighted as a crucial contributor to long-term growth (Barro, 1990).

Despite these macroeconomic policy efforts, Nigeria's economic growth performance has remained subpar. This raises questions about the macroeconomic determinants of Nigeria's economic growth and the policy implications of its economic performance between 1986 and 2012.

The significance of macroeconomic stability in economic growth lies in the uncertainty it generates regarding the future values of economic variables. Policy-induced uncertainty can disrupt the efficiency of price mechanisms. For instance, expectations of rising inflation, government spending, real exchange rates, real interest rates, and population growth can adversely affect future economic growth rates. Temporal uncertainty also plays a role, as investors may withhold investments until macroeconomic conditions stabilize, potentially leading to capital flight.

This research seeks to qualitatively analyze the major macroeconomic determinants of economic growth, with a specific focus on identifying consensus among growth economists regarding the key macroeconomic determinants that either drive or hinder economic growth. This study distinguishes itself by emphasizing the macroeconomic determinants of economic growth relevant to both developing and developed nations.

II. STATEMENT OF THE PROBLEM

Developing economies across the globe grapple with a dual challenge: fostering growth and stability while also adapting to the demands of the twenty-first-century economy. Despite the existence of various growth theories, models, and a toolbox of fiscal and monetary policies, these economies experience growth that, more often than not, lacks the consistency and robustness needed to transition into sustainable economic development.

These challenges are multifaceted and require a comprehensive understanding of the intricate factors that shape the growth trajectories of developing economies. Conventional models and policies, while valuable, sometimes fall short in addressing the dynamic and evolving nature of these economies.

In most developing economies such as Nigeria, the advantages of growth of developing world economies solely benefits the few rich which worsens the problem of income inequality, and poverty alleviation among others. They remain vulnerable to external shocks like stock market crashes and internal destabilization. These fluctuations lead to significant unemployment, reduced income, heightened inequality, and widespread poverty (Stiglitz, 2001). In essence, they dampen economic growth or channel the rewards of growth primarily to a select group, leaving many in poverty. Nevertheless, despite the numerous macroeconomic policies implemented in Nigeria since gaining independence, the country's economic performance in terms of growth has been disappointing.

The available data indicates that Nigeria's economic growth stood at 8.2% in 1990 but experienced a decline to 5.4%, 4.6%, and 3.5% in 2000, 2001, and 2002 respectively. Subsequently, it saw an upturn to 9.6% in 2003, followed by a dip to 5.8% in 2005. It then showed slight improvements, reaching 6.4% and 7.3% in 2008 and 2011 respectively. Given these fluctuations, it becomes imperative to delve into the macroeconomic factors influencing Nigeria's economic growth and the policy implications arising from this growth.

In Nigeria, despite the government's concerted efforts to enhance economic growth and welfare, the nation continues to grapple with persistent challenges such as rising unemployment, inflation, social unrest, and poverty. Achieving significant improvements in economic welfare remains an ongoing challenge.

Since independence in 1960, Nigeria has been trying to make impressive efforts towards achieving sustainable economic growth and development. The poor growth performance of Nigeria over recent years is often attributed to the ineffectiveness of macroeconomic variables to drive home much-needed growth that will help in achieving macroeconomic objectives. Indeed, it has been argued in the economic literature that ineffective macroeconomic policies/variables can deteriorate the economy of a country.

The inability of macroeconomic variables and determinants to effectively contribute to growth has resulted in significant instability in Nigeria's economic landscape. Despite sporadic periods of growth and expansion, it is evident that the reported economic growth has not been sustainable, with a concurrent increase in poverty levels among the population.

Nigeria has grappled with notable fluctuations in inflation rates, experiencing four major instances of high inflation, surpassing 30 percent, since the early 1970s. These episodes of high inflation are closely linked to the expansion of the money supply, which often outpaces real economic growth. However, it is essential to recognize that, preceding the surge in money supply, certain structural characteristics within the economy have played a pivotal role. This underscores the need for a comprehensive approach to monetary policy in Nigeria.

III. OBJECTIVES OF THE STUDY

The primary aim of this study is to assess how macroeconomic determinants influence the economic growth of Nigeria. To achieve this, the study has set forth specific objectives which include:

- Evaluating the historical patterns of capital, foreign direct investment, openness, interest rates, and their impact on economic growth.
- Analyzing the long-term relationships between interest rates, broad money supply, inflation rates, exchange rates, and economic growth, with a structural model represented as $GDP = f(\text{Capital, Foreign Direct Investment, Openness, Interest Rate})$.

IV. CONCEPTUAL REVIEW

A. Economic Growth

The economic goals of many developing nations, which heavily rely on a single commodity as a significant source of foreign exchange, as well as the global community at large, have consistently included the desire to reshape production and consumption patterns, diversify economic foundations, and reduce dependency on a single resource, such as oil. This collective aim is to steer their economies towards sustainable, inclusive growth without inflationary pressures. While rapid increases in output, as measured by real Gross Domestic

Product (GDP), hold importance, the transformation of various sectors within the economy takes precedence. This perspective resonates with the growth aspirations of most developing countries, where economic structure is anticipated to evolve alongside economic progress (Sanusi, 2010).

Economic growth stands as an essential prerequisite for achieving economic development. This explains why growth consistently takes center stage in the primary policy objectives of global development. Fundamentally, economic growth is closely linked to policies that seek to transform and restructure real economic sectors. However, a significant hindrance to economic development in many countries, including Nigeria, is the shortage of adequate domestic resources, savings, and investment required to support and sustain these sectors. This deficiency results from the disparity between savings and investment, as noted by Imimole and Imoughele (2012). Savings play a pivotal role by providing the necessary capital for investment, thereby fostering economic growth. An increase in savings leads to greater capital formation and increased production activities, ultimately resulting in employment generation and reduced government reliance on external borrowing. Maintaining low domestic saving rates can, in turn, keep growth levels at a minimum, a notion supported by Harrod-Domar's model, which underscores the importance of savings in driving economic growth.

Aigbokhan (1995) defines economic growth as the augmentation in the average rate of output produced per person, typically measured on an annual basis. It also represents the pace of change in a nation's output or income within a specific timeframe. This metric is often quantified as the rate of change in real GDP, emphasizing that economic growth relates solely to the quantity of goods and services generated. In contrast, Godwin (2007) characterizes economic growth as an escalation in real gross domestic product (GDP) or any other measurement of aggregate income, with adjustments made to account for inflation. Economic growth can exhibit either a positive or negative trajectory, with negative growth indicating a contracting economy, typically associated with periods of economic recession or depression. Ullah and Rauf (2013) further highlight that an increase in a country's real GDP elevates overall output, a phenomenon referred to as economic growth. This growth proves instrumental in enhancing societal incomes, reducing unemployment rates, and facilitating the provision of public services.

Economic growth encompasses a sustained upswing in per capita national output or net national product across an extended timeframe. It can also be characterized as the quantitative escalation in the monetary value of goods and services produced within an economy over a given year. The measurement of economic growth typically involves calculating the percentage change in Gross Domestic Product (GDP) or Gross National Product (GNP) (Dwivedi, 2004). This pursuit of economic growth ranks among the paramount macroeconomic policy objectives that nations worldwide continue to vigorously pursue, Nigeria being no exception. The seminal contribution by Solow (1956) has engendered

substantial attention to the determinants of economic growth within both theoretical and empirical research. Solow (1956) posits that a substantial portion of an economy's growth can be elucidated by variations in labor quantity.

Economic growth is steered by both direct and indirect factors. Direct determinants comprise human resources, exemplified by endeavors to augment the active population and invest in human capital, as well as natural resources such as land and underground assets. Moreover, factors like increased capital investment and technological progress contribute directly to economic growth. In tandem, economic growth is subject to the influence of indirect determinants including institutions like financial organizations and private administrations. The scale of aggregate demand, saving and investment rates, financial system efficiency, budgetary and fiscal policies, labor and capital migration, and governmental efficiency all collectively shape the trajectory of economic growth. Denison (1962) corroborates that economic growth involves the expansion of real GDP or GDP per capita, denoting an increase in the national product gauged at constant prices.

Economic growth is propelled by an intricate web of interrelated factors that collectively influence an economy's growth rate. Six pivotal factors play a central role in determining this growth, categorized into four supply determinants and two efficiency and demand determinants. The four supply-side determinants encompass natural resources, capital goods, human resources, and technology, all of which exert a direct impact on the value of goods and services produced. It's crucial to recognize that economic growth, as quantified by GDP, represents an augmentation in the growth rate of GDP itself. However, the factors driving the enhancement of each component differ significantly. Public expenditure, capital formation, private or public investment, employment rates, exchange rates, among others, exert distinct effects on economic growth. It's imperative to acknowledge that these determinants yield diverse implications, particularly contingent on a state's level of development.

Moreover, socio-political factors and significant events wield substantial influence over a nation's economic progress. Notably, a distinction arises between economic and non-economic determinants. "Proximate" or economic determinants pertain to factors like capital accumulation, technological advancements, and labor force dynamics, while "ultimate" or non-economic determinants encompass factors such as government efficiency, institutional frameworks, political and administrative systems, cultural and social dynamics, geographical factors, and demographic considerations (Acemoglu, 2009). It's pertinent to emphasize that this research focuses exclusively on examining the economic determinants of economic growth.

B. Capital

Economic growth fundamentally stems from the amplification of goods and services production. Multiple factors play a pivotal role in bolstering production levels within an economy. Elevated consumer spending, intensified international trade, and heightened business investments in

capital assets collectively contribute to the augmentation of goods and services production, thereby stimulating economic growth. The yardstick for quantifying this growth is Gross Domestic Product (GDP), denoting the total monetary value of all finalized goods and services generated within a nation's borders during a specified timeframe.

Capital investment emerges as a critical determinant that can demarcate between robust and sustainable economic growth versus lackluster progress. Capital investment serves as the catalyst for innovation, encompassing breakthroughs like the exploration of new reservoirs of natural resources and technological advancements. Capital investment materializes when businesses procure tangible assets, including edifices, machinery, equipment, and vehicles. These assets are subsequently harnessed to manufacture additional goods and services, catering to consumer demands.

Enhanced capital investment aims to bolster labor productivity by rendering companies more efficient and productive. Fresher equipment and factories translate into heightened output rates. As labor attains greater efficiency, this pervasive upswing in productivity permeates the entire nation, culminating in amplified economic growth at the national level and an elevated GDP.

C. Foreign Direct Investment (FDI)

As per Baghebo and Apere (2014), foreign direct investment (FDI) revolves around the movement and transfer of capital and financial assets across international borders. This typically occurs when investors acquire shares or significant ownership stakes in established firms. In the context of foreign portfolio arrangements, capital flows between individuals and countries seeking the highest returns are feasible (Aggarwal, Klapper & Wyszocki, 2003).

FDI inflows wield a positive influence on the economy and have the potential to expedite economic growth, particularly in developing nations (Johnson, 2006). By facilitating positive externalities like the dissemination of knowledge and new technology, FDI can directly impact the sectors to which these funds are allocated, as well as indirectly enhance overall productivity across the economy (de Vita and Kyaw, 2009).

Foreign direct investment inflows have emerged as a significant financing option for development, frequently embraced by developing countries, especially those in the sub-Saharan African region, to stimulate their sluggish economies toward sustainable growth. Nevertheless, recent discussions have incorporated the concept of economic freedom as a crucial intermediary factor in achieving successful growth. Nigeria, akin to many other African nations, has experienced a surge in foreign direct investment inflows from developed countries, contingent upon the presence of certain economic fundamentals, with economic freedom being a pivotal component.

Within the neoclassical growth framework proposed by Solow (1956), the influence of FDI on output growth rate was significantly limited due to diminishing returns to physical

capital. Consequently, it primarily had a level effect rather than a rate effect on output per capita. In essence, within neoclassical models, FDI was not seen as a substantial driver of long-term output growth. However, with the introduction of new growth theory, FDI gained the capacity to impact both the level and the rate of growth of output per capita.

The literature has elaborated on how FDI can potentially bolster the growth rate of per capita income in the host country. This goes beyond factors like the availability of human capital resources, the host country's absorptive capacity, favorable trade policies, market size, and various other factors that were previously discussed. Notably, the significance of economic freedom has been emphasized in the emerging FDI literature.

➤ Types of Foreign Direct Investment

- *Greenfield Investment:* Greenfield investments occur when foreign companies make substantial investments or establish new production facilities in the host country. These types of investments are highly desirable for host countries, particularly when the primary aim is to address high unemployment rates. Greenfield investments are often the main focus of a host nation's promotional efforts because they bring about new production capabilities, job opportunities, technology transfer, and knowledge sharing. Additionally, they can lead to connections with the global market. In terms of human capital, greenfield FDI typically generates new employment opportunities and enhances productivity. However, it's worth noting that while greenfield investments are welcomed in the host country, they can sometimes have the unintended consequence of displacing local companies and specific industries, especially those reliant on advanced technology. Unlike local companies, which reinvest their profits in the domestic market, foreign companies undertaking greenfield investments may not always channel their profits back into the host country's economy.
- *Mergers and Acquisitions:* Mergers and acquisitions (M&A) typically occur when there's a transfer of existing assets from local companies to foreign firms. In essence, the assets and operations of companies from different countries are combined to create a new legal entity. It's often assumed that in countries with lower levels of development, there are fewer opportunities for M&A activities. According to the IPAK (2012) Annual Study on Perception of FDI, in comparison to greenfield investments, M&A transactions are seen as providing no long-term benefits to the local economy. This perception arises because, in most M&A deals, the owners of the local firm receive payment in the form of stock from the acquiring firm. This means that the proceeds from the sale may not necessarily contribute to the local economy.
- *Joint Ventures:* Joint ventures can involve a local company, government, or a foreign company operating in the host country. A cross-border joint venture occurs when economic entities from at least two countries are involved. One notable positive outcome, particularly in terms of human capital, is technical advancement, especially when foreign and local companies collaborate. According to Dunning and Lundan (2008), one of the key

factors influencing the viability and success of cross-border joint ventures is the selection of partners and the establishment of mutual trust between them. Profit is not the sole motivation behind joint ventures; there are various factors and motives at play. Casson's model (2000) outlines nine factors influencing the formation of joint ventures. These factors include economies of scale, market size, economies of scope, technological uncertainty, technological change, cultural differences, interest rates, protection of autonomy, and the absence of patent rights (Casson, 2000).

D. Financial Openness

Financial openness refers to a country's willingness to adopt liberalized policies concerning business and trade with other nations in the global trade arena. It often involves the removal of state control and regulations on the ownership of production assets, along with an emphasis on encouraging private sector participation. Financial openness reflects a country's degree of engagement in the global trade system and its interactions with other nations worldwide (Kannan, 2010).

Kaminsky and Schmukler (2003) perceive financial openness as the complete deregulation of a country's financial system to global financial flows. However, Johnston and Sundararajan (1999) define it as a policy of operational reforms aimed at opening up the entire financial system, creating a market-oriented environment, and ultimately fostering rapid economic growth, development of the banking sector, and the improvement of institutional quality.

The relationship between financial openness and economic growth can vary, leading to either positive or negative outcomes. For instance, financial openness can accurately predict a country's long-term economic growth, capital accumulation, and overall productive capacity (King & Levine, 1993). It facilitates socioeconomic growth by promoting efficient allocation of capital (Beck & Levine, 2004). Additionally, a nation's financial openness can expand and improve market liquidity, leading to increased profit incentives, reduced transaction costs, lower information-related expenses, advancements in corporate governance practices, and more effective risk management and portfolio diversification (Levine, 1997; Levine & Zervos, 1998).

When a country opens up its financial system to global trade and capital inflows, it's evident that its domestic financial market will experience further development. However, there are potential downsides to financial openness, particularly concerning the growth and stability of the domestic stock market. These drawbacks are often associated with currency crises and significant financial booms (Kaminsky and Schmukler, 2003).

Supporting this viewpoint, Frenkel, Razin, and Sadka (1991) and Webb (1992) have argued that political costs play a significant role in the impact of financial openness. They emphasize that financial openness may not adequately consider a country's taxation policies and capital flows. They contend that investors are more likely to invest in countries with lower tax rates compared to those with higher tax burdens. Therefore, liberalizing a country's financial system

can imply relinquishing control over essential monetary policies, potentially posing a significant threat to the nation's sovereignty and serving as a channel for substantial capital flight.

V. THEORETICAL REVIEW

A. Neo-classical Growth Theories

During the 1960s, growth theory primarily revolved around the neoclassical model, which was developed by economists such as Ramsey (1928), Solow (1956), Swan (1956), Cass (1965), and Koopmans (1965). One significant aspect of this model, which has only recently been rigorously tested as an empirical hypothesis, is the notion of convergence. This principle suggests that the lower the initial level of real per capita gross domestic product (GDP), the higher the expected growth rate. If all economies were essentially the same, except for their starting levels of capital intensity, then convergence would hold true in an absolute sense, implying that poorer regions would tend to experience faster per capita growth than wealthier ones.

However, convergence applies conditionally if economies differ in various aspects, including savings behavior, population growth, labor participation rates, technological access, and government policies. In this case, the convergence effect is contingent on specific conditions. A country's growth rate tends to be high when its initial per capita GDP is far below its long-term or steady-state position, essentially when an economy starts well below its target level. For instance, a poor country with a low long-term position—potentially due to unfavorable public policies or a low savings rate—may not experience rapid growth.

The Neoclassical growth models proposed by Solow (1956) and Swan (1956) postulated that in the long run, technological progress and population growth are the primary drivers of economic growth. They argued that the government has the capacity to influence population growth rates, savings rates, and the motivation to invest in both human and physical capital through various policy tools, including fiscal, monetary, income, and exchange rate policies. These policy instruments can alter the equilibrium factor ratio or impact the trajectory leading to a steady-state growth rate.

In contrast, the endogenous growth model advanced by Barro (1990) posits that not only do physical and human capital play pivotal roles in economic growth, but fiscal policy variables such as distortionary taxation and productive expenditure also significantly influence output levels and their sustained growth rates. This model emphasizes that the government's fiscal policies can have a direct impact on the overall economic growth and development of a country.

Neo-classical growth theory suggests that the influence of fiscal policy on steady economic growth is transitory and not enduring. In recent decades, the connection between macroeconomic policies and economic growth has become a prominent topic of discussion among governments, policymakers, and researchers. A burgeoning body of literature has emerged, investigating the factors that drive economic growth both across countries and within specific countries, yielding diverse findings and conclusions.

The convergence principle in the neoclassical model is a result of diminishing returns to capital. Economies with lower capital per worker relative to their long-term capital per worker tend to experience higher rates of return and consequently, higher growth rates. However, convergence is not an absolute law but rather a conditional one, as steady-state levels of capital and output per worker in this model depend on factors such as the propensity to save, population growth rates, and characteristics of the production function, which can vary among economies.

Recent extensions of the model have introduced additional sources of variation between countries, particularly related to government policies affecting consumption spending, the protection of property rights, and market distortions both domestically and internationally. Additionally, the neoclassical model has evolved to consider human capital, including education, experience, and health, as part of the broader concept of capital.

In the neoclassical growth model, the economy naturally gravitates toward a steady-state ratio of human capital to physical capital. However, this ratio can deviate from its long-term equilibrium in the initial stages. The degree of departure from this equilibrium typically influences the rate at which per capita output approaches its steady-state value.

For instance, a country that begins with a high ratio of human to physical capital (possibly due to a significant loss of physical capital, like in the aftermath of a war) tends to experience rapid economic growth. This is because it's easier to expand physical capital quickly than to rapidly increase human capital. Additionally, having a substantial stock of human capital makes it easier to adapt and incorporate foreign technologies, further boosting economic growth. This phenomenon introduces the concept of an interaction effect, where a country's growth rate is more responsive to its initial level of per capita output when it has a higher stock of human capital to start with.

The neoclassical theory, when expanded to consider human capital, makes a prediction that per capita economic growth will ultimately come to a halt in the absence of ongoing technological advancements. This prediction is reminiscent of the ideas put forth by Malthus (1798) and Ricardo (1817) and stems from the premise of diminishing returns to a comprehensive concept of capital.

However, historical data spanning many countries over the long term suggest a different reality. These data indicate that positive rates of per capita economic growth can persist for a century or more without a clear tendency to decline, even in the absence of continuous technological progress. This challenges the notion that growth must inevitably slow down and stop in the absence of significant technological improvements.

B. Endogenous Growth Theory

Recent developments in endogenous growth theory have aimed to address the missing explanation for long-term economic growth. This approach primarily focuses on providing a theory of technical progress, which is a central element missing from the neoclassical model.

However, incorporating a theory of technological change into the neoclassical framework is challenging because it disrupts the standard competitive assumptions. These assumptions work well in models like those developed by Ramsey, Cass, and Koopmans. Technological advancement involves the creation of new ideas, and these ideas are partially nonrival, meaning that they have characteristics of public goods. While it's reasonable to assume constant returns to scale for traditional, rival factors of production like labor and physical capital, including nonrival ideas as factors of production tends to result in increasing returns to scale. This concept clashes with the assumptions of perfect competition.

The compensation of nonrival old ideas at their current marginal cost of production, which is effectively zero, doesn't provide the appropriate reward for the research effort that goes into creating new ideas. Arrow (1962) and Sheshinski (1967) developed models where ideas were unintentional by-products of production or investment, a process referred to as "learning by doing." In these models, when one person made a discovery, it immediately benefitted the entire economy because knowledge is nonrival. This instant diffusion process might be technically feasible because of the nonrival nature of knowledge.

Later, Romer (1986) demonstrated that the competitive framework could be retained in this scenario to determine an equilibrium rate of technological advance. However, the resulting growth rate would typically not be Pareto optimal, meaning it wouldn't represent the most efficient allocation of resources.

In a more realistic setting, where discoveries depend in part on purposeful research and development (R&D) efforts, and an individual's innovations spread only gradually to other producers, the competitive framework breaks down. In this context, a decentralized theory of technological progress requires significant changes to incorporate elements of imperfect competition.

These important additions to economic theory, particularly concerning technological change, didn't emerge until Robert Romer's research in the late 1980s. Prior to that, researchers like Romer (1986), Lucas (1988), and Rebelo (1991) were building on the earlier work of economists such as Arrow (1962), Sheshinski (1967), and Uzawa (1965) but hadn't yet introduced a comprehensive theory of technological change.

In these earlier models, the potential for economic growth to continue indefinitely was based on the idea that the returns to investment in a wide range of capital goods, including human capital, might not necessarily diminish as economies develop. This concept can be traced back to Knight (1944). The role of knowledge spillovers among

producers and the external benefits of human capital were recognized as contributing factors in this process, primarily because they helped mitigate the tendency for diminishing returns to capital.

The integration of R&D theories and imperfect competition into the growth framework marked a significant advancement, and this began with Robert Romer's work in 1987 and 1990. Other economists, including Aghion and Hewitt (1992) and Grossman and Helpman (1991), made substantial contributions in this area. Barro and Sala-i-Martin (1995) further developed and expanded upon these models.

In these new frameworks, technological progress results from purposeful research and development (R&D) activities, and these activities are rewarded, often resembling Schumpeter's concept of creative destruction (Schumpeter, 1934), through some form of post-monopoly power. If there's a continuous stream of new ideas and innovations, then long-term positive economic growth rates can be sustained. However, the rate of growth and the overall level of inventive activity may not be Pareto optimal due to distortions related to the creation of new goods and production methods.

One limitation of these endogenous growth theories is that they no longer predict conditional convergence, which is the empirical observation that poorer countries tend to grow faster than richer ones. To address this, extensions of these theories, such as diffusion models (Barro and Sala-i-Martin, 1995), have been proposed. These models suggest that because imitation is often cheaper than innovation, countries may converge in terms of economic growth rates, resembling the predictions of neoclassical growth models. Theories of fundamental technological change remain essential for understanding why the world as a whole can achieve sustained per capita growth over time.

➤ *Implications of the theory*

- This theory challenges the idea of convergence in per capita growth rates between developed and developing countries. It argues that due to increasing returns to both physical and human capital, the rate of return on investment will not necessarily decline in developed countries compared to developing ones.
- Both physical and human capital could play a more significant role in driving economic growth than what the Solow residual model suggests. Investments in education and research within a firm can have not only a direct impact but also potential spillover effects that contribute to growth.

C. *Solow Growth Theory*

The Solow-Swan model, which emerged independently through the work of Robert Solow and Trevor Swan in 1956, replaced the earlier Harrod-Domar model. According to this model, economic growth stems from the accumulation of additional capital and labor, as well as from the introduction of new ideas and technologies. The Solow model posits that a sustained increase in capital investment initially boosts the growth rate, primarily because it raises the capital-to-labor ratio. Nevertheless, this increase in capital may eventually

experience diminishing returns, leading the economy to return to a long-term growth trajectory where real GDP expands at a rate equivalent to the growth of the workforce, augmented by a factor representing enhanced productivity. This culminates in a state known as a 'steady-state growth path,' characterized by concurrent growth in output, capital, and labor at the same rate, thereby maintaining a constant output per worker and capital per worker.

This model underscores that elevating the long-term growth rate necessitates both an expansion in the labor force and an increase in labor and capital productivity. Variations in the pace of technological advancements among nations are often cited as a significant factor accounting for the disparities in growth rates observed across countries.

Foreign investment inflow, particularly in the form of foreign direct investment (FDI), is generally perceived to have a positive influence on the economic growth of the host country through a range of direct and indirect mechanisms. It serves to bolster domestic investment, a critical element in achieving sustainable growth and development (Olokoyo, 2012). Foreign direct investment encompasses investments that grant the investor an enduring stake in an enterprise situated in a foreign country. This can take various forms, such as constructing factories, acquiring equipment, or establishing new facilities. Additionally, it encompasses capital contributions and the reinvestment of earnings by a company incorporated in a foreign jurisdiction (Odo, Anoke, Nwachukwu & Promise, 2016).

➤ *Assumptions of the theory*

- The population experiences continuous growth at a steady rate denoted as 'g'.
- Every individual in the economy saves a fixed fraction, denoted as 's', of their incomes, and spends the remaining portion.
- All firms in the economy produce identical output using a uniform production technology that utilizes both capital and labor as inputs.
- The current capital stock (denoted as K), future capital stock (denoted as K'), the rate of capital depreciation (denoted as d), and the level of capital investment (denoted as I) are interconnected through the capital accumulation equation: $K' = K(1 - d) + I$.

➤ *Implications of the Solow Growth Model*

- In the long run, when countries share the same values of g (population growth rate), s (savings rate), and d (capital depreciation rate), they will reach the same steady state. Consequently, they are expected to experience conditional convergence, implying that less affluent countries will grow at a faster rate along this convergence path.
- Conversely, when countries have varying savings rates, their steady-state growth rates will differ, and they will not exhibit absolute convergence. In cases of disparate savings rates, a country with a lower initial capital stock does not always guarantee higher growth.

D. Harrod-Domar Theory

The Harrod-Domar growth model underscores the significance of savings and investment as fundamental drivers of economic growth. This model was separately formulated by Roy F. Harrod in 1939 and Evsey Domar in 1946. It posits that the growth rate of an economy can be elevated through one of two means:

- An escalation in the level of savings within the economy (known as national savings).
- Decreasing the capital-output ratio, essentially improving the quality of capital inputs.

The Harrod-Domar model, employed in the field of development economics, serves to elucidate how an economy's growth rate is intricately linked to its levels of savings and capital. This theory posits that there isn't an inherent tendency for an economy to achieve balanced growth.

Within the framework of the Harrod-Domar model, there exist three distinct types of growth: warranted growth, actual growth, and the natural rate of growth. The warranted growth rate delineates the pace of economic expansion at which the economy neither experiences perpetual expansion nor plunges into recession. Actual growth represents the tangible annual increase in a nation's GDP. In contrast, natural growth embodies the level of growth an economy necessitates to sustain full employment. To illustrate, if the labor force is expanding at a rate of 3 percent annually, then to uphold full employment, the economy must achieve an annual growth rate of 3 percent.

Harrod's growth model brings forth three fundamental questions:

- *Achieving Steady Growth:* It ponders how a consistent and sustained growth rate can be attained in an economy that operates with fixed parameters like the capital-output ratio (capital-coefficient) and a fixed saving-income ratio.
- *Sustaining Steady Growth:* The model delves into the conditions required to uphold this steady and uninterrupted growth rate. In other words, what factors or circumstances are necessary to maintain this growth consistently over time?
- *Natural Constraints:* Harrod's model also considers how natural factors impose an upper limit or a ceiling on the growth rate that an economy can achieve. These factors relate to the inherent limitations and constraints posed by the environment and available resources.

Harrod and Domar, despite their nuanced differences, share a common foundation in their models. Essentially, one could describe Harrod's model as the British counterpart of Domar's model. Both of these models underscore the vital prerequisites for achieving and sustaining a consistent growth rate. In particular, they place significant importance on the role of capital accumulation in this growth process.

Harrod and Domar highlight the dual nature of capital accumulation. On one hand, they recognize that new investments generate income, primarily through the multiplier effect. On the other hand, these investments also expand the productive capacity of the economy, effectively

increasing its capital stock and enhancing productivity. It's worth noting that classical economists primarily emphasized the productivity aspect of investment and often took income generation for granted. Keynes, in contrast, paid considerable attention to income generation but somewhat overlooked the issue of creating productive capacity. Harrod and Domar's models address both of these dimensions created by investment comprehensively.

VI. EMPIRICAL EVIDENCE

A. Evidence From Developed Countries

Chen and Feng (2000) conducted a study examining the relationship between various factors and economic growth in China. They analyzed trade (exports plus imports) as a share of real GDP, the presence of state-owned enterprises, inflation, investment levels, higher education enrollment, and their impact on economic growth using provincial panel data. Their findings indicated that trade and university enrollment had a positive and significant association with the annual average rate of per capita GDP. In contrast, inflation and the existence of state-owned enterprises were found to have a negative and significant relationship with economic growth. Consequently, their research concluded that private enterprises, foreign trade, and education played vital roles in determining China's long-term economic growth.

Bhaskara-Rao and Hassan (2011) conducted a study to investigate the determinants of long-run economic growth in Bangladesh, spanning the period from 1970 to 2007. Employing an Autoregressive Distributed Lag method, their results revealed that the implementation of economic reforms since the 1980s, foreign direct investment (FDI), the money supply, and trade openness were positively and significantly correlated with economic growth. Conversely, government expenditure and inflation were negatively and significantly associated with economic growth in Bangladesh.

Asheghian (2009) employed an augmented neoclassical growth model to explore the determinants of economic growth in Japan during the period from 1971 to 2006. Utilizing a Beach-Mackinnon technique, the study's findings demonstrated that the growth rates of total factor productivity and domestic investment had a positive and significant impact on economic growth in Japan.

B. Evidence From Developing Countries

Shera et al. (2014) conducted a study to assess the impact of corruption on the economic growth of 22 developing countries, former socialist states in the Balkans, East and Central Europe, and Asia. Their research findings demonstrated that corruption not only had statistical significance but also exerted a negative influence on economic growth in these countries.

Sabir and Tahir (2012) focused their research on examining the effects of various macroeconomic variables on the welfare of the poor in Pakistan, using annual time series data spanning from 1981 to 2010. Employing multiple regression techniques to uncover the relationship between macroeconomic variables and poverty, their analysis revealed that GDP growth rate, per capita income, major crops, minor crops, and livestock had a negative impact on poverty. In

contrast, inflation and population growth rate were found to have a positive impact on poverty. Their study concluded that changes in macroeconomic variables were crucial drivers of poverty reduction in Pakistan.

Ullah and Rauf (2013) conducted an evaluation of the impacts of macroeconomic variables on economic growth in selected Asian countries, utilizing panel data covering the years 1990 to 2010. Their analysis indicated that economic growth in the sampled countries was positively affected by foreign direct investment and the saving rate. However, exports were found to have a negative impact on economic growth, while factors such as labor force and tax rate were determined to have no significant impacts on economic growth in these countries.

Bengoa and Sanchez-Robles (2003) conducted a study that investigated the relationship between economic freedom, foreign direct investment (FDI), and economic growth. They employed panel estimation methodology in their analysis, focusing on a sample of 18 Latin American countries spanning the period from 1970 to 1999. To measure economic freedom, they utilized the Fraser and Institute index. The study's results indicated that countries with higher economic freedom indexes tended to attract more FDI and, consequently, experienced higher growth rates.

C. Evidence From Nigeria

Kolawole (2013) emphasized the critical importance of macroeconomic stability as a foundational element for sustainable economic growth in Nigeria. Macroeconomic stability, he argued, leads to increased national saving and private investment, enhances export performance, and contributes to a balanced balance of payments, all of which enhance competitiveness and ultimately the well-being of the population. Several factors, including low inflation, minimal deficits, stability in the real exchange rate, and exchange rate relationships, were identified as key determinants of macroeconomic stability, and they were recognized as significant drivers of economic growth. In his empirical analysis covering the period from 1980 to 2011, Kolawole found that the real interest rate had a direct and positive impact on Nigeria's economic growth, while external debt and the real exchange rate had negative effects on growth. The study concluded that achieving macroeconomic stability in Nigeria would require a comprehensive examination of each of these factors, with tailored macroeconomic policies formulated and implemented where needed.

Machi (2011) conducted an empirical study to investigate the determinants of economic growth in Nigeria, utilizing time series data from 1970 to 2008 and employing Johansen's method of cointegration-regression analysis. The study's findings highlighted the importance of policies that promote investments in physical capital, human capital, manpower development, training, research, and technological advancement in driving both short-term and long-term economic growth. Consequently, the government was advised to employ policy tools such as fiscal, monetary, and income-price policies to facilitate economic growth in Nigeria.

Edoumiekumo and Opukri (2013) conducted an assessment of the economic growth factors in Nigeria with a focus on the role of global trade, utilizing annual time series data spanning from 1981 to 2008. The analysis revealed the presence of two co-integrating equations, establishing long-term relationships among international trade variables. Ordinary Least Squares (OLS) statistical techniques were employed to evaluate the extent of influence these variables had on each other. The results indicated a positive relationship among real GDP (RGDP), exports, and imports. However, the parameter related to exports was found to be statistically insignificant at the 5 percent level. The overall model demonstrated statistical significance at the 5 percent level. The Granger causality test revealed a unidirectional relationship between the variables, with RGDP Granger causing exports and imports Granger causing RGDP and exports. The study concluded that Nigeria should consider increasing or diversifying its export products to maximize the benefits of international trade, which would have a substantial impact on its economic growth.

Ahmed and Sabo (2011) conducted an evaluation of the impact of macroeconomic policies on economic development in Nigeria over the period from 1990 to 2008. They utilized multiple regression techniques in their analysis and found that public capital expenditure, fuel prices, the balance of trade, and total bank lending had a positive impact on economic development. In contrast, net foreign direct investment and dummy variables representing the periods of major macroeconomic policies were found to have negative and statistically insignificant effects on economic growth. This suggests that structural adjustment programs introduced from 1986 to 1994 and the National Economic Empowerment and Development Strategies introduced since 2004 did not lead to long-term economic growth but, rather, contributed to economic challenges in Nigeria.

VII. MODEL SPECIFICATION

This current study follows the model proposed by Machi (2011), which emphasizes the significance of investments in various forms of capital to stimulate both short-term and long-term economic growth. These investments encompass physical capital, human capital, manpower development, training, research, and technological development. The research aligns with the principles of endogenous growth theory and is structured as follows:

$$\begin{aligned} \ln GDP_t &= \beta_0 + \beta_1 \ln GRCAP_t + \beta_2 \ln GRFDI_t + \beta_3 \ln GROPT_t \\ &+ \beta_4 \ln INT_t + \varepsilon_t \dots \dots \dots (1) \end{aligned}$$

- here GDP_t = Gross Domestic Product
- CAP_t = Capital
- $GRFDI_t$ = Foreign Direct Investment
- $GROPT_t$ = Openness
- INT_t = Interest Rate
- ε_t = Stochastic Error Term

A. *Priori Expectation*

$$\delta \text{LnGDP} / \delta \text{LnGRCAP} > 0$$

Based on a priori expectations, there is an anticipated positive relationship between economic growth, typically measured by Gross Domestic Product (GDP), and the rate of capital growth within an economy. In simpler terms, it is expected that as the capital within an economy grows, so too will its GDP. This suggests that GDP is likely to increase as the capital base of an economy expands.

$$\delta \text{LnGDP} / \delta \text{LnGRFDI} > 0$$

The rate of growth in Foreign Direct Investment (FDI) plays a crucial role in driving economic growth. Specifically, FDI has a positive impact on the growth of an economy, and this impact is not only positive but also significant. In other words, when FDI increases or grows within an economy, it tends to contribute significantly to the overall economic growth of that country.

$$\delta \text{LnGDP} / \delta \text{LnGROP} > 0$$

The rate at which an economy is open to investment and flows of trade from international countries increases the rate of growth of the economy. Economically, an increase in the degree of openness will have a positive economic effect on the growth of the economy.

$$\delta \text{LnGDP} / \delta \text{LnINT} < 0$$

The analysis here is in tandem with that of capital. An increase in the rate of interest will slow the pace of economic growth as borrowing for investment purposes will be discouraged. As a consequence, aggregate output in the economy will be negatively affected.

VIII. ESTIMATION TECHNIQUES

The study examines the determinants of economic growth in Nigeria using the ARDL. However, before using the ARDL, it is fundamental to carry out some other analysis to aid the estimation of the relationship between the variables and test of Co-integration using the ARDL Bound test.

Table 1: Summary of data (1990-2018)

Variables	<i>LNCAP</i>	<i>LNFDI</i>	<i>LNGDP</i>	<i>INT</i>	<i>OPN</i>
Mean	3.182697	1.739961	4.626976	2.956387	3.348526
Median	3.167158	1.608243	5.015935	2.900551	3.212739
Max	3.220082	5.790847	15.32916	3.454761	3.947796
Min	3.149356	0.195183	-2.035119	2.717065	3.031243
Std. Dev.	0.026055	1.208545	4.032216	0.601535	0.248654
Skewness	0.320347	1.806599	0.441917	1.584742	-0.623327
Kurtosis	1.360223	2.215806	1.632925	3.635726	2.452895
Jarque-Bera	3.745057	31.13897	3.202186	7.453283	1.395243
Prob	0.153734	0.000000	0.201676	0.000035	0.385497
Sum	92.29822	50.45989	134.1823	85.71002	104.1958
SumSq Dev	0.019008	40.8926	455.2455	0.784164	1.731208
Obs	29	29	29	29	29

Source: Eviews 10

Table 1 provides a summary of the statistical characteristics of the data used in the model. Among all the variables, Gross Domestic Product (GDP) has the highest mean, followed by Foreign Direct Investment (FDI), Capital, the degree of openness, and Interest Rate in Nigeria. Additionally, when examining the minimum and maximum values, it's evident that all variables have experienced positive changes over time. The skewness values indicate that all variables, except for openness, are positively skewed,

meaning they are skewed to the right. This suggests that the data tend to have more extreme values on the positive side of the distribution. Furthermore, the Jarque-Bera statistics test the hypothesis that all variables are normally distributed. The results indicate that the null hypothesis cannot be rejected for any of the variables, as the normality of all variables is statistically significant at the 5% level. Therefore, it can be concluded that all the variables used in the study follow a normal distribution.

IX. TREND ANALYSIS, DATA PRESENTATION, AND INTERPRETATION OF RESULT

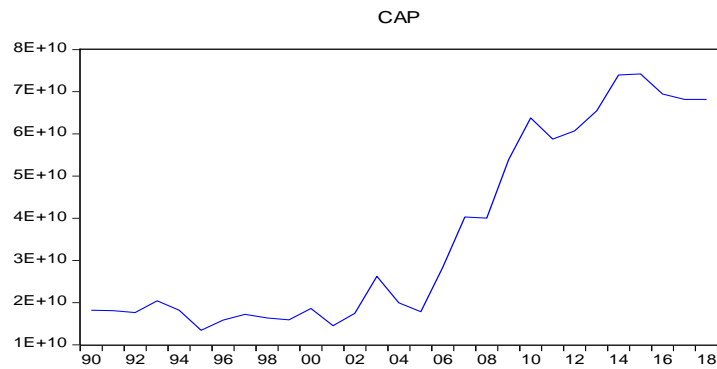


Fig. 1. Trend of Capital (Eviews 10)

The trend analysis of capital formation in Nigeria from 1990 to 2018 reveals some interesting patterns. It appears that capital formation has been oscillating over this period, with fluctuations in the level of investment in the country. One notable observation is that capital formation was at an all-time low in the year 1995, indicating a period of reduced investment during that time. This might have been influenced by various economic factors or policies in place during that period. On the positive side, the analysis also highlights that capital formation in Nigeria reached its peak in the years 2013

and 2015. During these years, Nigeria experienced a significant increase in investment and capital accumulation. This period coincided with Nigeria being recognized as one of the fastest-growing economies in Africa. It's worth noting that fluctuations in capital formation can be influenced by a range of economic, political, and policy-related factors. Understanding these trends is essential for policymakers and economists in assessing the health and growth potential of an economy.

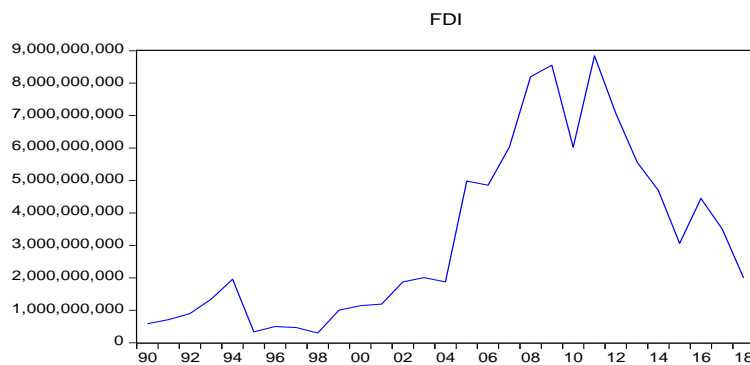


Fig. 2: Trend of FDI (Eviews 10)

The horizontal axis of the trend of foreign direct investment as shown in the above diagram are the years of the research analysis ranging from 1990 to 2018 while the vertical axis reflects the figure in billions as against the years. The graphical illustration for Foreign Direct Investment in Nigeria shows that it increased over time in a fluctuating

manner from the year 2007 till 2018 it started declining. This can be responsible for the slow growth of the economy as the number of foreign investors in the economy decreases greatly. In the year 1995, the trend depicts that it was an all-time low showing the period of economic boom.

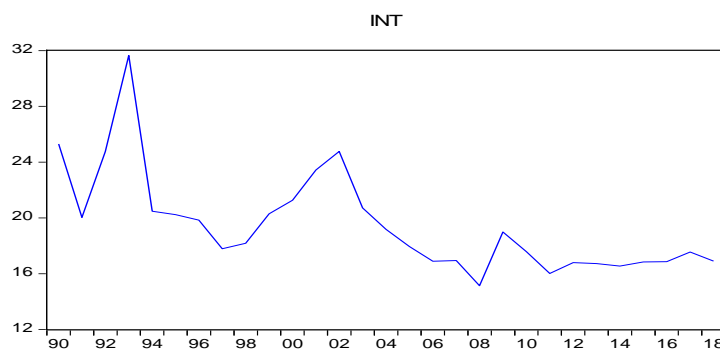


Fig. 3: Trend of Interest Rate (Eviews 10)

The vertical axis of the fig. 3. is in percentage while the horizontal axis reflects the years of this analysis. The trend for the interest rate in Nigeria throughout this research

analysis shows that it fluctuates over time. The interest rate (the cost of borrowing money) declined from the year 1994 till 2018.

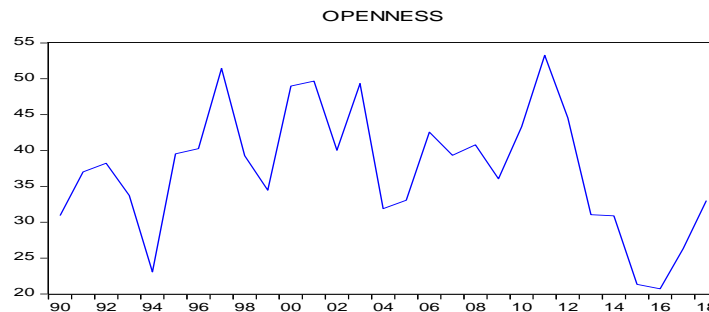


Fig. 4: Trend of Openness (Eviews 10)

The trend on the degree of openness of Nigeria's economy shows that it was at the lowest in the year 2016, it

can be recalled that Nigeria's economy suffered a recession during this period. It was at its highest in the year 2011.



Fig. 5: Trend of GDP (Eviews)

The trend of gross domestic product as a measure of the level of economic growth in Nigeria throughout the year of this research analysis shows the gross domestic product over time in Nigeria. It was at its peak in the year 2013 when

Nigeria was the fastest-growing economy in Africa. Similarly, the trend slopes downward in the year 2016 reflecting when Nigeria's economy was in recession.

Table 2: Phillip-Perron Unit Root Test

Variables	Level		First difference		I(d)
	T-Statistics	Prob.	T-Statistics	Prob.	
CAP	-0.269993	0.9175**	-6.368612	0.0000**	I(1)
FDI	-3.063819	0.0412	-7.644517	0.0000***	I(0)
GDP	-3.550861	0.0138	-8.628002	0.0000***	I(0)
INT	-2.851636	0.0641	-8.087442	0.0000**	I(1)
OPN	-3.035540	0.0437	-7.881512	0.0000***	I(0)

Note * (**) (***) denotes null hypothesis at 10%, 5% and 1% respectively

Table 2 shows the Phillip-perron unit root test for the entire variable used in the analysis. The decision to reject the null hypothesis was based on a 5% significant level. As shown in the table, all the probabilities are significant at first

difference. Hence, we do not accept the null hypothesis of the presence of unit root at first difference. All the variables were not all stationary at first difference.

Table 3: ARDL Bound test result

F-statistics	4.569415	
K (dof)	4	
Significance	I(0)	I(1)
10%	2.45	3.52
5%	2.86	4.01
2.5%	3.25	4.49
1%	3.74	5.06

Table 4: Estimated Short-Run Error Correction Model using the ARDL Approach

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNFDI)	-0.274705	0.630752	0.227485	0.0474
D(INT)	1.175736	5.844788	2.277132	0.5424
D(CAP)	8.991220	36.257654	0.000000	0.6051
D(OPN)	5.241568	3.162501	0.000000	0.0123
CointEq(-1)	-0.663317	0.133572	-0.046959	0.0016

The short-run estimates of the macroeconomic determinants of economic growth in Nigeria, as presented in Table 4, provide valuable insights into the relationships between these variables.

Firstly, foreign direct investment (FDI) and its lag values exhibit a negative relationship with economic growth in the short run. This aligns with the expected negative relationship between FDI and economic growth. In simpler terms, when FDI decreases in the short run, the level of economic growth tends to decline. This implies that, in the short run, economic growth is negatively influenced by fluctuations in foreign direct investment. Specifically, a unit increase in FDI leads to a 1.176-unit decrease in economic growth.

Secondly, the short-run estimates of capital and its lag values reveal a positive relationship with economic growth. This indicates that capital has a positive impact on economic growth in the short run. This finding aligns with the a priori expectation that economic growth tends to increase with higher levels of capital. However, it's important to note that

the positive relationship is statistically insignificant, as indicated by the probability value of 0.6051, which is greater than the standard 5% benchmark.

Lastly, interest rate and openness both exhibit a positive relationship with economic growth in the short run. These relationships are statistically significant, as indicated by their probability values being less than 0.05. This suggests that in the short run, higher interest rates and greater economic openness tend to have a positive impact on economic growth.

The error correction term (ECT), specifically ECT(-1), provides insight into the adjustment or feedback mechanism in the long run. A negative and significant ECT confirms that disequilibrium in GDP will be corrected in the long run. In this case, it implies that the system corrects almost 66 percent of the disequilibrium in GDP annually.

These findings shed light on the dynamics of economic growth in Nigeria in the short run and provide a basis for understanding how various macroeconomic factors interact to influence economic performance.

Table 5: Autocorrelation Test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	2.110376	Prob. F(2,15)	0.1474
Obs*R-squared	4.879330	Prob. Chi-Square(2)	0.0872

Table 5 presents the results of the autocorrelation test for the study. The test aims to determine whether there is autocorrelation present in the error term of the regression model. The null hypothesis (H0) posits that there is no autocorrelation in the error term, while the alternative hypothesis (H1) suggests the presence of autocorrelation. Based on the F-statistic value of 1.151951 and its corresponding probability of 0.3425, we can conclude that

there is no statistically significant evidence of autocorrelation in the error term. Therefore, we fail to reject the null hypothesis, indicating that autocorrelation does not exist in the error term of the regression model. This result is important because it suggests that the model's error term is not exhibiting a systematic pattern of correlation between successive observations, which is a desirable characteristic for regression analysis.

Table 6: Heteroscedasticity Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.369414	Prob. F(17,17)	0.5488
Obs*R-squared	0.393157	Prob. Chi-Square(17)	0.5306

The table above provides the results of the heteroscedasticity test conducted in the study. The test aims to determine whether there is heteroscedasticity in the

variance of the error term of the regression model. The null hypothesis (H0) states that there is homoscedasticity, meaning that the variance of the error term is constant across

observations. The alternative hypothesis (H1) suggests the presence of heteroscedasticity, indicating that the variance of the error term varies across observations. Based on the F-statistic value of 0.369414 and its associated probability value of 0.5488, we conclude that there is no statistically significant evidence of heteroscedasticity in the variance of the error term. Therefore, we fail to reject the null hypothesis,

indicating that the variance of the error term is constant across observations. This result is important because it suggests that the assumption of constant error variance, which is a key assumption in regression analysis, holds true for this study. It enhances the reliability of the regression results and conclusions drawn from the model.

Table 7. Stability Test

Ramsey RESET Test			
	Value	df	Probability
t-statistic	1.531398	21	0.1466
F-statistic	2.345180	(1, 21)	0.1406

F-test summary:			
	Sum of Sq.	Df	Mean Squares
Test SSR	28.58267	1	28.58267
Restricted SSR	284.5273	22	12.93306
Unrestricted SSR	255.9446	21	12.18784

The null hypothesis (H0) in this case is that the regression model is valid and fits the data well, while the alternative hypothesis (H1) suggests that the regression model is invalid. The F-statistic is used to test the overall significance of the regression model. In this analysis, the F-statistic has a value of 2.345180, and its associated probability value is higher than the 5% level of significance. When the probability value is higher than the chosen significance level (in this case, 5%), it indicates that we fail

to reject the null hypothesis. Therefore, based on the F-statistic and its associated probability value, we accept the null hypothesis, which means that the regression model is valid and fits the data well. This suggests that the parameter estimates in the model are stable over time and that the model is a good representation of the relationship between the variables under investigation.

In summary, the results support the validity of the regression model used in the analysis.

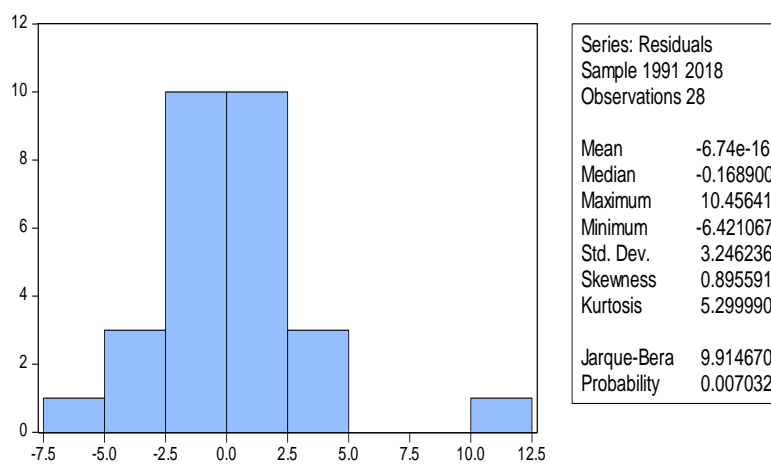


Fig. 6: Normality Test

The normality test, based on the Jarque-Bera statistic, is used to assess whether the error term in a regression model is normally distributed. The null hypothesis (H0) for this test is that the error term is not normally distributed, while the alternative hypothesis (H1) suggests that the error term is normally distributed. In this analysis, the Jarque-Bera statistic

and its associated probability value were used to evaluate the normality of the error term. The graph indicates that the probability value associated with the Jarque-Bera statistic is not provided, so I'll provide a general explanation.

If the probability value associated with the Jarque-Bera statistic is greater than a chosen significance level (often 5% or 0.05), it indicates that we fail to reject the null hypothesis. In other words, if the error term is normally distributed, the Jarque-Bera statistic will not provide strong evidence against this assumption, and the probability value will be high.

Therefore, based on the graph and the information provided, it appears that the error term is normally distributed because the probability value associated with the Jarque-Bera statistic is not given. This is a desirable property for regression analysis, as it supports the reliability of statistical inferences and forecasts made using the model.

In summary, the result suggests that the error term is normally distributed, which is a positive outcome for the use of the model in forecasting. However, it's essential to verify the specific probability value associated with the Jarque-Bera test to make a conclusive assessment.

X. DISCUSSIONS OF FINDINGS

This research study focuses on investigating the macroeconomic determinants of economic growth in Nigeria. The study employs various statistical techniques and analyses to understand the behavior of the data and draw meaningful conclusions.

Descriptive statistics were used to summarize the characteristics of the variables under consideration. It was observed that the variables behaved well and displayed certain patterns. Notably, the mean value indicated that "openness" had the highest average among all the variables.

The analysis also involved examining the skewness of the variables. Skewness helps determine whether the data is symmetrically distributed or skewed in one direction. It was found that all variables, except "openness," exhibited positive skewness, indicating a rightward skew or a tendency for higher values in the data distribution.

To assess the normality of the variables, the Jarque-Bera statistic was employed. This test evaluates whether the data follows a normal distribution. The results suggested that the null hypothesis, which assumes normal distribution, could not be rejected for any of the variables, as they were statistically significant at the 5% level. This implies that all the variables in the study can be considered normally distributed.

Unit root tests were conducted to assess the order of integration of the variables, which is crucial for time series analysis. The results indicated that the variables had different orders of integration.

In the short run, the study found that all variables had a positive relationship with economic growth, meaning they positively influenced economic growth. However, most of these relationships were statistically insignificant, except for "interest rate" and "openness."

The Error Correction Model (ECM) indicated that approximately 60% of the discrepancies among the variables in each period were corrected. This implies that an adjustment of about 60% is needed annually among the variables to address short-term instability, and this adjustment will be completed within a year.

Furthermore, post-estimation tests were conducted to ensure that the model was free from issues like autocorrelation and heteroskedasticity, making it suitable for forecasting. The results of these tests showed that the model did not suffer from serial autocorrelation or heteroskedasticity. This implies that the error term follows a normal distribution, there is no autocorrelation in the residuals, and the variance of the error term is constant.

In summary, this research provides a comprehensive analysis of the macroeconomic determinants of economic growth in Nigeria, employing various statistical techniques and ensuring the model's suitability for forecasting.

XI. SUMMARY OF THE STUDY

This research aims to explore the macroeconomic determinants of economic growth in Nigeria. The study involves a set of variables, with GDP as the dependent variable and openness, foreign direct investment, capital, and interest rate as independent variables. Secondary data from sources like the World Bank Data Bank and the Central Bank Statistical Bulletin were employed for analysis.

The analysis starts with a descriptive examination of the variables, aiming to understand their behavior and distribution. The results of this analysis indicate that the variables in the study behaved appropriately and followed a normal distribution.

The primary analytical technique used in this study is the ARDL (Autoregressive Distributed Lag) Bound test. However, before conducting this estimation, several preliminary tests were performed, including descriptive statistics and unit root tests. The Philip-Perron Unit Root test was used to assess the stationarity properties of the time series data. The results showed that some variables were integrated of order one (I(1)), while others were integrated of order zero (I(0)).

The ARDL Bound test was then employed to determine whether there existed a long-run relationship among the variables. However, the results of this test revealed that the variables did not exhibit a long-run relationship.

Moving on to the short-run estimates, the study found that foreign direct investment and capital had a negative relationship with economic growth during the period under consideration. In contrast, openness and interest rates displayed a positive relationship with economic growth in the short run.

Additionally, the error correction term (ECT) was found to be negative and significant. This indicates the presence of long-run co-integration among the variables. Furthermore, the magnitude of the ECT suggests that disequilibrium in the economy is corrected by more than 60% annually.

In summary, this research investigates the macroeconomic determinants of economic growth in Nigeria, employing various analytical techniques. It includes descriptive analysis, unit root tests, and the ARDL Bound test. The findings highlight the short-run relationships between economic growth and the selected variables and confirm the presence of long-run co-integration among them.

XII. CONCLUSION AND RECOMMENDATIONS

The findings of this study provide valuable insights into the relationship between various economic factors and economic growth in Nigeria. These insights carry important policy implications, which can be summarized as follows:

- *Promote Economic Openness*: Efforts should be directed towards increasing economic openness in Nigeria. This entails creating a conducive environment that encourages both foreign and domestic investment. Given that openness was found to have a significant positive effect on economic growth, policies aimed at facilitating trade, reducing trade barriers, and attracting foreign investment can contribute to overall economic development.
- *Attract Foreign Direct Investment (FDI)*: The government should actively work to attract foreign direct investment. FDI has the potential to significantly boost economic growth. By implementing policies that make Nigeria an attractive destination for foreign investors, such as providing incentives and ensuring a stable business environment, the country can tap into the benefits of FDI.
- *Monetary Policy Review*: The Nigerian monetary authority should regularly review the monetary policy rate (MPR) with careful consideration. High-interest rates were found to have a negative impact on economic growth. Therefore, adjustments in the MPR should be made judiciously to mitigate adverse effects on domestic investment and production costs, which can lead to cost-push inflation. Additionally, it's crucial to ensure coordination and harmonization between the Federal Ministry of Finance and the Central Bank of Nigeria in implementing economic policies.
- *Equitable Economic Distribution*: Policymakers must focus on the equitable distribution of economic gains. Although the trend analysis indicates that economic growth has been increasing over time, this growth has not been evenly distributed to address poverty and broader macroeconomic challenges. Implementing measures to ensure that the benefits of economic growth reach a wider segment of the population can help alleviate poverty and improve overall economic stability.

In conclusion, these policy implications highlight the importance of fostering economic openness, attracting foreign investment, conducting prudent monetary policy reviews, and ensuring equitable economic distribution to promote sustained and inclusive economic growth in Nigeria.

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