Estimation of Economic Growth using Export and Import Goods in Nigeria: A Kernel Regression Approach

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Abstract: - **This study employed the Kernel regression approach for reliable estimation of economic growth in Nigeria from 1989 to 2018 using the Kernel regression Approach. The study employed secondary source of data collection which was obtained from African Development Bank Group publication, 2018. The result of the kernel regression analysis found a residual standard error value of 37.399, R-square value of 0.8645 (86.5%), bandwidths of 8.316 and 5.071 for export and import goods respectively and a corresponding p-value of 0.00. Findings showed that export goods and import goods significantly impact positively on Economic Growth.**

Keywords: **Export Goods, Economic Growth, Import Goods, Kernel Regression**

I. INTRODUCTION

Most government in the world are spending resources and time to efficiently grow various sectors of their economy. These governments have over the years keyed into varied economic measures and plan aimed at improving growth and development in their domestic economy. One way to come about these economic measures is by encouraging research in various sectors of the economy.

However, Economic Scholars in Nigeria have over the years been suggesting different model(s) for estimation economic growth in Nigeria. Some of these studies use export and import goods in estimating economic growth in Nigeria but the model obtained in some cases are not good estimators of the economic growth. Even, some of the studies considered partitioning export goods into oil export and non oil export (Ugwuegbe and Uruakpa, 2013). Exports of goods and services are part of important sources of foreign exchange revenue which eases pressure on the balance of payments and create employment opportunities, increase productivity and enhance the living standard of the citizenry (Ugwuegbe and Uruakpa, 2013). Exporting activities is related to static gains that involves access to larger outside markets, thereby exploiting economies of scale. International trade plays significant role boasting the economy of developing countries like Nigeria (Ojide and Ojide, 2014). The importance of export-led growth hypothesis in Nigeria has become one of the major issue of interest empirical studies. Hence, this study seek to determine a reliable model for estimation of economic

growth in Nigeria given the amount of export and import goods.

II. LITERATURE REVIEW

Ugwuegbe and Uruakpa (2013) used the Ordinary Least Squares approach to examine the impact of oil and non-oil export on economic growth in Nigeria. They also used the granger causality test to determine the direction of causality between the variables under consideration. They employed secondary data from Central Bank of Nigeria (CBN) statistical bulletin from 1986-2011. The findings of their study showed that oil export, non oil export and foreign reserve has positive and significant impact on economic growth in Nigeria. The study obtained a very strong coefficient of determination (R-square = 0.99). It was found that economic growth granger causes oil export and foreign reserve, and oil export granger causes non oil export, while non oil export granger causes foreign reserve.

Edoumiekumo and Opukri (2013) investigated the contributions of export and import values on economic growth in Nigeria. They used the Augmented Dickey-Fuller (ADF) analysis to test for the unit root test and the variables were found to be stationary at levels I(0). They employed the Johansen's co-integration test to establish a short and long run relationships between the two variables and the findings revealed two co-integrating equations which establish the existence of long run relationship among the variables. The Ordinary Least Square analysis was used to determine the impact of the independent variables on estimating economic growth. The findings showed that export and import has a relationship with economic growth though export was found to insignificantly impact on economic growth while import has a significant impact on economic growth in Nigeria within the observed period. Economic growth was found to granger cause export while import was found to granger cause economic growth and export. They conclude that there is need for Nigeria to diversify her export goods to enjoy more of the benefits of international trade.

Bakari (2017) examined the long run term and the short run term effect of vegetables exports on economic growth of Tunisia. The study used annual data from the reports of World Bank for the periods between 1970 and 2015. The statistical tools used in the study were the Correlation Analysis,

Augmented Dickey-Fuller (ADF) and Phillip- Perron (PP) stationary test, and co-integration analysis of Vector Error Correction Model. The findings of the study showed that vegetables exports have a positive impact on economic growth in the long run term and in the short run term. These results indicate that vegetables exports should be seen a very good source of economic growth both in Tunisia and Africa as a whole.

Ojide and Ojide (2014) investigated the relationship between imports and economic growth in Nigeria for the period 1970 to 2011.The study used an error correction model (ecm) for the analysis. The findings of the study showed that importation of manufactured goods has adverse effect on economic growth while the importation of factor inputs contributes to economic growth in Nigeria.

Mafizur and Shahbaz (2013) investigated the impact of imports and foreign capital inflows on economic growth of Pakistan over the period of 20 years. They used the structural break autoregressive distributed lag (ARDL) bounds testing approach to co-integration and examine the long-run relationship between the variables. The findings of the study shows that the existence of a long-run relationship between imports and economic growth. This result implies that that imports have positive significant impact on economic growth in Pakistan.

III. METHODS AND MATERIAL

3.1 Method of Data collection

Secondary source of data collection was adopted for this study with data obtained from African Development Bank Group publication, 2018. The data comprises of the real GDP which is a proxy for economic growth, export goods and import good from 1989-2018.

3.2 Kernel Regression Analysis

The Kernel regression is a non-parametric approach in statistics used to estimate the conditional expectation of a random variable (Uka *et al*., 2018). The function of the Kernel regression is to find a non-linear relation between a pair of random variables the independent variable(s) say X and the dependent variable say Y.

The non-parametric regression model measures the functional relation between Y and X. This implies that the conditional expectation of a variable Y relative to a variable X can be expressed as

$$E(Y \mid X) = m(X) \qquad (1)$$

Where, m is an unknown function to be estimated

The relationship in a Kernel model can be modeled as:

$$Y_i = m(x_i) + \varepsilon_i \qquad (2)$$

for i= 1,...,N and $E(\varepsilon_i) = 0$

where,

Y_i and ε_i is n x 1 random vectors called the response vector and the random error vector respectively.

3.3 Kernel Smoothing Techniques

One approach to express the weight sequence in the local averaging method is to represent the weights distribution by a density function which contains a scale parameter that adjust the size and the form of the weights according to the location of the point with respect to the point of estimation x (Nadaraya, 1964). This density function is known as the kernel function k. smoothing techniques based on this kind of weight representation are called kernel smoothing. The kernel estimate m(x), is defined as a weighted average of the response variable in a fixed neighborhood around x, determined in shape by the kernel function k and bandwidth h. The kernel used in this study is the Nadaraya-Watson estimator. It is interesting to note that the shape of the kernel weights is determined by the kernel function k with the smoothing parameter h, which is called the bandwidth (Uka *et al.*, 2018). The kernel function is a continuous, bounded and symmetric real function which integrates to one.

3.4 Model Specification

The model for this study is expressed as:

We shall obtain equation (3) by replacing Y_i= RGDP and x_i= Export_Goods$_i$ + Import_Goods$_i$ in equation (2)

$$RGDP_i = m(\text{Export\_Goods}_i + \text{Import\_Goods}_i) + \varepsilon_i \qquad (3)$$

for i= 1,...,n

where,

RGDP represents the response variable known as Real Gross Domestic Growth and a proxy for economic growth

Export_Goods and Import_Goods represents the independent variables

3.5 Data Presentation

Table 1: Summary of Financial Deepening Parameters and the Various Administration of the 4th Republic in Nigeria

Year	RGDP (Billion USD)	Export Goods (Billion USD)	Import Goods (Billion USD)	Year	RGDP (Billion USD)	Export Goods (Billion USD)	Import Goods (Billion USD)
1989	236.7	9.812	5.992	2004	527.6	36.871	18.833
1990	267.5	14.146	7.335	2005	561.9	49.609	21.872
1991	265.4	12.28	8.179	2006	286.47	57.001	22.184
1992	271.4	12.172	8.89	2007	262.22	66.039	28.291
1993	274.8	10.27	8.292	2008	330.26	85.771	39.844
1994	275.5	9.85	6.47	2009	297.46	56.167	30.779
1995	281.4	11.526	8.128	2010	369.06	79.618	49.52
1996	293.7	15.454	8.98	2011	414.1	99.052	66.223
1997	302	15.87	10.107	2012	460.95	96.123	56.933
1998	310.9	10.081	8.021	2013	514.97	97.818	55.3
1999	312.2	12.906	10.104	2014	568.5	82.595	61.593
2000	329.2	23.759	9.648	2015	493.84	45.887	52.334
2001	357	19.628	10.94	2016	405.44	34.704	35.239
2002	433.2	17.974	16.581	2017	376.36	42.35	36.248
2003	477.5	27.449	20.676	2018	397.47	45.893	41.422

Source: African Development Bank Group, 2018

IV. DATA ANALYSIS AND RESULTS

4.1 Result of Kernel Regression Analysis of for the estimation of RGDP on Export and Import Goods

Regression Data: 30 training points, in 2 variable(s)

	Export_Goods	Import_Goods
Bandwidth(s):	8.316896	5.071139

Kernel Regression Estimator: Local-Constant

Bandwidth Type: Fixed

Residual standard error: 37.39919

R-squared: 0.8645572

Continuous Kernel Type: Second-Order Gaussian

4.2 Kernel Regression Significance Test

Type I Test with IID Bootstrap (399 replications, Pivot = TRUE, joint = FALSE)

Explanatory variables tested for significance: Export_Goods (1), Import_Goods (2)

Individual Significance Tests

P Value:

Export_Goods 0.0050125 **

Import_Goods < 2.22e-16 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

The result of the kernel regression analysis found a residual standard error value of 37.399, R-square value of 0.8645 (86.5%), bandwidths of 8.316 and 5.071 for export and import goods respectively and a corresponding p-value of 0.00. This result indicates a strong positive coefficient of determination and implies that the model is reliably adequate for estimating economic growth in Nigeria. The independent variables export goods and import goods were found to significantly impact on Economic Growth since their p-values were obtained evenly as of 0.00. This result indicate that export and import goods are useful in estimating economic growth in Nigeria.
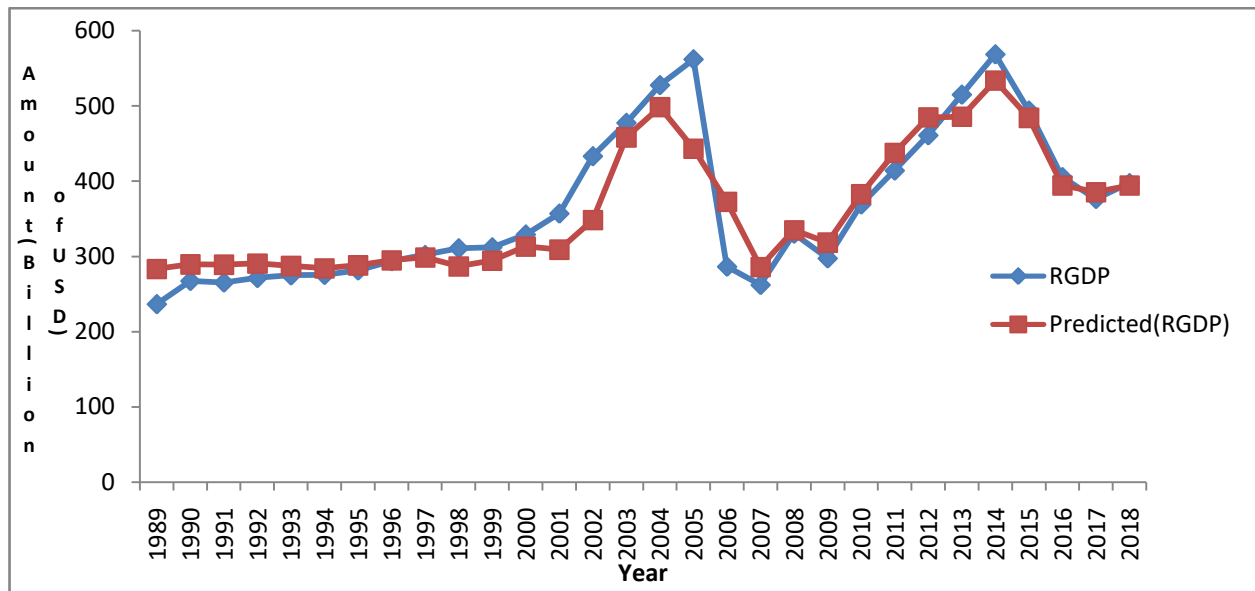
Figure 1: Plot showing distribution of observed and Predicted RGDP from 1989 to 2018

The distribution of the observed and predicted RGDP displayed in figure 1 shows that the model is reliable in estimating economic growth in Nigeria.

V. CONCLUSION

This study focused on obtaining a reliable model for the estimation of economic growth in Nigeria from 1989 to 2018. The Kernel regression model obtained for the estimation of economic growth found a strong positive coefficient of determination (R-square value= 86.5%) and positive bandwidths of 8.316 and 5.071 for export and import goods respectively. Export and Import goods were found to significantly impact on economic growth in Nigeria. The estimates obtained using the model revealed that the Kernel model is very reliable in estimation of economic growth using the amount of export and import goods within the observed period of study. In view of this, it is recommended that the Kernel model be used for estimation of economic growth until further studies proves it less efficient.

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