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Savings, Investment and Economic Growth Nexus in Nigeria: A Simultaneous Equation Model Estimation

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Abstract
Economic growth has become the main thrust of developing countries across the globe for the simple fact that it is not just the precursor to development, but also in the enhancement of the welfare of the citizenry, and the role of savings and investment are of pivotal importance in this regard. This study explored the complementarity of the savings, investment and economic growth nexus with the use of the simultaneous equation technique. Three endogenous equations were estimated viz; savings, investment and output, using the explanatory variables of current GDP (GDP_t), interest rates ($INTR_t$) and investment (INV_t) for the first model, ditto for the other two models, save for the addition of the current exchange rate (EXR_t) variable in the second model, as well as the addition of the current inflation rate (INF_t) variable in the third model. Unit test was conducted on the variables to determine their times series characteristics using ADF statistics, and the cointegration test was also carried with the help of Johansen technique. The identification condition of the model was also determined before its estimation. The results in our estimated model indicates that most of the explanatory variables met our a priori expectation, and were significant determinants of the endogenous variables, with the exception of the inflation variables in models two and three respectively. Based on these results, the study recommended that government should implement policies that improves national income through various ways like wage indexation, legislation and the likes. It was also suggested that government should create the enabling environment for businesses to thrive, and thus advance the citizens' welfare, by improving the infrastructures, reducing red tapes and all such impediments that stand in the way of optimal government and business performances in Nigeria, among others.
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1. Introduction

Capital accumulation is core to economic growth, since without it the socio-economic infrastructural support needed for growth will not be attained. There is no arguing the fact that the dearth of capital, constitutes one of the most limiting factors to achieving a robust and inclusive economic growth in Nigeria. It has be asserted by Chien (2015), that accumulation of capital stock constitutes one of the major factors that drives long-run economic growth in any economy. Capital accumulation entails the increase in the stock of real capital in the country Dewett and Navalur (2013). These includes irrigation works, production of agricultural tools and implements, land reclamation, building of dams, bridges, and factories with machines installed in them, roads, railways, airports, ships and harbors etc.

Capital formation occupies the central and strategic position in the process of economic growth, and savings and investments (both public and private) are essential for making addition to the stock of capital. However, data from World Bank African Development Indicators (2013) showed that gross domestic savings as a fraction of GDP across Africa is relatively low. It roughly stood at 20%, 17% and 21% in the 1980s, 1990s and 2000s respectively. Comparatively, these figures were 28%, 32% and 32% for Asian countries over the same period, little wonder that the latter region has fared much better in terms of economic growth than their African counterpart.

The history of Nigeria is replete with economic growth models and policies as effected by government and economic planners from the outset of independence of the country as indicated in the various development plans, and programs, where some of these policy measures and programs have been implemented to enhance economic growth via savings and investment enhancement in the country with mixed results. This is however not peculiar to Nigeria, as growth and development theories are as old as the subject matter of economics itself, where the classical economists of the eighteenth and nineteenth centuries were all development economists, writing about forces determining the progress of nations as the countries of Europe embark on the process of industrialization (Thirwall, 2010).

Despite these efforts of Nigeria to achieve growth, available data according to Garba (2003) show that most African countries including Nigeria exhibit striking evidence of a dysfunctional economic and social processes, manifesting in sustained fall in economic growth, decline in quality and quantity of public goods, internal and

external imbalances anud deepening and widening of poverty, and rising inequality. Again, the challenge of most developing countries, especially in Africa to mobilize domestically adequate capital to meet their extensive investment needs has been attributed to two main reasons: the underdeveloped nature of their financial system, and the low rate of access of households to basic financial products (Adom & Elbahnasawy, 2014). These stiffens economic growth which is a necessity for reduction in poverty and unemployment in the continent. In their work on the savings, investment and growth nexus, Ugochukwu, Oruta, Israel and Lucky (2021) in their study, opine that for growth to take place, certain variables such as savings and investments need to be triggered, and concluded that the poor link between savings, and economic growth in Nigeria, is attributable to the inefficient financial intermediation in allocating savings to productive uses, underutilization of monetary and fiscal policies to stimulate investment among others.

Rewane (2021) asserts that the Nigerian economy needs to maintain an annual growth rate of between 7 - 8% in the next 5 – 10years for the country to avert the risks of multidirectional poverty, debt crisis and heightened insecurity. Although Nigeria has the highest GDP in Africa, it needs to attract both domestic and international capital, to grow the current $446.543billion GDP to $1.5trillion by 2030 given the projected population of the country that would be 250 million (Rewane, 2021).

Although there are empirical evidences linking savings and investments in other regions, Adelakun (2011), however asserted that it is sadly not the case for most African countries as there is a disparity between the growth rate recorded and the level of investment in the continent due to a myriad of problems including, but not limited to corruption; compared to researches of other countries like that of (Mohammad & Anas, 2015).

The study of Omoregie and Ikpesu (2016) showed a disturbing trend of savings and investment as a percentage share of GDP in Nigeria, which lends credence to the position of Adelakun. The trend indicated that in the years of their review, domestic savings as a percentage of GDP exceeded that of investment in Nigeria save in 1981, 1998, 1999 and 2009 respectively, where gross domestic investment as a share of GDP exceeded that of gross domestic savings by 3.92%, 2.08%, 6.79%, and 0.26% respectively. The trend further indicated that the gross domestic savings as a proportion of GDP fell considerably from 30.10 to 1.83% in 1998 replicating a decline in household and government savings in Nigeria. Their trend analysis further showed that between 2000 and 2013, domestic savings as a percentage of GDP showed a fluctuating trend, and also, in 2014, the proportion of savings as a share of GDP was 21.70%, while investment as a share of GDP that was 34.02% in 1981, fell drastically to 8.62% in 1998. Again, in the period of 1999 to 2013, they observed that gross domestic investment as a proportion of GDP also showed a similar fluctuating trend. For instance, the successes of economic growth in Asian countries have been attributed in part, largely to higher rate of savings in comparison to other regions of the world (Adom & Elbahnasawy, 2014). It has been asserted that accumulation of savings in the form of capital formation would boost investment, and hence economic growth in Nigeria (Odey, Effiong & Nwafor, 2017). A case of replicating the Asian economic success. The study cardinal objective is to empirically investigate the nexus among savings, investment and economic growth, by exploring the complementarity among these economic variables with the help of a simultaneous equation technique.

2. Literature Review

2.1. Conceptual Issues:

2.1.1. Savings

Essentially, saving has been defined as income not spent on consumption (Bannock, Baxter & Rees). Though a rather broad definition, it represents money which, having been paid out as income to households, does not flow back to firms in the form of expenditure on goods and services. On the other hand, Black (2003) defined saving(s) as the excess of income over consumption. He says it a way of acquiring assets; for the economy as a whole it is the only way, since while individuals may gain or lose assets through inheritance or otherwise, these cancel out on aggregation. Black distinguished between saving and savings in economics to dispel any confusion, since they cover a number of different, yet related concept in their understanding and usages. He described saving as a flow, while savings was described as a stock of assets built up by past saving. Savings has been explained as the portion of disposable income not spent on consumption by households plus profit retained by firms (Todaro, 2010). All these aforementioned clarifications on the concept of saving have one thing in common; saving(s) represents income not spent, which is often assumed in economics as invested. However, there are some additions in the cases of Black and Tadaro's conceptualizations in terms of assets and retained profits respectively. However, our working definition adopted for this study is tailored after Todaro's for its encompassing view.

2.1.2. Investment

By investment, we mean real gross private domestic capital formation. Real investment may be defined as the new physical goods to be used in further production i.e. it does not refer to purchases of existing securities. It also excludes purchases of newly issued stocks and shares since this amounts to an exchange of money for a claim against future earnings of a corporation. In other words, investment consists only of new physical goods to be used to increase productive capacity, and hence future output (Iyoha, 2004). The part of aggregate demand devoted to

the production of capital goods over a given period of time (Todaro, 2010). He further divided investment into two viz; gross investment which is the total expenditure on new capital goods, and net investment which is the additional capital goods produced in excess of those that wear out and need to be replaced.

2.1.3. Economic Growth

The steady process by which the productive capacity of the economy is increased over time to bring about rising levels of national output and income (Todaro, 2010). In other to achieve this, three important components are germane viz; capital accumulation that involves all new investments in land, physical equipment, and human resources through enhancements in health, education, and job skills; growth in population and labour force; as well as technological progress which results from new and improved ways of undertaking traditional tasks, such as in agricultural production, commerce, manufacturing etc. the Corporate Finance Institute (CFI) describes economic growth in a broad term, as a process of increasing a country's real GDP, the expansion of productive capacity which results from technological change and accumulation of capital. The rate of economic growth according to CFI, refers to the percentage change of real GDP from one year to another. Hence, the growth rate is calculated as follows;

Real GDP Growth Rate = Real GDP in Current Year – Real GDP in Previous Year / Real GDP in Previous Year * 100. The Reserved Bank of Australia refers to economic growth as an increase in size of a country's economy over a period of time. It is measured by the total production of goods and services in economy-GDP. It further asserts that it can be measured in "nominal" or "real" terms. Nominal economic growth refers to increase in in the dollar value of production over time, which includes changes in both the volume of production and the prices of goods and services produced. On the other hand, real economic growth means increases in the volume produced only, which ignores the effect of price changes.

2.2. Theoretical Issues:

Economic could be described as the rate at which real GDP increases. It could also be defined as the change in the productive capacity of an economy over a period of time, resulting to an increase availability of goods and services. One of the necessary and sufficient conditions of growth is the accumulation of capital, therefore, savings is synonymous with capital accumulation. Hence, the trajectory of growth is increase in savings. Savings as defined by Jeyachandran & Sekar (2016) as the income not spent on current consumption. Odejimi & Edogiawerie (2019) also provided a similar definition. According them, savings is the amount of income not spent for current consumption. A broader definition is presented by Jayasinghe, Liyanage, Wijesundara, Ranasinghe & Weligodapola (2019). They viewed savings as the proportion of income reserved for use in the future by giving up present consumption and, in increasing amount of the available capital. Investment, on the other hand, constitute the acquisition of new capital equipment like building, machines, and other means of production that could enhance an economy's productivity capacity. Investment, as described by Ogbokor & Musilika (2014), plant and machinery, purchase of equipment, railways, roads, schools, etc. Abel, Bernanke, & croushore (2008), in a similar way, defined investment as the construction or acquisition of capital goods comprising of equipment and software needed for production, inventory stocks, residential and nonresidential buildings among others. A measure for domestic investment is gross fixed capital formation. It measures the aggregate expenditure on investment by the units of production in the domestic economy. It implies changes in the capital stock and the acquiring of valuables by both households and enterprises. Since the expenditure incurred for the acquisition of capital goods that could bring about capital formation is investment, therefore, gross capital formation is a justifiable measure of domestic investment.

2.2.1. Savings Function: The mirror image of consumption is saving defined by Kogiku (1980), as;

$$S = Y - C(Y, r) \quad (1)$$

Consumption behavior, and therefore saving behavior, is also affected by factors other than income and the rate of interest. To incorporate the effects of such factors, you can write the savings as;

$$S = \alpha + S(Y, r) \quad (2)$$

Where S(Y, r) represents part of aggregate saving that is a function of income and the rate of interest, and α represents the remaining part of aggregate saving that is related to exogenous factors. By partial differentiation of equation 2, with respect to Y and r,

$$S_y = 1 - Cy \quad (3)$$

$$S_r = - C_r \quad (4)$$

Recall the consumption demand equation where $C = C(Y, r)$, $0 < C_y < 1$, and $C_r < 0$

Similarly, we have $0 < S_y < 1$, and $0 < S_r$ (5)

The graph of the savings function for a given rate of interest is usually drawn with the income on the horizontal axis. Due to the inequality given in equation 5, the savings function slopes upward to the right, with the slope less than 45^0, indicating that the more a country saves and invests, the more increase in output.

2.2.2. Capital Formation: Investment is positively related to aggregate demand and to the equilibrium

level of income. *Ceteris paribus*, the higher investment is, the higher will be the equilibrium level of income, and vice versa (Iyoha, 2004). The multiplier concept of national income analysis stipulates that an increase in investment results in a multiplied increase in income. Moreover, investment is important because fluctuations in investment expenditures are highly correlated with fluctuations in GNP, known as business cycles. In addition, since investment expands productive capacity, it is a major explanation of and contributory factor to long-run growth in the economy. Although investment financed though savings (domestic or foreign) is the smallest of the three main components of aggregate demand, constituting between 15% and 20% of GNP, however, due to its nature, its importance is out of proportion to its size (Iyoha, 2004).

The capital stock of a country increases through the process of net investment that enhances a country's capacity to produce goods and services in the future and enables it to grow faster. Thirwall (2010) identified four main types of capital goods which includes ; plants and machinery, infrastructure investment, expenditure on Research and Development (R and D) as well as social expenditure such as investment in health and education that provides utilities directly, and at the same time makes individuals and society more productive. Investment have also been classified into business fixed investment, residential investment and inventory investment-real investment which adds to the stock of capital that raises the level of aggregate demand which increases additional level of income and employment in the economy (Ahuja, 2014; Iyoha, 2004). Capital formation depends on time intervals and can be expressed thus;

Let $K(t)$ stand for stock of capital K at a given time t, the net investment is $I(t)$ is a flow concept per time period. We can write $\frac{dk}{dt} = 6$

Given the investment function $I(t)$, capital accumulation over the time interval (t_1, t_2) is given by, $\int_{t_1}^{t_2} I(t)dt = \int_{t_1}^{t_2} dkt = k(t_2) - k(t_1)$ 7

2.2.3. Capital and Investment: if the total capital invested at a time t is K, and the requirement of capital at the equilibrium level K_1, ie capital is withdrawn if above K_1, and invested if below , then the rate of investment is proportional to $K - K_1$ i.e.

$\frac{dK}{dt} = C(K - K_1)$ Where, C, is constant. 8

We may write $\frac{dK}{K-K_1} = C\,dt \; or \; dK = C(K - K_1)dt$ 9

Integrating. $In(K - K_1) = Ct + InC_1$ Where C_1 is a constant

$$K - K_1 = C_1 e^{Ct}$$

$\therefore \quad K = K_1 + C_1 e^{Ct}$ 10

Suppose the initial condition is that the investment at time t = 0 is $K_1/3$, then

$K_1 + C_1 e^0 = K_1/3$ So that $C_1 = -\frac{2K_1}{3}$ and the solution is 11

$K = K_1 - \frac{2}{3}K_1 e^{Ct}$ 12

2.2.4. Dual Nature of Investment: if capital is to be fully utilized without deficit or excess demand, net investment must grow by a constant percentage equal to marginal propensity to save (mps) times marginal output- capital ratio (Monga, 2013). This is proven by the Harrod-Domar model which is concerned with the dual nature of investment. It finds an equilibrium growth pattern consistent with increased aggregate demand. Output-capital ratio Y/K is the maximum output attainable per unit of capital. The model assumes $\frac{Y}{K}$ to be constant for all values K so that

$0 = d\left(\frac{Y}{K}\right) = \frac{dY}{K} - \frac{Y}{K^2}dK$ 13

$\therefore \frac{dY}{dK} = \frac{Y}{K}$ 14

This gives the equality of marginal and average output-capital ratio. If we equate the change in K i.e. dk to net investment I then

$dY = \frac{Y}{K}dK = \frac{Y}{K}I$ 15

Assuming the general price level $p = 1$, aggregate demand $AD = pY = Y$

$$AD = Y = C + I = bY + I$$

$\therefore \quad Y = \frac{1}{1-b}I, dY = \frac{dI}{1-b}$ 16

Where b is the marginal propensity to consume

Since $dY = \frac{Y}{K}I, \frac{dI}{I} = (1-b)\frac{Y}{K} = s\frac{Y}{K}$ 17

and $1 - b = s$, marginal propensity to save.

$\therefore \quad \frac{dI}{I} = s\frac{Y}{K}$ 18

The proportionate rate of investment growth must equal marginal propensity to save (mps) times marginal output-capital ratio. Expression 13, represents the conclusion of Domar's equation that states that investment must rise quickly and sufficiently to absorb all the savings arising out of the rising incomes in a growing economy. Here *I* is investment, *dI* is increase in investment, *s* the proportion of income saved and *Y/K*, is the output- capital ratio. The implication of this therefore, means that the investment growth rate, $\frac{dI}{I}$, must be equal to the proportion of income saved,,*s*, multiplied by the - capital ratio, *Y/K*, assuming full employment.

To grow, economies must save and invest a certain proportion of their GDP. The more they save and invest, the faster they can grow- how much additional output can be had from an additional unit of investment, can be measured by the inverse of the capital- output ratio, *k*, because this inverse, 1/*k* , is simply the output-capital or output-investment ratio (Todaro, 2010). This is explained by the Harrod- Domar growth model expressed as;

$\Delta Y/Y = s/k$ 19

Expression, 14, states that the rate of growth of GDP ($\Delta Y/Y$) is determined jointly by the net national savings ratio, *s,* and the national the capital- output ratio, *k* . In a more specific term, the expression states that in absence of government, the growth rate of national income will be directly or positively related to the savings ratio. (i.e., the more an economy is able to save- and invest-out of a given GDP, the greater the growth of that GDP will be) and inversely or negatively related to the economy's capital- output ratio (Todaro, 2010).

2.3. Empirical Review:

Mehta and Rami (2014) examined the savings, investment and economic growth for India employing VECM to estimate the variables of gross domestic product (GDP), gross domestic savings (GDS) and gross domestic investment in the period 1951-2012. Their Johansen cointegration test indicates that GDP, GDS and GDI are co-integrated, and a long-run equilibrium exists among them, while the VECM test reveals that there is a unidirectional causality running from GDS and GDI to GDP in the short as well as long run. This implies that GDS and GDI lead to GDP but GDP does not lead to GDS and GDI. In an earlier similar research carried out by Jangili (2011) to examine the direction of relationship between saving, investment and economic growth for the Indian economy at both aggregate and sectoral levels, it was empirically evident that the direction of causality ran from saving and investment to economic growth collectively as well as individually, and there was no causality from economic growth to savings and investment. Again, the causality between GDP and savings was estimated for some Asian countries by Agrawal (2001), and found evidence that higher savings rates caused higher growth rates in countries like Bangladesh and Pakistan, and higher growth caused higher savings rates in countries like India and Sri Lanka. Similar researches carried out by Verma (2007) and Sinha (1996) for India show that savings do not cause growth, but growth cause savings in India for the former, and gross domestic saving (GDS) and gross domestic private saving (GDPS) are co-integrated with GDP, and causality tests among (GDS), (GDPS) and (GDP) indicates that the causality does not run in any direction in the latter.

Adom & Elbahnasawy (2014) investigated the Saving-Investment gap and economic growth in some selected developing countries of Africa (Egypt, Cote d' Ivoire, Ghana, Kenya and Nigeria) based on the Ramsey model within a general equilibrium framework where consumption and savings are the determinant factors in a typical household utility function. Their findings indicate significant gaps between optimal and actual levels of savings and investment furthermore, the results point out that these gaps are associated with relatively lower growth rates of actual output compared with simulated output, with the notable, but limited, exception of Nigeria until 2019.

The dynamic interaction between savings, investment and economic growth in Nigeria within the period 1981 to 2014, was investigated by Omoregie and Ikpesu (2016) using impulse response function, the variance decomposition of VAR as well as the granger causality test. Their VAR result revealed that GDP accounted more for GDS, while GDS accounted more for the variation in GDI. Besides, GDS accounted more for the variation in GDP. The impulse response result showed positive influences between the variables, while the causality test showed a uni-directional relationship running from GDP to GDS only.

Another study on the causal link involving savings, investment and growth in Nigeria carried out by Egbiremolen (2014), employed the error variance decomposition analysis in the period 19702012. The result revealed that gross domestic product does not have a direct effect on private savings and private investment variability in Nigeria, and that private savings contribute more to the variability of gross domestic product and private investment in Nigeria. Similarly, Ojiegbe, Duruechi and Makwe (2016) investigated the effect of savings on economic growth in Nigeria in the period 1980 to 2014, and analyzed the data with OLS methods and techniques; including the ADF test, Granger Causality Test, and Cointegration tests on the data. Their result showed that there is a relationship between savings, investment and economic growth in Nigeria.

Again, a similar study carried out by Nwanne (2014) to examine the implication of savings, investment and economic growth in Nigeria, using the methodology of OLS, indicated that gross domestic product and gross domestic savings are negatively significant, and the finding concluded that long-run relationship exist among

savings, investment and economic growth in Nigeria. Besides, the results of the empirical analysis on the study of understanding the nexus between savings, investment and economic growth in Nigeria between 1981-2020, by Ugochukwu, Oruta, Israel and Lucky (2021), employing three separate models, indicate a VAR result of an insignificant relationship between gross domestic savings, gross capital formation and economic growth. They also found that gross domestic savings, gross domestic product and lending rate have insignificant impacts on gross capital formation. However, their result also reveals that gross domestic product and lending rate significantly impacted gross domestic savings. Moreover, the Granger causality test shows a unidirectional causation which runs from lending rate to gross capital formation; and lending rate to gross domestic product. A bidirectional causality was found to exist between gross domestic product and gross capital formation, in contrast to the result of the unidirectional causation.

Using a-two stage least squares (2SLS) simultaneously equation technique, Awe (2013) studied the impact of foreign direct investment (FDI) on economic growth in Nigeria in the period 19762006. His findings revealed an inverse relationship between FDI and GDP-proxy for economic growth, which according to him was due to insufficient FDI inflows into the Nigeria. The study then recommended among others, that Nigeria should encourage domestic investment in order to accelerate the rate of economic growth rather than relying on FDI as the main engine of growth in the country.

Our empirical reviews did not take into cognizance the complementarity among savings, investment and economic growth in their estimations involving Nigerian case studies, which is not robust enough, and thus incapable of examining the accounting growth processes of savingsinvestment nexus in Nigeria. This study intends to fill this gap by simultaneously estimating these variables that are connected to economic growth processes in Nigeria.

3. Methodology of the Study

3.1. Model specification:

In our theoretical literature review, the role of savings and investment in enhancing economic growth was emphasized by Harrod-Domar model (Todaro, 2010), and further by Iyoha (2004) who stated that investment is positively related to aggregate demand and to the equilibrium level of income. Following these, and the neo-classical Solow growth model and its subsequent modifications, Ojiegbe et al. (2016) specified a growth model; $Y_t = (I_t, S_t)$ while Akinlola and Omolade (2013) specified both investment and savings models respectively as; $GCF_t = f(GDP_t, SAV_t)$ and $SAV_t = f(GDP_t, GCF_t)$. Also, Odel et al. (2017) specified a growth and investment models in the above mould; though, however, they included more explanatory variables in their specifications.

In a bid to explore the complementarity among savings, investment and economic growth in the spirit of McKinnon and Shaw (1973) and Todaro (2010), we formulate a simultaneous equation model of three equations involving savings, investment and growth. The functional as well as the stochastic relationships of the models are expressed in the following equations.

3.1.1. Savings Model

$SAV_t = f(GDP_t, INTR_t, INV_t)$ 20

$SAVt = \alpha0 + GDPt + \alpha1\ INTRt + \alpha2\ INVt + U1$ 21

3.1.2. Investment Model

$INV_t = f(SAV_t, GDP_t, INTR_t, EXRT_t)$ 22

$INV_t = \beta_0 SAV_t + \beta_1 GDP_t + \beta_2\ INTR_t + \beta_3\ EXRT_t + U_2$ 23

3.1.3. Growth Model

$GDP_t = f(SAV_t, INVt, INF_t, EXRT_t)$ 24

$GDP_t = \theta_0 SAV_t + \theta_1 INV_t + \theta_2 INF_t + \theta_3 EXT_t + U_3$ 25

Where: S_t = current savings; GDP_t= current income; $INTR_t$ = current interest rate (Prime Lending Rate); INV_t = current investment (GFCF); $EXRT_t$ = current exchange rate (N/$), and INF_t = current inflation rate.

A-priori restrictions for the models: α_0, α_1, and $\alpha_2 > 0$; β_0, $\beta1$, and $\beta_3 > 0$, $\beta_2 < 0$; θ_0, θ_1, θ_2, and $\theta_3 > 0$ or $\theta_2 < 0$ (if inflation is high).

3.2. Model Estimation Techniques

Before proceeding with the model estimation method, the Times series properties of the variables has to be undertaken in order to determine the behavior of the variables (in terms of stationarity or otherwise) employed in the study. The study employed the unit root tests involving the Augmented Dickey-Fuller (ADF) to test the stationarities of the variables. Besides, Johansen Co-integration Test was also carried out in order to determine the existence or otherwise of a long-run relationship among the variables of interest.

The estimation method involves the three-stage Least Squares (3SLS) estimator which is a system estimating method that attempts to estimate all the structural coefficients simultaneously.

3.2.1. Identification Condition of the Models

Identification often precedes the estimation of a simultaneous equation model. This is done in order to get a unique statistical form of the model in order to enable their unique parameter estimates to be subsequently made from the sample data.

Three results of an identification equation or model are feasible; it can either be exactly identified, over-identified or under-identified. Both exact and over-identified equations are termed identified, which can be estimated using appropriate techniques. However, an under-identified equation or model means they are not identified; hence no estimation method can be applied to obtain the structural parameters.

In this work, we apply the order conditions (which is the necessary condition) to identify our model. The order condition can be employed thus:

$H-H^{*} \lessgtr K-1$ 26

Where

H= Total number of variables in a system

H^{*}= total number of variables in a particular equation K= Total number of equations in the model.

3.2.2. Decision Rule

If $H-H^{*}=K-1$

We say the equation is exactly identified

If $H-H^{*} \square K-1$

We say the equation is over-identified, on the other hand, an equation is under-identified if;

$H-H^{*} \leq K-1$

In this case, the equation is not identified. Recall our model of Equations 21, 23 and 25, under which,

H = 11

H^{*} for equation 21 = 3

H^{*} for equation 23 =4

H^{*} for equation 25 =4

And K=3 (number of equations in the model)

To identify equation 21, we have,

$H-H^{*} \geq K-1$

Status

$11-3 \square 3-1$

$8 \square 2$ Over-identified

For equation 23,

$11-4 \square 3-1$

$7 \square 2$ Over-identified

For equation 25,

$11-4 \square 3-1$

$7 \square 2$ Over-identified

It thus means that all our equations are over-identified, hence identified, ditto for our model.

4. Sources of Data:

The data employed in our study were secondary data of times series. It covers a 34-year span (1986-2019). They were obtained from the Central Bank of Nigeria (CBN) Statistical Bulletin (Various Issues),

Table 1: Descriptive Statistics of Data Employed in our Estimation

	INV	GDP	INTR	EXRT	INF	SAV
Mean	5174.766	29274.77	18.62324	108.0126	19.96471	3820.419
Median	652.0400	8854.638	17.77000	119.7686	12.10000	623.9150
Maximum	37015.48	144210.5	29.80000	306.9206	76.80000	17040.72
Minimum	11.35000	134.6033	10.50000	2.020600	0.200000	13.93000
Std. Dev.	8532.892	41433.17	3.727307	91.70817	18.68576	5217.519
Skewness	2.054480	1.555757	1.028583	0.669105	1.726116	1.170723
Kurtosis	7.209426	4.092078	4.754467	2.743530	4.791493	2.986780
Jarque-Bera	49.02066	15.40505	10.35595	2.630162	21.43041	7.766937
Probability	0.000000	0.000452	0.005639	0.268453	0.000022	0.020579
Sum	175942.0	995342.3	633.1900	3672.427	678.8000	129894.3
Sum Sq. Dev.	2.40E+09	5.67E+10	458.4629	277542.8	11522.20	8.98E+08
Observations	34	34	34	34	34	34

The descriptive statistics in table 1 above specifies measures of central tendencies, the dispersions and shapes of the data employed in our study. The GDP which is a measure of economic growth, has a mean value of 29274.77,

median value of 8854.64, maximum and minimum values of 144210.50 and 134.60 respectively. The standard deviation value of 41433.17, indicates that the distribution has a large spread around its mean value. Skewness which is one of the measures of a distribution, has a value of 1.55 which shows that GDP in Nigeria in the review period, is positively skewed, and leptokurtic in distribution given its kurtosis value of 4.09. The data distribution has a total of 34 observations. The savings variable has a mean and median values of 3820.42 and 623.91 respectively. It has a maximum value of 17040.72, and a minimum value of 13.93. Its standard deviation value 0f 5217.52 is indicative of a large spread around its mean value. The variable's skewness values of 1.17 and 2.98 respectively, imply that the distribution is positively skewed, and exhibits a mesokurtic distribution. Furthermore, investment variable has a mean value of 5174.76, median value of 652.04, maximum and minimum values of 37015.48 and 11.35 respectively, as well as a standard deviation value of 8532.89, skewness value of 2.05 and kurtosis value of 7.20. With the standard deviation value, it means that the variable has a large spread around its mean value. Besides, the distribution is positively skewed, and exhibits a platykurtic distribution giving its skewness and kurtosis values.

Interest rates which measures the cost of capital in the economy, has values of 18.62 and 17.77 as its mean and median respectively. It also has a maximum and minimum values nof 29.80 and 10.50 respectively. The variable has a standard deviation of 3.72, which means that the distribution around its mean is small. The skewness variable value of 1.03 is indicative of positive skewness of its data, while its kurtosis value of 4.75, shows a leptokurtic distribution with 34 observations. Similarly, the inflation variable which measures changes in price levels in the economy, has mean and median values of 19.96 and 12.10 respectively. The variable also has a maximum and minimum values of 76.80 and 0.2 respectively. Its standard deviation value of 18.68 shows that the dispersion around the mean is fairly large. The variable skewness and kurtosis values of 1.72 and 4.79 indicates that the distribution is positively skewed, and its leptokurtic with 34 observations. Exchange rate variable, which is the rate at which the Nigerian currency exchanges for the US dollar, has a mean value of 108.62, median value of 119.76, while the maximum and minimum values are 306.92 and 2.02 respectively. The standard deviation of the data is 91.70, indicating a fair large dispersion of the data point around its mean. Its skewness and kurtosis values of 0.67 and 2.74 respectively, shows that the distribution is positively skewed, and leptokurtic with 34 observations.

4.1. Presentation and Analysis of Estimated Results:

Table 1: Unit Root Test Result Using ADF Statistics

Variables Levels	1^{ST} Difference	10% Level	5%Level	1% Level	Conclusion
EXR_t	0.9840	-4.0341	-2.6174	-2.9571	-3.6537	I(1)
GDP_t	1.2646	-4.4965	-2.6174	-2.9571	-3.6537	I(1)
INF_t	-2.7332	-5.1112	-2.6229	-2.9678	-3.6793	I(1)
$INTR_t$	-2.5386	-5.2172	-2.6274	-2.9763	-3.6999	I(1)
INV_t	4.9889	-4.6032	-2.6355	-2.9919	-3.6355	I(1)
SAV_t	0.3592	-3.9477	-2.6158	-2.9540	-3.6463	I(1)

Source: Author's Computation from E-views

Table 1 above shows the unit root tests results of the variables employed in the study, using the Augmented Dickey Fuller (ADF) test statistical method. All the variables became stationary at their first differences at both the 10%, 5% and 1% levels respectively, and hence integrated of order (1) as indicated in the table above.

Table 2: **Johansen Cointegration Test Result**

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.723192	114.8244	95.75366	0.0013
At most 1 *	0.626376	73.72268	69.81889	0.0236
At most 2	0.531555	42.21851	47.85613	0.1527
At most 3	0.296152	17.95173	29.79707	0.5696
At most 4	0.150446	6.713542	15.49471	0.6112
At most 5	0.045679	1.496155	3.841466	0.2213

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob. **
None *	0.723192	41.10174	40.07757	0.0382
At most 1	0.626376	31.50417	33.87687	0.0935
At most 2	0.531555	24.26678	27.58434	0.1257
At most 3	0.296152	11.23819	21.13162	0.6235
At most 4	0.150446	5.217387	14.26460	0.7142
At most 5	0.045679	1.496155	3.841466	0.2213

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

The results of the Trace Test report in Table 2 above, indicates the presence of coitegration among the variables employed in the study. This means that there is a long-run relationship among the endogenous variables used in our estimation

Table 3: Estimated Savings Equation

Variables	**Coefficients**	**t-stat**	**prob. values**
Constant	736.4855	0.8937	0.3740
GDP_t	0.08056	3.2115	0.0019
$INTR_t$	-22.5153	-5.6578	0.0030
INV_t	-0.2240	1.7542	0.0830

R^2 = 0.956, R^2 (Adjusted) = 0.951, DW-stat. = 2.42

The estimated savings equation in Table 3 indicates that why two of the variables (***INTR$_t$***, and ***INV$_t$***) have indirect relationship with the dependent variable (current savings), the third variable, ***GDP$_t$*** has a direct relationship with the dependent variable, given the signs of their various coefficients in the estimated model. The probability values of the variables show that they were all significant, with ***INTR$_t$***, and ***GDP$_t$*** at the 5% level, while ***INV$_t$*** variable did so at the 10% level. The values of the R^2 and its adjusted counterpart, show that over 95% of the variation in the dependent variable is accounted for by the three explanatory variables. There is no evidence of autocorrelation in our estimated equation in table 3, since the DW-statistical value is 2.42. Two variales ***GDP$_t$*** and ***INTR$_t$*** met our a-priori expectations while the third explanatory variable failed it.

Table 4: Estimated Investment Equation

Variables	Coefficients	t-stat	prob. values
Constant	-2604.125	-7.1377	0.0000
SAV_t	2.4112	1.8179	0.0726
GDP_t	0.6890	-4.1802	0.0027
$INTR_t$	-109.1797	-0.6212	0.5361
$EXRT_t$	-13.8194	-5.9537	0.0032

R^2 = 0.873, R^2 (Adjusted) = 0.855, DW-stat. = 1.64

Table 4 shows that while two of the explanatory variables SAV_t and $_{GDPt\ have}$ direct relationship with the dependent variable (current investment), the other two $INTR_t$ and $EXRT_t$ indicate inverse relationship with the dependent variable. Save for $INTR_t$, all the other three variables were significant at the 5% and 10% levels respectively, with the variable GDP_t being the most significant. Over 87% of the systematic variation in the estimated investment equation is caused by the four explanatory variables given the R^2 value, though it dipped to about 85% with the adjusted value of R^2, taken cognizance of degree of freedom. As in the case of the result in Table 3, there is no autocorrelation in the estimated investment model, with the DW-statistical value. All the explanatory variables coefficient signs, with the exception of the coefficient of EXRTt variable, met our a-priori expectations.

Table 5: Estimated Growth Equation

Variables	Coefficients	t-stat	Prob. values
Constant	58.9836	12.8299	0.0000
SAV_t	8.0500	3.4337	0.0009
INV_t	0.8500	6.0790	0.0049
INF_t	54.5560	0.8387	0.4040
$EXRT_t$	-70.1744	-1.0741	0.2858

R^2 = 0.947, R^2 (Adjusted) = 0.939, DW-stat. = 2.43

The results of Table 5 above shows the estimated growth model, where all the explanatory variables save one, have direct relationship with the dependent variable (Current GDP), and met our a-priori expectations of our variable coefficients. The only one that has an inverse relationship with the dependent variable, $EXRT_t$, is not significant and did not also meet our a priori expectation. Furthermore, only two of the explanatory variables, SAV_t and INV_t were highly significant at the 5% level, while the INF_t was not significant at both the 5% and 10% levels respectively. The values of the R^2 and R^2 (Adjusted) indicate that about 94% of the variation in the estimated growth equation is accounted for by the four explanatory variables. There is also the absence of autocorrelation in the estimated model given the value of DW-statistics of 2.43.

5. Policy Implications and Conclusion:

Our estimated three equations showed different thought provoking results as indicated from tables 3-5 above. The Savings estimated model indicates that all three explanatory variables were significant determinants of savings in Nigeria in the period under review, with the first two variables being the most significant. The result in Table 3 is implies that current national income plays a positive significant role in the determination of savings in Nigeria. Secondly, interest rate was a major determinant of current savings in Nigeria albeit, it negatively imparted it in the review period. Also, the current investment showed a significant negative relationship with savings at the 10% level. From the foregoing therefore, the government should implement policies that improves national income such as improving the wages and salaries of public officers, and using legislation and laws to achieve same in the private sectors. Besides, by creating an enabling environment for investment to thrive, by removing red tapes, improving infrastructure and other hostilities that stand in the way of doing business as well as improving the welfare of the citizens will create the needed impetus for not just national income to increase, but also improve the savings and hence bring about a competitive interest rate. Another finding in Table 3 shows that investment did not positively impart savings, which perhaps stems from the poor performance of most firms in Nigeria occasioned by poor operational (economic and other sundry) environment, as well as the high import costs of capital goods.

Similarly, our estimated invested equation (Table 4), indicates that current national income was the most significant variable that influenced current investment, though negatively in the equation. Furthermore, current values of exchange rate as well as savings were also major determinant variables of current investment, though the former showed a direct relationship, the latter had an inverse relationship with savings. The import of these results can be seen in terms of the capital flights that manifests in various forms, as well as the rent-seeking activities of most government officials which results in low productivity in the economy, since the illegally acquired wealth are stashed away in safe havens. The performance of the current exchange rate variable indicates that despite the deregulation on the exchange rate in Nigeria, investment is still poor due perhaps to the perceived

hostile environment as well as the low propensity to export in the country, there is thus the need for government to thoroughly interrogate previous policies (especially economic) that showed less than optimal performance overtime, principally, those that were implemented to drive exports among others.

For the output equation estimation, save for the current inflation variable, all other three variables were significant determinant of output in Nigeria, with current exchange rate inversely related, while current savings and interest rates were directly related to the level of output. Their coefficient signs indicate that savings is pivotal for any economic growth, while a higher interest rate attracts FDI into an economy, and enhances growth. However, the sign exhibited by the exchange estimate showcases the dearth of capital in Nigeria resulting from high cost of imported capital goods which has deteriorated the growth output in the country.

From the foregoing, income and savings were the key variables that significantly influenced our model estimates. Therefore, government economic policies, programs and strategies should be ones that promotes exports not just in crude or raw forms, but also those that have to do with refined products and heavy manufacturing through the use of tax incentives, provision of financial support, improvement of the business environment that reduces cost, such as provision of adequate security etc. to the manufacturing sector. Secondly, there should be a far reaching fiscal and monetary reforms by the authorities concerned in order to create a conducive environment to improve the infrastructure requirements, reduce waste and mismanagement in the system. This can be achieved through the PPP model and the deployment of ICT in governance. In order to improve productivity, increase the tax base and expand the national savings of the country, unemployment and underemployment should be tackled through proper educational training, enhanced through ICT deployment, R and D, stemming brain drain through improved wages and welfare of the professionals among others.

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