

## CAPITAL FORMATION: IMPACT ON THE ECONOMIC DEVELOPMENT OF NIGERIA 1960-2013

**Shuaib, I. M (MBA, M.Sc, ACE)**

Department of Business Administration & Management  
Auchi Polytechnic, Auchi, NIGERIA

&

**Dania Evelyn Ndidi (M.Sc, PhD, NES)**

Institute of Continuing Education  
Benin City, NIGERIA

### ABSTRACT

This paper examined the capital formation: impact on the economic development of Nigeria, using time series data from 1960 to 2013. The paper applied Harrod –Domar model to Nigerian economic development model and tested if it has a significant relationship with Nigerian economy. The paper explored various econometrics and statistical analytical (i.e., Eview 7.2) method to examine the relationship between capital formation and economic development. The paper tested the stationarity and/or different diagnostic tests of Nigeria's time series data. The entire tests rejected the null hypothesis and accepted the alternative hypothesis. From the empirical findings, it was discovered that there is a significant relationship between capital formation and/or economic development in Nigeria. The results corroborated with the Harrod-Domar model which proved that the growth rate of national income will directly be related to saving ratio and/or capital formation (i.e. the more an economy is able to save-and—invest-out of given GNP, the greater will be the growth of that GDP). The paper recommended based on the econometric results that the government should continue to encourage savings, create conducive investment climate and improve the infrastructural base of the economy to boost capital formation and hence promote sustainable growth.

**Keywords:** Capital formation, Economic development, investment.

### INTRODUCTION

A nation that needs to meet her objective of economic development needs a capital formation (physical capital stock) or capital accumulation. However, economic development may be measured through building of capital equipment on a sufficient scale to increase productivity in agriculture, mining, plantations and/or industry on the one hand. While on the other, capital is required to construct schools, hospitals, roads, railways, standards of living, research and development (R & D), etc. (Jhingan, 2006; Ainabor, Shuaib & Kadiri, 2014). The essence of economic development is the creation of economic and social overhead capitals (or costs), which leads to increase in national output and/or income through creation of employment opportunities and/or reduction of vicious circle of poverty both from the demand side and supply side. Economic development is *sine qua non* and/or is not normally achieved in the short run rather in the long run, where the citizenries of *per se* country could match up with the 21<sup>st</sup> century trends relatively to economies of the world. The discovered problem (s) that is/are responsible for the emerging economies is/are resulting from low capital formation (or base) (Jhingan, 2006; Ainabor, *et. al.*, 2014). The emerging countries of the World have no opportunity costs or the attitude of sacrificing present consumption (i.e.

save) for future consumption (.i.e. investment) in order to augment future national output and income (*ibid.*). Gross capital formation leads to technical progress which helps realize the economies of large scale of production (or economies of scale or operation) and/or increases specialization, in terms of providing machines, tools and equipments for growing labour force. Thus, the accumulated capital enables the acquisition of new factories alongside with machinery, equipment and all productive capital goods. In addition, to the construction of capital or mega projects and/or utilize (diverting) the gross capital formation into educational sectors, health sectors, etc (*op.cit.*).

Capital formation is analogous (or prerequisite) to an increase in physical capital stock of a nation with investment in social and economic infrastructures. Gross fixed capital formation can be classified into gross private domestic investment and gross public domestic investment. The gross public investment includes investment by government and/or public enterprises. Gross domestic investment is equivalent to gross fixed capital formation plus net changes in the level of inventories (*loc.cit.*). Capital formation perhaps leads to production of tangible goods (i.e., plants, tools & machinery, etc) and/or intangible goods (i.e., qualitative & high standard of education, health, scientific tradition and research) in a country. The paper examines the relationship between the domestic investment and public investment and GDP of the Nigerian economy and how capital formation raises the national output and national income. In Nigeria for example, capita output is low resulting from the fact that capita income is low. In Nigeria the marginal or average propensity to save is low, while the marginal or average propensity to consume is so high, this leads to unattainment of economic development. For economic development to be achieved in Nigeria, then there should be increase of domestic saving from 4% to thereabout 12% in national income, expansion of market, investment in capital equipment, decrease in population rate, correcting of imbalance of payments, declining of foreign debts, control of inflationary pressure, etc. These stated points are possible only and only if there is a rapid rate of capital formation in the country, that is, if smaller proportion of the community's current income or output is partly devoted to consumption and/or the other part is saved and/or invested in capital or industrial equipment. Recently, the percentage of domestic investment and/or public investment has reduced drastically, which resulting from macroeconomic variables disequilibria—such as, inflation rate; exchange rate fluctuations; balance of payment problems; High external debt ratio; increase in population, corruption, etc. it was worsened when most recently there was a significant drop of crude oil prices in OPEC. This has had inverse relationship with countries that depended on crude oil or agriculture (mono-economy)—such as Nigeria. In other words, in Nigeria growth rate has dropped from 7% to 4.2%. This has led to devaluation of currencies and/or other stringent fiscal and monetary policies—such as reduction in taxes and deliberate attempt to make a mismatching of the unit of domestic currency and another currency (most especially American dollar as the commonest currency for exchange for goods and services) (Ainabor, *et.al*, 2014).

The devaluation of currencies which was opted for by the CBN has negative impact on the Nigerian economy as an emerging country; rather it has caused harshness in the economy such as various degrees of unemployment, high cost of production, etc. The purpose of economic development is to build capital equipment on a sufficient scale to increase productivity in agriculture, mining, plantations and industry. He went further to opine that capital is also needed to construct schools, hospitals, roads, railways, etc. In addition, economic development leads to the creation of economic and social overhead capital (*op.cit.*).

Besides the internal (domestic) sources, the external sources are complementing the capital formation of the emerging countries—such as Nigeria, are: (i) foreign aids; (ii) restriction of imports; & (iii) favourable terms of trade (Jhingan, 2006).

Capital and money markets are other sources of capital formation for the economic development of any nation. These markets are avenue for surplus investors to save their excesses and/or the deficit investors to borrow the excesses for investments, which in turn, will lead to creation of employment opportunities, reduce poverty level, etc, (Shuaib & Peter, 2010).

During Structural Adjustment Programme (SAP) of 1986, the government of Nigeria considered the need for improvement in capital formation and pursued an economic reform that shifted emphasis on private sector. The public sector reforms were expected to ensure that interest rates were reduced (or positive) in real terms and/or to encourage savings, thereby ensuring that investible funds would be readily available to the real sectors. Besides, the reforms were expected to lead to efficiency and productivity of labour; efficient utilization of economic resources, increase aggregate supply, reduces unemployment and generate single digit inflation rate. For example, during 1980s till date, the percentage of gross fixed capital formation had dwindling or fluctuating in Nigeria, inspite of SAP programme. The fluctuations in capital formation from 1980 to 2013 resulted from macroeconomic imbalances (or problems) such as deteriorating foreign exchange rate, increase in general price level, high real interest rate, double digit inflation, and/or high rate of corruption in public sector. In addition, inadequacy in economic infrastructures such as epileptic power generation, deplorable road networks as well as poor health and educational facilities were equally responsible for the decline in capital formation (Bakare, 2011, Ainabor, *et. al.*, 2014).

Capital information is thus *sine qua non* as an important determinant of economic development. This would be however, an oversimplification to regard economic development as a matter of capital formation alone ignoring political, social, cultural, technological, and entrepreneurial factors (Jhingan, 2006).

In the final submission, the speed and/or the strength of economic growth in Nigeria have not been satisfactory, in that, it has not generated employment opportunities, and contributed to the Gross Domestic Product or Gross National Product or Income or Investment as the case may be.

## LITERATURE REVIEW

Theoretical and empirical research works carried out by various researchers on capital formation and economic development are found on the schools or academic's archives. Regarding capital formation and economic development, recent empirical studies (i.e., Khan & Reinhart 1990; Ghura & Hadjimichael, 1996; Ben-David, 1998; Collier & Gunning, 1999; Hernandez-Cata, 2000; Ndikumana, 2000) conducted in Africa, Asia and Latin America have established, beyond a doubt, the critical linkage between capital formation and the rate of growth. Throughout the 1990s, the ratio of total Gross Domestic Investment (GDI) to Gross Domestic Product (GDP) in Asia, which experienced a high average rate of growth compared with the rest of the world, was about 27 percent, while in Latin America and sub-Saharan Africa the corresponding ratios were 20 percent and 17 percent, respectively. Econometric evidence (Ghura & Hadjimichael, 1996; Ghura, 1997; Beddies, 1999) indicated that private

capital formation has a stronger, more favorable effect on growth rather than government capital formation probably because private capital formation is more efficient and/or less closely associated with corruption.

To ascertain the relationship between capital formation and economic development, Jhingan (2006) asserted in his work that capital formation could not only result on the investment in capital equipment that leads to increase in production but again lead to employment opportunities. He further stressed that capital formation leads to technical progress which helps realise the economies of large-scale production and/or increases specialization and/or thus provides machines, tools and equipment for the growing labour force. Capital formation also leads to the expansion of market. He further accentuated that capital formation helped to remove market imperfections by the creation of economic and social overheads capital, and thus breaks the vicious circles of poverty both from the demand side and supply side. Even in the face of increasing population capital formation makes development possible. In overpopulated underdeveloped countries as it is in sub-Sahara Africa increase in per capita output is related to the increase in capital-labour ratio. Countries aiming at raising the capital-labour ratio have to face two problems: (i) the capital-labour ratio fall with increase in population so that large net investment is needed to overcome the diminution of capital-labour ratio. (ii) When population is increasing rapidly, it becomes difficult to have sufficient savings for the required quantity of investment, reason being that a low per capita income keeps the propensity to save at a low level in such a country. The only solution to these problems is a rapid rate of capital formation (*loc.cit*).

Capital formation has been the major bane to economic growth and development of the peripheral countries. From the previous literature, the developing countries are faced with the macroeconomic problems—such as: balance of payment; high foreign debt burden; inflationary pressure; high interest rate; etc. (*Op.cit*).

Determining the bane of capital formation, Shuaib, Ekeria and Ogedengbe, (2015) examined the impact of fiscal policy on the growth of the Nigerian economy using time series data from 1960-2012. The paper tested the stationarity—through Group unit root test, and stationarity found at first differenced at 5% level of significance. Factor method, Goodness-of-fit summary, VAR and its properties were tested. Also, the Co-integration Technique and Pairwise-Granger Causality were employed in this study to test and determine the long-run relationship among the variables examined.

Shuaib, Ekeria and Ogedengbe, (2015) examined the impact of inflation rate on the economic growth in Nigeria. The study explored secondary data for the period of 1960 to 2012 and used E-view 7.2 statistical window in processing and analyzing the time series data. The empirical result of the test showed that for the periods, 1960-2012, there was no co-integrating relationship between Inflation and economic growth for Nigeria data. Furthermore, we examined the causality relationship that exists between the two variables by employing the Pairwise-Granger causality at two lag periods.

Shuaib, Ekeria and Ogedengbe, (2015) examined the impact of corruption on the growth of Nigerian economy using time series data from 1960 to 2012. The paper utilized secondary data and the paper explored various econometrics and/or statistical analytical (Eview 7.2) method to examine the relationship between corruption and economic growth. The paper explored unit root, Cointegration analysis to test for the Nigeria's time series data and used an error correction mechanism to determine the long-run relationship among the variables

examined. From the results of the findings, it was discovered that corruption has an inverse relationship with growth of an economy.

Shuaib, Ekeria and Ogedengbe, (2015) examined balance of payments: Nigerian Experience: 1960-2012 using time series data from 1960-2012. The study explored secondary data from the Central Bank Statistical Bulletin for the period of 1960 to 2012 and used various econometric analyses and/or statistical analytical (E-view 7.2) method to examine the relationship between balance of payments and economic growth. The paper tested the stationary—through Group unit root test. The co-integration technique employed in this study is Engle and Granger, (1987) approach in assessing the co-integrating properties of variables, especially in a multivariate context to determine the long-run relationship among the variables examined. Further effort was made to check the causality relationship that exists between the two variables by employing the Pairwise-Granger causality at one lag period.

In the work of Bakare (2011) asserted that capital formation influences the economic welfare of a country. It helps in meeting all the requirements of an increasing population in developing economy. It leads to the proper exploitation of natural resources and the establishment of different types of industries, levels of increase and the varied wants of the people are satisfied. They consume a variety of commodities, their standard of living rises and their economic welfare increases. Capital formation raises the level of national income. Bakare, (2011) using cointegration to ascertain the relationship between capital formation and economic growth, his result showed that capital formation has a direct relationship with economic growth of Nigeria.

Another theoretical model of capital formation and growth is —Q theory. In the —Q theory of capital formation (which is also in the neoclassical framework) the ratio of the market value of the existing capital stock to its replacement cost (the —Q ratio) is the main force driving investment and growth. Tobin argued that delivery lags and increasing marginal cost of investment are the reasons why Q would differ from unity. Another approach dubbed —neoliberal (Galbis, 1979) emphasized the importance of financial deepening and high interest rates in stimulating growth. The proponents of this approach are McKinnon (1973) and Shaw (1973). The core of their argument rested on the claim that developing countries suffer from financial repression (which is generally equated with controls on interest rates in a downward direction) and that if these countries were liberated from their repressive conditions, this would induce savings, investment and growth. Not only will liberalization increase savings and loanable funds, it will result in a more efficient allocation of these funds, both contributing to a higher economic growth. In the neoliberal view, investment is positively related to the real rate of interest in contrast with the neoclassical theory. The reason for this is that a rise in interest rates increases the volume of financial savings through financial intermediaries and thereby raises investible funds, a phenomenon that McKinnon (1973) called the —*conduit effect*. Thus, while it may be true that demand for investment declines with the rise in the real rate of interest, *realized* investment actually increases because of the greater availability of funds. This conclusion applies only when the capital market is in disequilibrium with the demand for funds exceeding supply (*op.cit*).

Ainabor, *et. al* (2014) examined the impact of capital formation on the growth of Nigeria using time series data from 1960 to 2010. The paper applied Harrod –Domar model to Nigerian growth model and tested if it has a significant relationship with Nigerian economy. The paper utilized secondary data and the paper explored various econometrics and/or statistical analytical (Eview 4.0) method to examine the relationship between capital

formation and economic growth. The paper tested the stationarity, OLS, cointegration of Nigeria's time series data and used an error correction mechanism to determine the long-run relationship among the variables examined. The results of the findings supported the Harrod-Domar model which proved that the growth rate of national income was directly related to saving ratio and capital formation (i.e. the more an economy is able to save-and invest-out of given GNP, the greater will be the growth of that GDP).

Ugwuegbe and Uruakpa, (2013) investigated the impact of capital formation on economic growth in Nigeria. To analyze the impact of capital formation, stock market capitalization, inflation rate and interest rate on economic growth, the study employed Ordinary least square (OLS) technique. To test for the properties of time series, phillip-perron test was used to determine the stationarity of the variables and it was discovered that gross fixed capital formation and economic growth are integrated of order zero  $I(0)$ , Johansen co integration test was employed to determine the order of integration while error correction model was employed to determine the speed of adjustment to equilibrium. The empirical findings suggested that capital formation has positive and significant impact on economic growth in Nigeria for the period under review.

Kanu & Ozurumba, (2014) examined the impact of capital formation on the economic growth of Nigeria using multiple regressions technique. It was ascertained that in the short run, gross fixed capital formation had no significant impact on economic growth; while in the long run; the VAR model estimate indicates that gross fixed capital formation, total exports and the lagged values of GDP had positive long run relationships with economic growth in Nigeria. It was equally ascertained that there exists an inverse relationship between imports (IMP), Total National Savings (TNSV) and economic growth; while GDP was seen to have a unidirectional causal relationship with export (EXP), Gross fixed capital formation (GFCF), Import (IMP) and Total national saving (TNSV).

Examining the capital formation and economic development through government expenditure on education, Shuaib, Ahmed & Kadiri.,(2015) examined the impact of innovation for 21<sup>st</sup> century educational sector in Nigerian economic growth. The paper employed the characteristics of each time series by testing their stationarity using Augmented Dickey Fuller (ADF) tests, including co-integration tests and Error Correction model through over-parameterization and parsimonious of the variable to enable the researcher to ascertain both short run and long run equilibria. Shuaib, *et.al*, (2015). Examined the impact of innovations and transformations in teaching and learning on educational systems in Nigerian economic growth, The paper employed the characteristics of each time series by testing their stationarity using Augmented Dickey Fuller (ADF) tests, including co-integration tests and Error Correction model through over-parameterization and parsimonious of the variable to enable the researcher to ascertain both short run and long run equilibria. The results of the findings revealed that total government expenditure on education proxied for teaching and learning has direct relationship with economic growth.

Shuaib, Igbinosun and Ahmed, (2015) examined the impact of government agricultural expenditure on the growth of the Nigerian economy. The study employed secondary data sourced from National Bureau of Statistics, and Financial Review of Central Bank of Nigeria. The study employed E-view 7.2 statistical output as a window in exploring the possible links between government agricultural expenditure and economic growth. The results revealed that government agricultural expenditure has a direct relationship with economic growth which statistically significant at 5% level.

Ascertaining the capital formation, globalization, Foreign Direct Investment and trade, and economic growth, Shuaib, Ekeria and Ogedengbe, (2015) empirically examined the impact of globalization on the growth of Nigerian economy using times-series data from 1960 to 2010. The paper utilized secondary data and various econometrics and/or statistical packages analytical (View 7.2) method were explored to examine the link between the econometrics variables and their impact on the growth of Nigerian economy. The paper tested the stationarity, cointegration of Nigerian's time series data and used error correction mechanism to determine the long run and short run relationship among the variables examined. The results of the findings supported the Obadan's findings which proved that growth of external debt ratio as one of the variables of the model was an inversely related to economic growth in Nigeria.

Shuaib (2011) examined the impact of Foreign Direct Investment (FDI) and trade on the economic growth of Nigeria. Taking into account the possible existence of endogeneity of Foreign Direct Investment modelling, and employed the Ordinary Least Square (OLS) techniques—through statistics Gretl packages in exploring the possible links between FDI, trade and economic growth in Nigeria. The results revealed that Foreign Direct Investment and trade have significant impact on the economic growth of Nigeria. Though the overall impact of Foreign Direct Investment and trade on economic growth may not be significant, but the components of Foreign Direct Investment and trade have a direct impact on the growth of the Nigeria economy during the period under review. Though the relationship between FDI, trade and economic growth was found to be statistically insignificant, but there still exist a direct relationship. Shuaib, Ekeria and Ogedengbe, (2014) examined the impact of exchange rate on the growth of Nigerian economy using time series data from 1960 to 2010. The paper tested the stationarity—through unit root test (ADF), Vector Autoregressive Estimates (VARs), cointegration test, Granger-Causality test of Nigeria's time series data and used an error correction model through over-parameterization and parsimonious of model to determine the long-run relationship among the variables examined. It was discovered from the findings that the growth rate of national income was directly related to domestic investment and economic growth.

## THEORETICAL FRAMEWORK

The model that captures the main objective of this study is Harrod–Domar model (see equation 1-8 below). Harrod–Domar model described the economic mechanism by which more investment leads to more growth. For a country to develop and grow, it must divert part of its resources from current consumption (or save) and invest them in capital formation. Diversion of resources from current consumption is called saving. While saving is not the only determinants of growth, the Harrod Domar model suggests that it is an important ingredient for growth. Its argument is that every economy must save a certain proportion of its national income if only to replace worn-out of capital goods. The model shows mathematically that growth is directly related to saving and indirectly related capital output ratio. Suppose we define national income as  $Y$ , growth as  $G$ , capital output ratio as  $K$ , saving as  $S$ , and investment as  $I$ , and average saving ratio as  $s$  and incremental capital output ratio as  $k$ , then we can construct the following simple model of economic growth.

$$S = sY \dots\dots\dots 1$$

i.e. saving ( $S$ ) is some proportion of ( $s$ ) of national income ( $Y$ )

$$I = \frac{\Delta K}{Y} \dots\dots\dots 2$$

i.e. net investment (I) is defined as the change in capital stock K

$$G = \frac{\Delta Y}{Y} \dots\dots\dots 3$$

$\Delta Y$  i.e. growth is defined as change in National income  $\Delta Y$  divided by the value of the National income.

But since the total stock, K, bears a direct relationship to total national income, or output Y, as expressed by the capital/output ratio k, then it follows that:

$$K = \frac{\Delta K}{\Delta Y} \dots\dots\dots 4$$

or  $K = \frac{\Delta K}{\Delta Y}$

or, finally,

$$\Delta K = K \Delta Y$$

Finally, since total national saving, S, must equal total investment, I, we can write this equality as

$$S = I \dots\dots\dots 5$$

But from Equation (I) above we know that  $S = sY$  and from Equations (2) and (3) we know that:

$$I = \Delta K = k \Delta Y.$$

It therefore follows that we can write the identity of saving equalling Investment shown by Equation (6) as

$$S = sY = \Delta K = k \Delta Y = I \dots\dots\dots 6$$

or simply as

$$sY = k \Delta Y \dots\dots\dots 7$$

$$\frac{\Delta Y}{Y} = \frac{\Delta K}{K} \dots\dots\dots 8$$

Now by dividing both sides of Equation (8) by Y and later by K, we derive the growth Model  $\Delta Y/Y$  which represents the rate of change of national income or rate of GDP (i.e., It is the percentage change in GDP).

Equation (8), which is a simplified version of the famous Harrod –Domar equation in the theory of economic growth, implies that the rate of growth of GDP ( $\Delta Y/Y$ ) is determined jointly by the national saving ratio, s, and national capital/output ratio, k. More specifically, it says that in the absence of government, the growth rate of national income will be directly or positively related to saving ratio (i.e. the more an economy is able to save-and- invest-out of given GDP, the greater will be the growth of that GDP) and inversely or negatively; relate to the economy’s capital/output ratio (i.e., the higher the k is, the lower will be the rate of GDP growth).

The economy logic of equation (8) is very simple. In order to grow, economies must save and invest a certain proportion of their GDP. The more an economy can save, and invest, the faster they can grow, for any level of the rate of growth depends on how productive the investment is.

### The Specification of Model

The model of this paper is hinged on the model of Ainabor, *et.al* (2014), which enables the determination of the capital formation: impact on the economic development of the Nigerian from 1960 to 2013. The model is designed below:

$$RGDP = f(GCF, TGEXP, INTR, INFL, TSR, EDR, INV) \dots 9$$

$$RGDP_t = \alpha_0 + \alpha_1 GCF_t \pm \alpha_2 TGEXP_t \pm \alpha_3 INTR_t \pm \alpha_4 INFL_t \pm \alpha_5 TSR_t \pm \alpha_6 EDR_t \pm \alpha_7 INV_t + \varepsilon_t \dots 10$$

Where: RGDP = Real gross domestic product as a proxy for economic growth; GCF = Gross Capital Formation proxied for capital formation; TGEXP = Total Government Expenditure proxied for economic & social infrastructures—including electricity, Power generations; INTR = Interest Rate; INFL = Inflation Rate; TSR = Total Saving Rate; EDR = External Domestic Rate; INV = Investment;  $\varepsilon$  = stochastic term.

For the estimation purposes for this paper, equation (10) was transformed into double-log. We re-specify equation (10) thus:

$$RGDP_t = \alpha_0 + \alpha_1 \log GCF_t \pm \alpha_2 \log TGEXP_t \pm \alpha_3 \log INTR_t \pm \alpha_4 \log INFL_t \pm \alpha_5 \log TSR_t \pm \alpha_6 \log EDR_t \pm \alpha_7 \log INV_t + \varepsilon_t \dots 11$$

Where:  $\varepsilon$  = White noise error

The a priori expectations are as follows:

$$\alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5, \alpha_6, \alpha_7, < > 0$$

The contribution of this study to knowledge is in terms of the estimation techniques employed and/or the data used which is extended to 2013. Attempt was attempted to empirically investigate the relationship between the capital formation and economic development of Nigeria for the period 1960 – 2013 regression analysis. The equation was estimated using a variety of analytical tools, including Group unit root tests, Variance Ratio Test, Test for series, Hypothesis Testing, Empirical Distribution Test and BDS. The results are discussed below. The data used for the study covers the period 1960 and 2013. The study employed secondary data which are derived from various issues of *CBN Annual Report and Statement of Accounts (2013)*, & *CBN Statistical Bulletin (2014)*.

### SUMMARY OF EMPIRICAL RESULTS

#### Table 1: Results of Group Units Roots Tests using Summary Test from 1960-2013

Group unit root test: Summary

Series: LOG\_RGDP\_, LOG\_EDR\_, LOG\_GCF\_, LOG\_INFL\_, LOG\_INTR\_,

LOG\_INV\_, LOG\_TGEXP\_, LOG\_TS\_

Date: 03/23/15 Time: 13:34

Sample: 1960 2013

Exogenous variables: Individual effects

Automatic selection of maximum lags

Automatic lag length selection based on SIC: 0 to 1

Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross- sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-12.1173	0.0000	8	381
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W- stat	-13.6905	0.0000	8	381
ADF - Fisher Chi-square	192.596	0.0000	8	381
PP - Fisher Chi-square	184.400	0.0000	8	384

\*\* Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Table 1 shows the summary of the Group unit root test using summary test (i.e. Levin, Lin & Chu t\*; Im, Breitung t-stat, Pesaran and Shin W-stat; ADF-Fisher Chi-square; PP-Fisher Chi-square) with the lag length selection based on AIC: 0 to 1 of the variables used for the empirical study. The group unit root test shows that; Real Gross Domestic Product (RGDP); External Debt Ratio (EDR); Gross Capital Formation (GCF); Inflation rate (INFL); Interest Rate (INTR); Investment (INV); Total Government Expenditure (TGEXP); and Total Saving (TS) were stationary at first differenced at 5 percent level of significance respectively. The probability of obtaining the Group Unit Root is greater than 0 and less than 0.05 (i.e.,  $0 < p < 0.05$ ) which means the null hypothesis has to be rejected—which says there is no significant relationship between capital formation and economic development and the alternative hypothesis is to be accepted.

The top of the output indicates the type of test, exogenous variables and test equation options. If we were instead estimating a Group unit test, a list of the series used in the test would also be depicted. The lower part of the summary output gives the main test results, organized both by null hypothesis as well as the maintained hypothesis concerning the type of the unit root process.

All of the results indicate the presence of a unit root, as the LLC, BTS, IPS, ADF-Fisher tests and PP-Fisher tests could not reject the null of a unit root at first differenced.

### Variance Ratio Test

The variance ratio test view allows the research to perform the Lo and Mackinlay variance ratio test to determine whether differences in series are uncorrelated, or follow a random walk or martingale property. In addition, Lo and Mackinlay (1988, 1989) variance test ratio enables for homoskedastic and heteroskedastic random walks using asymptotic normal distribution or wildbootstrap to evaluate statistical significance (*loc. cit*).

### Table 2: Variance Ratio Test

Null Hypothesis: Cumulated LOG\_RGDP\_ is a martingale

Date: 03/23/15 Time: 14:10

Sample: 1960 2013

Included observations: 54 (after adjustments)

Heteroskedasticity robust standard error estimates

User-specified lags: 2 4 8 16

Test probabilities computed using wild bootstrap: dist=rademacher,  
reps=1000, rng=kn, seed=1511975342

Joint Tests	Value	df	Probability
Max  z  (at period 16)	14.90861	54	0.0000

Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	1.967190	0.193744	4.992116	0.0000
4	3.886581	0.359419	8.031247	0.0000
8	7.397428	0.554057	11.54652	0.0000
16	12.53709	0.773854	14.90861	0.0000

Test Details (Mean = 1.53997737308)

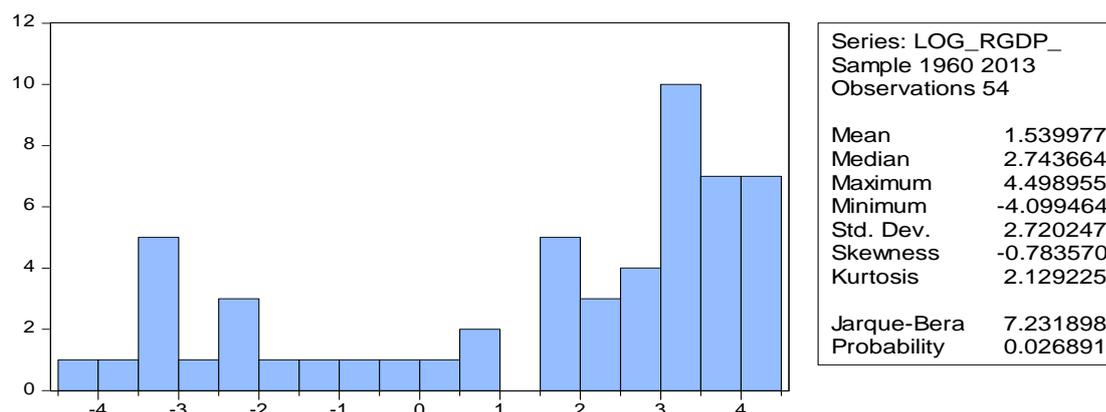
Period	Variance	Var. Ratio	Obs.
1	7.39975	--	54
2	14.5567	1.96719	53
4	28.7597	3.88658	51
8	54.7391	7.39743	47
16	92.7712	12.5371	39

From the table 2, the researchers maintained that since the specified test is more than one test period, there are two sets of test results. The “Joint Tests” are the tests of the joint null hypothesis for all periods, while the “Individual Tests” are the variance ratio tests applied to individual periods. Here, the Chow-Denning maximum statistic of 8.031247 is associated with the period 4 individual test. The approximate  $p$ -value of 0.0000 is obtained using the studentized maximum modulus with infinite degrees of freedom so that we strongly reject the null of a random walk. The results are quite similar for the Wald test statistic for the joint hypotheses. The individual statistics generally reject the null hypothesis since all the period variance ratio statistic  $p$ -value is less than 0.05.

The bottom portion of the output shows the intermediate results for the variance ratio test calculations, including the estimated mean, individual variances, and number of observations used in each calculation.

### Diagram 1: Test for Series

From the test of analysis of variance test ratio, the research test for series in the time series data from 1960 to 2013.



From diagram 1, the output of the series was demonstrated. Though the output present different results, but the keen interest is on Jarque- Bera, which is 7.231898 and the *p-value* is 0.026891 (0.03). The result reveals that the null hypothesis could be rejected because it clearly stated there is no normal series distribution in the analysis and accepts the alternative hypothesis.

## Hypothesis Testing

**Table 3: Hypothesis Testing**

Hypothesis Testing for LOG\_RGDP\_

Date: 03/23/15 Time: 14:15

Sample: 1960 2013

Included observations: 54

Test of Hypothesis: Mean = 6.000000

---

Sample Mean = 1.539977

Sample Std. Dev. = 2.720247

<u>Method</u>	<u>Value</u>	<u>Probability</u>
t-statistic	-12.04829	0.0000

---

Test of Hypothesis: Variance = 4.000000

Sample Variance = 7.399745

<u>Method</u>	<u>Value</u>	<u>Probability</u>
Variance Ratio	98.04663	0.0002

---

Test of Hypothesis: Median = 4.000000

Sample Median = 2.743664

<u>Method</u>	<u>Value</u>	<u>Probability</u>
Sign (exact binomial)	47	0.0000
Sign (normal approximation)	5.307228	0.0000
Wilcoxon signed rank	5.811897	0.0000
van der Waerden (normal scores)	-5.528031	0.0000

## Median Test Summary

Category	Count	Mean Rank
Obs > 4.000000	7	9.57142857
Obs < 4.000000	47	30.1702128
Obs = 4.000000	0	
Total	54	

In the Table 3 above, hypothesis test for mean, variance and median was conducted. The output is analyzed. The reported probability value is the  $p$ -value, or marginal significance level, against a two sided alternative. If this probability value is greater than 0 and less than the size of the test, say 0.05, we may reject the null hypothesis and accept the alternative hypothesis. Here, we strongly reject the null hypothesis for the two-sided test of equality. The probability value for a one-sided alternative is one half the  $p$ -value of the two sided test.

**Empirical Distribution Test****Table 4: Empirical Distribution Test**

Empirical Distribution Test for LOG\_RGDP\_

Hypothesis: Normal

Date: 03/23/15 Time: 14:24

Sample: 1960 2013

Included observations: 54

Method	Value	Adj. Value	Probability
Lilliefors (D)	0.194789	NA	0.0000
Cramer-von Mises (W2)	0.562432	0.567640	0.0000
Watson (U2)	0.511656	0.516394	0.0000
Anderson-Darling (A2)	3.250494	3.298148	0.0000

Method: Maximum Likelihood - d.f. corrected (Exact Solution)

Parameter	Value	Std. Error	z-Statistic	Prob.
MU	1.539977	0.370179	4.160091	0.0000
SIGMA	2.720247	0.264214	10.29563	0.0000
Log likelihood	-130.1617	Mean dependent var.		1.539977
No. of Coefficients	2	S.D. dependent var.		2.720247

From table 4 above, the output of the empirical distribution test is shown. The reported E-views  $p$ -values ( $0 \leq 0.05$ ) will account for the fact that parameters in the distribution have been estimated. In cases where estimation of parameters is involved, the distributions of the goodness-of-fit statistics are non-standard and distribution dependent, so that E-views may

report a subset of tests and/or only a range of *p-value*. In this case, for example, E-views reports the Lilliefors test statistic instead of the Kolmogorov statistic since the parameters of the normal have been estimated.

The second part of the output table (i.e., table 4) displays the parameter values used to compute the theoretical distribution function. Any parameters that are specified to estimate are estimated by maximum likelihood (for the normal distribution, the ML estimate of the standard deviation is subsequently degree of freedom corrected if the mean is not specified *a priori*). For parameters that do not have a closed form analytic solution, the likelihood function is maximized using analytic first and second derivatives. These estimated parameters are reported with a standard error and *p-value* based on the asymptotic normal distribution. The probability of sustaining z-Statistic values is less than the size of the empirical distribution test—such as  $0 \leq 0.05$ , which means we need to reject the null hypothesis that says there is no empirical distribution asymptotically and/or accept the alternative hypothesis.

### BDS Test

The BDS test is a portmanteau test for time based dependence in a series. It can be used for testing against a variety of possible deviations from independence including linear dependence, non-linear dependence, or chaos. The test can be applied to a series of estimated residuals to check whether the residuals are independent and identically distributed (*iid*) (Brock, Dechert, Scheinkman & LeBaron, 1996).

The BDS test proceeds by noting that under the assumption of independence, this probability will simply be the product of the individual probabilities for each pair.

When working with sample data, we do not directly observe  $c_{1(\epsilon)}$  or  $c_{m(\epsilon)}$ . We can only estimate them from the sample. As a result, we do not expect this relationship to hold exactly, but only with some error. The larger the error, the less likely it is that the error is caused by random sample variation. The BDS test provides a formal basis for judging the size of this error.

To estimate the probability for a particular dimension, we simply go through all the possible sets of that length that can be drawn from the sample and count the number of sets which satisfy the condition. The ratio of the number of sets satisfying the condition divided by the total number of sets provides the estimate of the probability (*loc.cit*)

### Table 5: BDS Test

BDS Test for LOG\_RGDP\_  
Date: 03/23/15 Time: 13:53  
Sample: 1960 2013  
Included observations: 54

<u>Dimensio</u>				<u>Normal</u>	<u>Bootstrap</u>
<u>n</u>	<u>BDS Statistic</u>	<u>Std. Error</u>	<u>z-Statistic</u>	<u>Prob.</u>	<u>Prob.</u>
2	0.177502	0.009557	18.57272	0.0000	0.0000
3	0.294127	0.015303	19.21982	0.0000	0.0000
4	0.362626	0.018360	19.75087	0.0000	0.0000

5	0.403934	0.019281	20.94935	0.0000	0.0000
6	0.424488	0.018738	22.65404	0.0000	0.0000

Raw epsilon	4.508463				
Pairs within epsilon	2054.000	V-Statistic	0.704390		
Triples within epsilon	83606.00	V-Statistic	0.530953		

<u>Dimensio</u>			<u>C(1,n-(m-</u>	<u>c(1,n-(m-</u>	<u>c(1,n-(m-</u>
<u>n</u>	<u>C(m,n)</u>	<u>c(m,n)</u>	<u>1))</u>	<u>1))</u>	<u>1))^k</u>
2	912.0000	0.661829	959.0000	0.695936	0.484327
3	830.0000	0.625943	918.0000	0.692308	0.331816
4	753.0000	0.590588	881.0000	0.690980	0.227962
5	685.0000	0.559184	844.0000	0.688980	0.155250
6	622.0000	0.528912	807.0000	0.686224	0.104423

From the table 5 above, the output shows that probability (*p-value*) and bootstrap probability of obtaining the BDS and z-statistic values are less than the size, in other words, *p-value* greater than 0 and less than 0.05. Which states that the null hypothesis has to be rejected, in that it refers that there exists no BDS or portmanteau test (or residual) in the series? While, the alternative hypothesis has to be accepted, in that it states the presence of the residual in the series.

## SUMMARY OF THE RESULT FINDINGS

The paper empirically examines the capital formation: impact on the development in Nigerian economy, using annual time series data from 1960 to 2013. The paper employs stochastic characteristics of each time series data by testing their stationarity using Group unit root tests, variance ratio test, test for series, hypothesis testing, empirical distribution test, and/or BDS. The null hypothesis being that there is presence of a Group unit root was rejected at first differenced implying that the variables were found stationary at 5% level of significance. The variance ratio test, test for series, hypothesis testing, empirical distribution test, and/or BDS were also statistically significant at 5%.

From the entire test carried out with different diagnostic tests, it was revealed that all the null hypotheses were rejected (i.e., there is no significant relationship between capital formation and economic development) and/or accepted the alternative hypotheses (i.e., there is significant relationship between capital formation and economic development). The paper discovered that the capital formation and/or its components (determinants) have significant relationship with the economic development of Nigeria. Rejecting null hypotheses in the diagnostic tests corroborated the fact that capital formation has a direct relationship with Nigerian economic development.

## RECOMMENDATIONS

From the econometric study of the capital formation and impact on the development of the Nigerian economy, the following recommendations are stated below:

- Government should ensure that there mechanism between the potential investors and/or potential lenders in Nigeria. This will in turn, lead to capital formation and/or hence economic development.
- Government should encourage domestic savings by increasing interest rate in Nigeria, in order to garner investible from the citizens. This thus will translate to capital formation which, however, is the engine of growth of any economy.
- Government should ensure an enabling, conducive investment climate and/or improve the infrastructural (such as: power generation, portable water and good road networks) base of the economy to boost capital formation.
- Government should maintain single digit inflation in Nigeria. Since it has an inverse relationship with economic growth. That would enable capital formation and/or hence economic development.
- Government should ensure that both money and capital markets in Nigeria are adequately functioning in order to enhance investors' confidence as the source of start-up capital. This will lead to capital formation and/or thereby enhances economic growth.

## REFERENCES

- Ainabor, A.E, Shuaib I.M, Kadiri, A.K. (2014). Impact of Capital Formation on the Growth of Nigerian Economy 1960-2010: Vector Error Correction Model (VECM), *School of Business Studies, Readings in Management and Social Studies*, 1(1): 132-154
- Ainabor, et. al, *op.cit.*, 133-154
- Bakare A.S. (2011). The Impact of Capital Formation on the Growth of Nigerian Economy: Causality Approach, *Far East Journal of Psychology and Business*, 13(1), 2-13  
[www.fareastjournals.com](http://www.fareastjournals.com).
- Beddies, C. (1999). Investment, Capital Accumulation and Growth: Some Evidence from Gambia: 1964-1998. *IMF Working Paper 99/117*, August.
- Ben-David, D. (1998). Convergence Clubs and Subsistence Economies, *Journal of Development Economics*, 55, pp.155-171.
- Brock, William, Davis Dechert, Jose Sheinkman and Blake LeBaron (1996). A Test for Independence Based on the Correlation Dimension, *Econometric Reviews*, August, 15(3), 197-235.
- Central Bank of Nigeria (2013). *Annual Report and Statement of Accounts*, CBN, Abuja
- Central Bank of Nigeria (2014) *Statistical Bulletin*, CBN, Abuja
- Collier, P., & Gunning, J.W. (1999). Explaining African Economic Performance, *Journal of Economic Literature*, 37, March, pp.64- 111
- Domar, E.(1946). Capital Expansion, Rate of Growth and Employment, *Econometrica*, 14(1), 30-40.
- Engle, R.F., & Granger, C.W.J. (1987). Co-integration and error correction representation estimations and testing. *Econometrica*, 35: 251-276.
- Ghura, D., & Hadji Michael, T.(1996). Growth in Sub-Saharan Africa, *Staff Papers*, International Monetary Fund, 43, September.
- Harrod, R.F. (1939). An Essay in Dynamic Theory, *Economic Journal*, 49(10), 5-20.
- Herandez-Cata, E. (2000), —Raising Growth and Investment in Sub-Saharan Africa: What Can be Done? *Policy Discussion Paper: PDP/00/4*, International Monetary Fund, Washington, D .C.  
*Ibid.*, 134- 154
- Jhingan, M.L. (2006). *Economic Development*, New Delhi, Vrinda Publications (P) Ltd, p.162
- Jhingan, *loc.cit.*, 163.

- Khan, M.S., and C.M. Reinhart (1990). Private Investment and Economic Growth in Developing Countries, *World Development*, 18 (1), 19-27
- Kanu, S. I & Ozurumba, B. A. (2014). Capital Formation and Economic Growth in Nigeria, *Global Journal of Human-Social Science: Economics*, 14( Issue 4 version 1.0), ISSN: 2249-460x (Online) & ISSN: 0975-587X (Print).
- Lo, Andrew W. and A. Craig MacKinlay (1988). Stock Market Prices Do Not Follow Random Walks: Evidence From a Simple Specification Test, *The Review of Financial Studies*, 1, 41–66.
- Lo, Andrew W. and A. Craig MacKinlay (1989). The Size and Power of the Variance Ratio Test in Finite Samples, *Journal of Econometrics*, 40, 203-238.
- Lo, Andrew W. and A. Craig MacKinlay, *op.cit.*, 204-236
- McKinnon, R.I. (1973), *Money and Capital in Economic Development*. Washington D.C.
- Ndikumana, L. (2000). Financial Determinants of Domestic Investment in Sub-Saharan Africa, *World Development*, 28 (2), 381-400.
- Shaw, E.S. (1973). *Financial Deepening in Economic Development*, New York: Oxford University Press.
- Shuaib, I.M., Ekeria, O.A., & Ogedengbe, A.F. (2014). The Impact of Exchange on the Growth of Nigerian Economy from 1960 to 2010, *Journal of US-China Public Administration*, ISSN 1548-6591, 11(7): 693-706, doi: 10.17265/1548-6591/2014.08.007
- Shuaib, I.M., & Peter A.O. (2010). *Principles of Public Finance: Modern Trend*, Prosper Publishing, Edo State-Auchi, 22-29.
- Shuaib, I.M. (2011). The Impact of Foreign Direct Investment and Trade on the Growth of the Nigerian Economy, *An M.Sc Thesis* submitted the Department of Economics, Ambrose Alli University, Ekpoma, 30-31.
- Shuaib, I.M., Ekeria, O.A., & Ogedengbe, AF. (2015). The Impact of Globalization on the Growth of the Nigerian Economy from 1960-2010: Error Correction Model Analysis, *British Journal of Economics, Management & Trade*, 7(1): 63-73, Article no. BJMET. 2015.072 ISSN: 2278-098X
- Shuaib, I.M., Igbinosun, F.E., & Ahmed, A. E. (2015). Impact of Government Agricultural Expenditure on the Growth of the Nigerian Economy, *Asian Journal of Agriculture Extension, Economic & Sociology*, unpublished.
- Shuaib, I.M., Ekeria, O.A., & Ogedengbe, AF. (2015). Fiscal Policy: Nigerian Experiences from 1960-2012, *Asian Journal of Agriculture Extension, Economic & Sociology*, DOI: 10.9734/AJAEES/2015/14699, unpublished.
- Shuaib, I.M., Ekeria, O.A., & Ogedengbe, AF. (2015). Impact of Inflation Rate on the Economic Growth in Nigeria, *British Journal of Economics, Management & Trade*, DOI: 10.9734/BJEMT/2015/15293, unpublished.
- Shuaib, I.M., Ekeria, O.A., & Ogedengbe, A.F. (2015). Balance of Payments: Nigerian Experience: 1960-2012, *British Journal of Economics, Management & Trade*, DOI: 10.9734/BJEMT/2015/14638, unpublished.
- Shuaib, I.M., Ekeria, O.A., & Ogedengbe, A.F. (2015). Impact of Corruption on the Growth of the Nigerian Economy-1960-2012: Error Correction Mechanism (ECM), *Journal of Scientific Research and Reports*, DOI: 10.9734/JSRR/2015/15329, unpublished.
- Shuaib, I.M., Igbinosun, F.E., & Ahmed, A. E. (2015). Impact of Innovation for 21<sup>st</sup> Century Educational Sector in Nigerian Economic Growth, *British Journal of Education, Society & Behavioural Science*, DOI:10.9734/BJESBS/2015/14700, unpublished.
- Shuaib, I.M., Igbinosun, F.E., & Ahmed, A. E. (2015). Impact of Innovations and Transformations in Teaching and Learning on Educational Systems in Nigerian

Economic Growth, *British Journal of Education, Society & Behavioural Science*, unpublished.

Ugwuegbe S. U., & Uruakpa, P. C. (2013). The Impact of Capital Formation on the Growth of Nigerian Economy, *Research Journal of Finance and Accounting*, 4(9), 36-40, ISSN 2222-1697 (Paper) ISSN 2222-2847 (Online). Available at [www.iiste.org](http://www.iiste.org)