

Economic Data and Determinants of Growth in Nigeria

Adebanwa Ayowole A., Rufai Aliyu Akorede, Olaleye Adenike Oluwafunmilayo

Abstract— this paper discussed the sources, types, measurement and some of the determinants of growth in the Nigerian economy, using some of the existing data that advances the field of humanities through information, science and technology. Based on existing growth theories, this paper empirically established how economic data could be utilized for robust information gathering that advances the field of humanities in the growing world of science and technology. Time series data was employed to validate soundness of the determinants of economic growth employing Augmented Dickey Fuller (ADF) to establish the stationarity of the data, while Auto regressive distributed lagged model (ARDL) was used as the research estimation technique, meanwhile, the existence of serial autocorrelation was tested using Durbin-Watson test to avoid spurious results. The result shows that the robust economic data spur growth in Nigeria. The study recommend that data depository should always scrutinize and solidify the veracity of published economic data to empower researchers in making formidable economic forecasts which could be relied upon for effective policy formulation.

Index Terms— ARDL, Economic data, Economic growth, Serial autocorrelation, Stationarity.

I. INTRODUCTION

Economic data offer a systematic and objective source of information, and almost every day the economic literatures and other publications have stories about some newly released statistics. Most of these statistics are produced by private and government agencies (both locally and internationally). It is believed that various government agencies survey households and firms to learn about their economic activities—how rational consumers make their preferences, what are the reasons for the buyers' behaviour?, what are the prevailing market prices?, what are the prevailing government policies, as they affect economic agents and so on. From these surveys, various statistics are computed that summarize the state of the economy. Economists use these statistics to study the economy; policymakers use them to monitor developments and formulate policies. Researchers also use these data to evaluate the performance of the economy, either at micro or macro levels. Hence, economic data provides a veritable tool for advancing the humanities through information, science and technology.

Without economic data, the field of macroeconomics and microeconomics will not be robust. While Macroeconomics is the study of the economy as a whole, including growth in incomes, changes in prices, increase/decrease in the rate of unemployment, performance of Balance of payment equilibrium, etc. Microeconomics is the science of constrained choice, such that individuals, firms, government and other economic agents are faced with the challenge of making rational decisions that maximize their utility functions.

Furthermore, in order to understand the workings of the economy, Economists use models, that is, theories that simplify realities in order to explain how exogenous (independent) variables affect endogenous (dependent) variables. The 'art' in the science of Economics is to judge whether a model captures the important economic relationships for the matters at hand. Since, no single model can provide answers to all economic questions, economists make use of large quantity of data to examine different economic situations and try to provide answers to the central economic questions. Hence, providing answers to the central economic problems will advance humanities through information, science and technology.

Historically, the issue of economic growth and development have engaged the attention of many researchers, governments of many nations as well as theorists. In Nigeria, for instance, the focus of successive government has been the desire to promote sustainable economic growth and re-position Nigeria in the Committee of Nations. Unfortunately, her economic performance has been like that of 'tales by moonlight', since the period of Structural Adjustment Programme (SAP) in 1986 to the period of 'radical change' of the present civilian administration of President Muhammadu Buhari.

Therefore, the purpose of this paper is to provide explanations to how important economic data are necessary to be accurate, unbiased and reliable for effective policy formulation, implementation and evaluation as it affects some determinants of economic growth in Nigeria.

In academic research, particularly in economics, a serious problem is often a *lack of data at hand* for testing the theory or hypothesis of interest. Economic data has been salient in economics due to its usefulness in validating economic theories, economic models cum making a formidable economic predictions to aid formulation of appropriate policies by decision makers. Non-availability of sufficient economic data has been a hindrance for testing the theory or hypothesis of interest, likewise validating the impact of

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government's economic policies on the development of the society, which sometimes make model generated spurious and nonsensical.

Based on review of existing literatures, this paper therefore examines some basic macroeconomic variables that determine economic growth and provides explanations to the significance of economic data in determining growth in Nigeria. Thus, the focus of this paper is to establish empirically not only the determinants that spur economic growth, but rather make a concrete stand in relation to how viable economic data will aid sound policy formulations and rational decision-making process.

The work utilized time series data on some macro-economic variables such as inflation rate, exchange rates, and GDP growth rates in Nigeria from 1980 to 2018 to suggest certain policies for the government to achieve the basic macro – economic goals. Thus, providing a verifiable explanation to the central growth questions.

This study investigated the following research questions:

- What are the determinants of economic growth?
- How significant are these determinants to measuring economic growth?
- Why is Nigeria, still regarded as a developing or underdeveloped economy?

This paper discusses the sources, types, measurement and not forgetting the factors that drive growth in the Nigerian Economy. It is essentially based on analyzing some macro-economic variables to identify critical factors that brings about economic growth and verify the potency of useful data for effective policy making. Thus, the study aligned with some basic stylized facts about growth:

- (a) Economic growth depicts the standard of living. Across countries, there are differences in the standard of living. While some countries have experienced increased growth (growth miracles), others have experienced declined growth (growth disasters);
- (b) A country's relative position in the wealth of nations in terms of per capita income distribution is not permanent. Hence, Nigeria can grow from being 'poor' to being 'rich' and vice-versa;
- (c) There is divergence between the growth pattern in the last centuries and the present centuries.

II. BACKGROUND TO THE STUDY

A. Types of Economic data

Chris Brooks (2008) identified three types of data that can be employed in quantitative analysis of financial problems: time series data, cross-sectional data, and panel data.

1. Time series data

Time series data, as the name suggests, are data that have been collected over a period of time on one or more variables. Time series data have frequency: annually, quarterly, monthly, weekly or daily, depending on the nature of information or research to be carried out. For example, data on industrial

production can be monthly or quarterly while the GDP growth rates in Nigeria is annual data; aggregate money supply could be weekly or monthly while the value of shares in the stock exchange could be gathered as daily transactions occur. All these are examples of time series data.

These data can be '*quantitative*' (for example: inflation rates, exchange rates, stock prices, GDP growth rates, life expectancy rates, etc.) or '*qualitative*' (for example: level of academic qualifications of workers, extent of job satisfaction, experience, economic recession, political instability, etc.). In all of the above cases, it is clearly the time dimension which is the most important, and the analysis will be conducted using the values of the variables over time. For the purpose of this paper, we shall be adopting time series data.

2. Cross –sectional data

This is another category of economic data, collected on one or more variables, at one point in time, across several cross-sections. For example, the performance of students during the 2018 Joint Matriculation Admission Board (JAMB) examinations conducted across all the 36 states in Nigeria, is an example of cross –sectional data. The cross –sectional data provides comparison of data on specified area of interest with precision and robustness.

3. Panel Data

Panel data have the dimensions of both time series and cross-sections. For example, unemployment rates from 1988 – 2018 of twenty (20) Sub-Saharan countries. It is pertinent to note that for panel regressions to be done accurately, all available data must follow the same *frequency of observation*.

All economic data are either '*continuous*' or '*discrete*'. Data is *continuous* when it can take on any value and are not confined to take specific numbers; their values are limited only by the researchers' precision. For example: the interest rates determined by the Central Bank of Nigeria. On the other hand, *discrete* data can only take on certain values, which are usually integers (whole numbers), and are often defined to be count numbers.

B. Sources of Economic Data

Basically, there are two major sources of data: we have primary and secondary data. Data collected by the researcher himself for a specific purpose, and used for that purpose. These are data collected from the field through research instruments such as questionnaires, opinion polls, interview guide, etc. When the data is used for another purpose, it becomes a secondary data. Foreexample, data obtained from research institutions' bulletins, financial institutions such as World Bank, Central Bank of Nigeria (CBN), National Bureau of Statistics (NBS), Professional journals, etc.

III. THEORETICAL REVIEW

This section presented some key theories of economic growth and the relevance of data on some of the economic variables that influences growth in Nigeria:

A. The Solow-swan model

According to the Solow model, "the accumulation of

physical capital cannot account for either the vast growth over time in output per person or the vast geographical differences in output per person” Romer (1996). This simply means that, capital and labour are not determinants of economic growth. The Solow model demonstrates convincingly that growth is not derived from capital or labour but from technological progress. However, the model fails to explain what generates technological progress. In other words, it identifies what can potentially cause growth, but since it treats technology as random or exogenous, it essentially fails to model the very cause of the economic growth which it identifies. This is essentially why the model is only a starting point to analyzing determinants of economic growth. If one seeks to investigate what initiates and sustains long term growth-there is need to go beyond this model.

Structure and Assumptions

There are four major variables in the model: output (*Y*), capital (*K*), labour (*L*), and “knowledge” or “effectiveness of labour” (*A*). That is

$$Y = F(K, AL) \quad (1)$$

The production function follows a constant return to scale (CRS), that is

$$F(cK, cAL) = cF(K, AL) \quad \text{for all } c \geq 0 \quad (2)$$

If output is expressed in unit of effective labour input, we have

$$y = f(k) \quad (3)$$

The production function satisfies

$$f(0) = 0, f'(0) = \infty, f'(\infty) = 0, f''(k) < 0, f'(k) > 0 \quad (4)$$

The production function takes the form of Cobb-Douglas process

$$F(K, AL) = K^\alpha(AL)^{1-\alpha}, \quad 0 < \alpha < 1 \quad (5)$$

B. The Endogenous growth theories

Unlike the above exogenous growth theories, endogenous growth theories attempt to model technological change and thereby identify potential factors which can influence economic growth through technology. According to the Arrow and Romer’s endogenous growth and learning theory, the rate of growth of technology depends on the rate of growth of capital.

Basic Assumptions:

- The endogenous growth theory provides explanation for understanding sources of long-run growth of income per capita
- It treats technical progress, *A*, otherwise known as knowledge or effectiveness of labour in the neoclassical models, as endogenous. And that the rate of growth of *A* is not constant over time.
- It assumes constant returns to capital, rather than diminishing returns as in the case of neoclassical theory. In addition, even if returns to capital diminish over time, the rate of returns is assumed to asymptotically approach a positive constant.
- Capital input is broadly conceived to include *physical* and *human capital*
- It incorporates the impact of such factors as research and development (*R&D*), knowledge, knowledge accumulation, learning-by-doing etc. in the

explanation of long-term growth rate of income per capita.

- Production function takes the form of Cobb-Douglas; however, the sum of the inputs share parameter is not necessarily equal to 1.

This means capital accumulation embodies technological progress and thus leads to economic growth. When a country accumulates more capital, there will be technological advancement and consequently economic growth. This finding is contrary to the Solow model which proposed that capital stock does not influence economic growth.

Robert Lucas’ endogenous growth and human capital goes further by demonstrating that economic growth is a function of physical and human capital. Thus, it is not only the physical capital accumulation, which is needed for growth, but also human capital accumulation. Under the endogenous growth and human capital model, technology was assumed to be synonymous with human capital. Thus, the model concludes that just as technology is dependent on physical capital accumulation; it is also dependent on human capital accumulation because the two are equivalent.

Robert Barro’s Model of endogenous growth presents yet another explanation to growth.

According to this model, government spending and taxes can affect the marginal productivity of capital and consequently influence output and growth. Increase in government spending has a positive impact on output, thus enhancing economic growth.

IV. METHODOLOGY

A post-ante facto research design was adopted to examine the relationship between inflation rate, exchange rate, unemployment rate and economic growth (measured by Gross Domestic Product (GDP) using secondary data collated from the World Bank data indicators spanning through thirty-one years (1988 to 2018).

The research adopted GDP as the endogenous variable because it helps in assessing the overall productive capacity of a country over a period of time. The GDP used was in official US dollar, which induce the researchers to logged the variable due to the decimal standing of another variable include in the model. The inclusion of this has been established in studies such as Li (2008), Havi and Enu (2014). The exogenous variables are the macroeconomic determinants of Exchange, Interest, Inflation and Unemployment rates.

A. Model Specification

The model used for the evaluation of the hypotheses of this research followed the Keynesian IS-LM framework, with the functional relationship given as:

$$GDP = f(INF, INT, EXC, UNEMP) \quad 6$$

$$LGDP_t = \alpha_0 + \alpha_1 GDP_{t-1} + \alpha_2 INF_{t-1} + \alpha_3 INT_{t-1} + \alpha_4 EXC_{t-1} + \alpha_5 UNEMP_{t-1} + \varepsilon_t \quad 7$$

Where α_0 to α_5 are parameters of the model variables which are Interest Rate (INT), Exchange Rate (EXC) and Unemployment Rate (UNEMP) respectively; ε_t is the stochastic term.

E-views 10 statistical software was utilized for analyzing

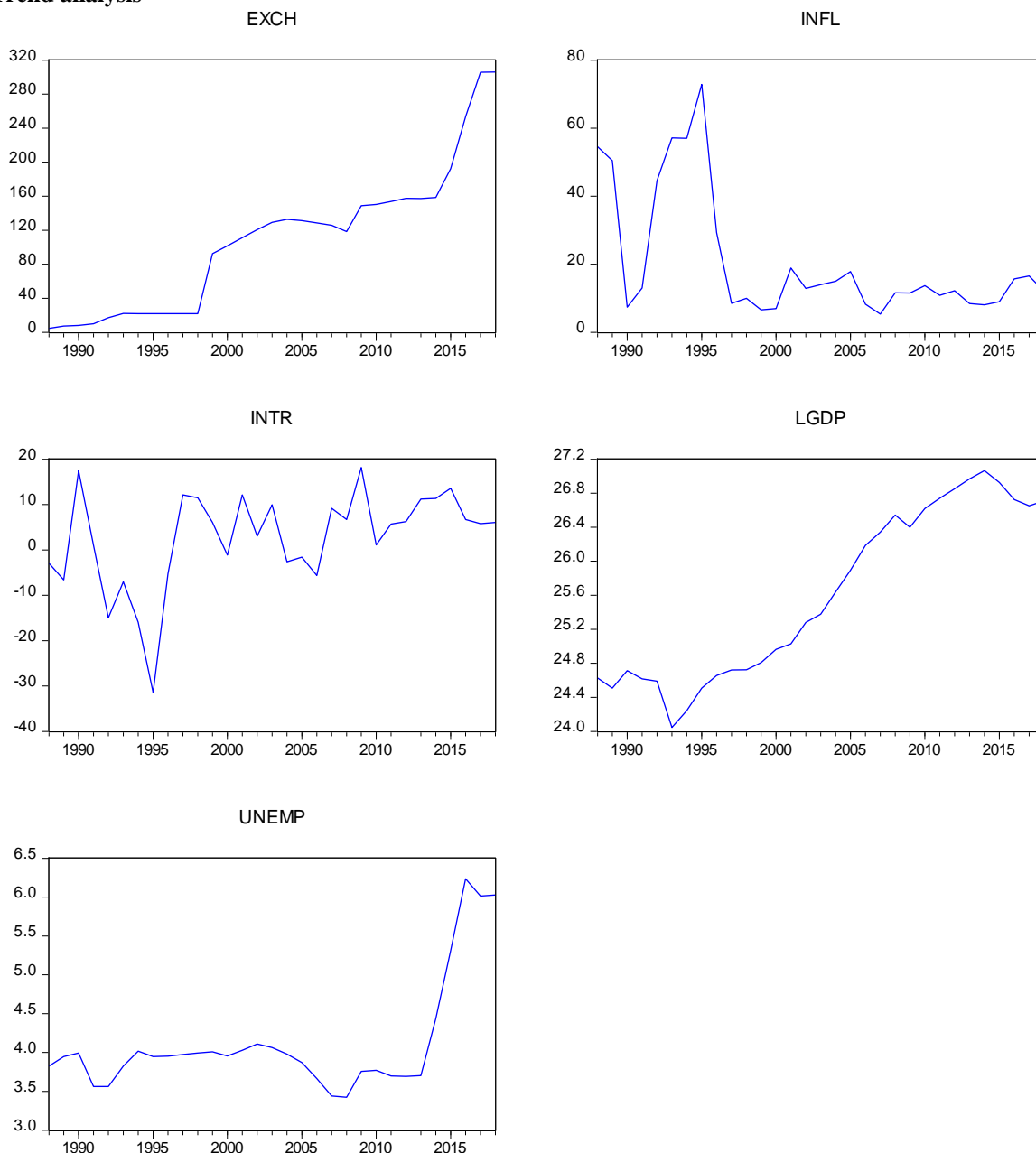
the economic data. Trend analysis which represented graphs showing movements or changes in various years of the variables used was conducted. Also, in the course of the study, the followings were conducted: These data were subjected to unit root test to establish the stationarity of the data over time, this was done using the Augmented Dickey Fuller (ADF) test, while in order to determine the long run relationship between the independent and dependent variables, the co-integration test was used. This research employed the Bound test based on the Auto-Regressive Distributed Lagged (ARDL) model guided by the stationarity

A. Trend analysis

of some variables at level ($I(0)$) and some at first difference ($I(1)$)

V. DATA ANALYSIS, RESULTS AND DISCUSSION OF FINDINGS

Here, we present an explicit analysis and interpretation of results of the econometric methods and tests employed in evaluating the macroeconomic determinants on economic growth of Nigeria over the period 1988-2018.



Authors' computation from E-views 10

The above trend diagrams are used to depict the flow of exchange rate (EXC), logged value of GDP, inflation rate (INF), interest rate (INT) and unemployment rate (UNEMP). The trend for exchange rate grew steadily early in the study period before some slight upward movement was recorded in 1999 which could be unconnected to the change from the military regime to the democracy and this trend has been

sustained thereafter with slight decline.

In the case of economic growth (GDP), the trend indicated a progressive trend for economic growth, with the value increasing on a yearly basis but steadily, though a sharp downturn was witnessed in between 1994 and 1995, a significant increase was not noticed not until the year 2005 where a significant increase was recorded, and this significant

increase was sustained till 2014, where a noticeable decline could be detected which could be traced back to the change of baton in the political economy of Nigeria.

B. Unit Root Test

Variable	ADF	Probability	Order of integration
LGDP	-4.516629	0.0012	I(1)
EXCH	-3.877309	0.0062	I(1)
INFL	-3.877309	0.0062	I(0)
UNEMP	-3.159615	0.0331	I(1)
INTR	-4.177642	0.0032	I(1)

Source: Authors' computation from E-view 10

The result of the stationarity test as reported using Augmented Dickey Fuller test for stationarity exhibit that only one of the five variables (inflation rate) was stationary at Level I(0), while the remaining three variables (LGDP, interest, exchange rate and Unemployment rate) became stationary at 1st Difference I(1) under the ADF test.

C. Test for Co-integration

After establishing the stationarity of the variables above, which depicted a mixture of level I(0) and 1st difference I(1), the study proceeded to test for integration among the variables. The Bound co-integration test was employed to validate whether the variables co-integrate. This was carried out using an automatically generated lagged value by the E-view 10 employed. The result of the bound test is presented below:

Table 1: Test for Co-integration using Bound Test.

Test Statistic	Value	K
F-statistic	6.320733	4

Source: Authors' Computation from E-Views 10

Table 2: Critical Value Bounds

Significance	I (0) Lower Bound	I(1) Upper Bound
10%	2.2	3.09*
5%	2.56	3.49*
1%	2.88	3.87*

* and * denote cointegration at the 1%, 5% and 10% critical level respectively

Source: Authors' Computation from E-Views 10

The tables above show the bound test and the bound critical value table. The F-statistic value from table 1 show a value of 6.320733, which when compared with both the lower and upper bound of table 2, we discovered that the F-statistics is greater than all the critical values in both the lower and upper bounds, based on this, we conclude that there is an existence of long run relationship among the variables.

D. Autoregressive Distributed Lag (ARDL) Model

The Autoregressive Distributed Lag (ARDL) model is employed in this study to analyse the short run relationship between the dependent variable and the independent variable. It examined the short run behaviour of the independent variables and how they individually affect the dependent variable.

Table 3: Autoregressive Distributed Lag (ARDL) Model

Dependent Variable: LGDP

Variable	Coefficient	SE	T-stats	Prob.
LGDP(-1)	0.9211	0.0550	16.7223	0.0000
EXCH	-0.0006	0.0017	-0.3417	0.7358
EXCH(-1)	0.0023	0.0015	1.484153	0.1520
INFL	-0.0114	0.0029	-3.8507	0.0009
INFL(-1)	0.0041	0.0020	2.0565	0.0518
INTR	-0.0131	0.0043	-3.0158	0.0064
UNEMP	-0.1142	0.0628	-1.8171	0.0828
C	2.5618	1.4277	1.7943	0.0865
R ² : 0.987841		DW Statistics: 2.462977		
Adjusted R ² : 0.983973		F-statistics: 255.3454		
Prob (F-stat): 0.0000				

Source: Authors' Computation from E-Views 10

$$LGDP = 2.56 + 0.92LGDP(-1) - 0.000603EXCH + 0.002319EXCH(-1) - 0.011433INFL + 0.004177INFL(-1) - 0.013195INTR - 0.114244UNEMP + e \dots \dots \dots 8$$

Equation 8 depicts the research adjusted coefficient of determination portraying 98.39% which translated that 98.39% of the variations in the dependent variable was well explained by the independent variables employed in this research, while the remaining 1.61% could be attributed to other variables that could determine economic growth, which the paper has not included, this has been captured by the error term (e). The F-statistics captures the overall effect of all the explanatory variables on the explained variable. The result shows that the variables employed in this research has an overall effect on the dependent variables. This submission invariably leads us to conclude that the determinants of economic growth used in this paper has a significant effect on GDP.

Furthermore, it could be captured from equation 8 that a unit increase in exchange rate (EXCH) will bring about 0.063% decrease in economic growth proxy (i.e. GDP), likewise, as the inflation rate (INFL) decreases by a unit, it will lead to a 1.143% increase in economic growth, while a spur of 1.319% in the economic growth was as a result of a unit decrease in the interest rate (INTR). Finally, as unemployment (UNEMP) decreases by a unit it will bring an increase of 11.42% in the economic growth.

VI. CONCLUSION

In conclusion, the above result has shown how viable data set could be used as a pilot to portray the stand of a nation among its peers. The data employed has enabled us to make meaningful inference based on the estimated result which has given us an insight on how the Nigerian economy is sailing, which could have not been possible save for availability of sound and healthy databank.

As established from the pilot result, the robustness of the used economic data aid in identifying the determinant of economic growth in Nigeria viz: interest rate, exchange rate, inflation rate and unemployment rate. Thus, we recommend that the Nigerian data depository should always scrutinize

and solidify the veracity of published economic data to empower researchers in making formidable economic forecasts whereas researchers making use of primary sources of data are encouraged not to be biased and stop “mining” data to suit expected result.

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