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FACTORS INFLUENCING CONTRIBUTION OF FORESTRY SECTOR TO ECONOMIC GROWTH OF NIGERIA

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ABSTRACT

Forest resources play a vital role in revenue generation of many countriesand this translate to economicgrowth and development. This study investigates the macro economic variables affecting the contribution of forestry sub-sector in boosting Gross Domestic Product (GDP) of Nigeria.Secondary data were obtained from Central Bank of Nigeria Statistical Bulletin. The data range covered a period of 22 years (1995-2017).Data were analysed using descriptive statistics and multiple regression analysis. The cointegration test was conducted usingAuto-regressive distributed lag(ARDL) model.The descriptive statistics results showthat a relatively straight but tuggling line was maintained from 1981 till 1998 with a sharp decline towards year 2000, from where it maintain a continues increase up to 2017. The regression analysis carried out on the other hand showed thatthere is positive effect of independent (Agricultural loan, Exchange rate, Inflation and Norminal GDP) variables on overall Forestry GDP (Dependent variable) and (Independent variables). With optimal lag structure at (2,0,0,2) for the independent variables respectively, partial Auto-correlation shows level of significants on forestry GDP at 15% from agricultural loan, 5% on both exchange rate and inflation and 10% on norminal GDP. Co-efficentregression's first lag of Agricultural loan is associated to 0.14% at 10% significant level while the second lag is associated with 0.358% decline on forestry GDP. Similarly, exchange rate and inflation rate are associated with a decline of 10807.89 and 4660.66 significants respectively, while Norminal GDP is associated with an increase and decrease of 699.57 and 887.32 respectively. Meanwhile, the Bond Test reveals that co-integration exist between dependent variable and independent variables while test of Heteroskedasticity is free at 5% level of significance. It is on this premise that this paper concluded that, if sufficient funding and appropriate policies are implemented on forestry sector to improve output, techniques used and encourage exportation of surplus and value added forestry products, it will help to increase the GDP acrueablefrom the sector and thereby contribute to economic growth.

Keywords: GDP, Correlation, Co-integration, Significant and Associated

Introduction

Forestry activities' contributeto wealth and development of a nation andhelp to boost revenue generation.Contribution of forestry sectorto GDP in many countries nowadays is sizeable(Arezki and Ploeg, 2010). In most developing countries, a number of people depend on it as a means of livelihood and it is recieveing improvement. The introduction of technology and techniques, has madethe sector become a major source of employment and growth (Oke*et al*.,2019); Oke and Adebisi,2019). The global forest status shows that, forests cover around 31 percent of the world's space amounting to one thirds of the total dry land in the world which is lower to 32 percent according to the report result of Global Forest Resources Assessment of the world forest area data from 1990 to 2015(FAO

2005, GFRA 2017) . One third of this is primary forest, that is, forests naturally regenerated of native species with no sign of major human activities and insignificant ecological disturbances. The total forests area is 4.06 billion hectares distributed across the globe of which 66 percent of the total are in just five countries of China, United States of America, Canada, Brazil and the Russian Federation. Only china has significant forest area in the entire Asia and African's size is around 17 percent of the total(GFRA, 2020). GFRA reports shows that the rate of decrease in forest size has slowed down generally with an uneven trend across the continents. Why a number of countries in North America, Europe, Eastern and South Eastern Asia had increased their respective forest size within the study period, the size has slightly decrease in Oceania, North and Western Africa (GFRA, 2020).

The research further shows that most of the aforementioned countries have increased their forest contriution to GDP to over 10% but in developing countries all over, it has provided between 40 to 60 million jobs through formal and informal employment(OECD, 2008; Cronin and Pandya,2009). In Nigeria specifically, the contribution of forestryis just about 2.5% to the GDP and provided employment for around 5 million people. Meanwhile the potentialhas not been reached due to improper institutionalization and bad policies that paved way for deforestation and other illegal activities by those who depend on it(Rotowa*et al.*, 2019). The inadequate support been given to forest sector in Nigeria on research and development is also a problem. And this can be identified and resolved accordingly if major players in the sector followthe rule (Oke and Adebisi 2019). The Nigerian economy has locally exploited the opportunities in most part of non-timber forest product (NTFP) which considerably has yielded result but there is still lot of work to be done to meet global standard (Jimoh*et al.*, 2019) and Fuwape (2003)).

This paper set to look into the accumulated side of the proceed from forestry and aim to identify macro economic variables that affect the GDP accrued from forestry sub-sector of the economy. This will provide a guide for appropriate policy decision.

Theoretical framework

This study is based on classical growth theory which states that wealth of a nation is as a result of the input or investment through several factors.This will enable an increase in economic growth. The theory Thus explain the role market play in determining demand and supply, labour productivity, trade for better specialization and increasing return to scale which can be motivated by economy of scale of production increase or knowledge. An increase in proportion of GDP that is invested however will lead to diminishing returns.

Forest Sector Contribution to a Developing Economy

Apart from the subsistence structure of forest utilization by the rural dwellers as a means of livelihood, forestry contribution to the domestic economy habitually show in the revenue of a country through GDP, importation and exportation, job creation and balance of payment among others (Oke and Adebisi,2019;) Rotawa*et al.*, 2010)). The predominant and non-accountable subsistence nature of forest activities in most part of Africa has reduced its impact or expected contribution to macro-economy. Forestry sector economic contribution involves the production of forest activities in goods and services, this include tourism, industrial and fuel wood, fibre, pulp, herbs, fruits among others (Thirtle *et al.*,2003),Njimanted, and Aquilas,2015).

Lack of proper monitoring and record keeping does not give a proper account of the impact of forestry activity on economy in most developing countries. This has made a diverse contribution of various employment around it unaccounted for especially those employment in rural area (Gylfason, 2001). Although, over time there has been an improvement where there has been an introduction of technology and value addition to forest production processes. Through this, there are different segment on a line of product. For instance logging harvest in Nigeria recorded 6.2 million m^3 of saw log, providing over 160,000 labour employment with another 40,000 jobs through transportation and tree filling annually. In this same line, wood usage for furniture, pole, in construction industry has tremendously generated employment and contributed to the GDP(Adekunle*et al.*,2018; Rotowa*et al*.2019). The same can be said about other derivable forest product along their value chain. In recreation, herbal products, economic trees etc. There are usually collector, processors and marketers along the chain of these non-timber products of which, each of them creates employment and contribute to the GDP(Oke, 2019).

The contribution of of forestry sub-sector to Nigeria economy could not be over emphasized especially timber products before commercial exploitation of petroleum. Before the oil boom, that is, in the pre-independence time, forestry and agriculture played a dominant role in sustained growth of the economy. The economic development plan during this period based on forest resource exploitation. Forest resources in Nigeria have been reported to have contributed greatly in GDP of Nigeria (Kalu and Okojie 2009). However, the noticeable decline in the export role of forest products in the national economy has been attributed to over-exploitation of the high quality timbers in the previous decades and partly to the inability of the forest departments and the timber trade to develop the secondary species which now constitute the main timber contents of the forest estate (Faleyimu, 2013).

Methodology

Type and source of data

This paper rests on the strength of other literatures and Data from statistical bulletin and publications of the Central Bank of Nigeria as well as reports and publications of national bureau of statistic (Table1).

Table 1: Forestry GDP data for the year 1981-2017

Year	Forestry	Agricultural Loan	Real Exchange rate	Inflation rate %	Nominal GDP
1981	77.9	35642.4	0.62	20.81	144.83
1982	73.91	31763.9	0.67	7.7	154.98
1983	75.28	36307.5	0.72	23.21	163
1984	76.69	24654.9	0.77	17.82	170.38
1985	78.08	44243.6	0.89	7.44	192.27
1986	86.59	68417.4	1.75	5.72	202.44
1987	87.59	102152.5	4.02	11.29	249.44
1988	88.91	118611	4.54	54.51	320.33
1989	67.31	129300.3	7.36	50.47	419.2
1990	72.61	98494.5	8.04	7.36	499.68

1991	74.79	79107.4	9.91	13.01	596.04
1992	76.51	91953.1	17.3	44.59	909.8
1993	78.04	80845.8	22.07	57.17	1259.07
1994	80.07	104463	22	57.03	1762.81
1995	81.83	164133.1	21.9	72.84	2895.2
1996	82.24	225519.5	21.88	29.27	3779.13
1997	82.98	242028.3	21.89	8.53	4111.64
1998	83.98	219144.2	21.89	10	4588.99
1999	19.31	241839	92.34	6.62	5307.36
2000	24.49	361449	101.7	6.93	6897.48
2001	29.98	728545.4	111.23	18.87	8134.14
2002	36.23	1050982.3	120.58	12.88	11332.25
2003	44.13	1151015	129.22	14.03	13301.56
2004	56.39	2083744.7	132.89	15	17321.3
2005	67.45	9366392.9	131.27	17.86	22269.98
2006	80.2	4195099.68	128.65	8.23	28662.47
2007	91.5	4087447.94	125.81	5.39	32995.38
2008	108.1	6497958.93	118.55	11.58	39157.88
2009	121.25	8328565.78	148.9	12.56	44285.56
2010	135.72	7840496.63	150.3	13.72	54612.26
2011	153.05	10028988.81	153.86	10.84	62980.4
2012	170.16	9332484.23	157.5	12.22	71713.94
2013	187.95	9256676.8	157.31	8.48	80092.56
2014	207.74	12456250.87	158.55	8.06	89043.62
2015	222.83	10857380.83	192.44	9.01	94144.96
2016	236.25	7858643.35	253.49	15.68	101489.49
2017	257.21	5849388.73	305.79	16.52	113711.63

Source: ***CBN Statistical Bulletin 2017***

Data analysis

Both descriptive and regression method of data analyses were employed using Partial Auto-correlation, Co-efficient Regression, Heteroskedasticity test, ARDL Bound Test depicted in tables and graphs by focusing on forestry GDP. The data collected include, Forestry GDP, Nominal GDP, Agriculture loan, real exchange rate and inflation. All between 1981 and 2017. Where forestry GDP is the independent variable, while Agricultural loan, Real exchange rate, Inflation rate, and Nominal GDP are all dependent variables.

Therefore, the formulae goes thus: $Y = f(X1, X2, X3, X4, \mu)$

Where;

Y= Forestry GDP(Monetory value of forestry products)
X_1= Agricultural loan (Amount inNaira)
X_2= Real exchange rate (Value of naira relative to USD)
X_3= Inflation rate (Consumer price index)

X_4= Nominal GDP(Monetary value of goods and services)
μ = Error term.

The Auto-regressive distributed lag (ARDL) was used to perform conintegration test. It is an ordinary least square (OLS) based **model** which is applicable for both non-stationary time series as well as for times series withmixed order of integration. The model is specified as:

$$Y_t = \mu + \rho_1 Y_{t-1} + \rho_2 Y_{t-2} + - - - - - - - \rho_n Y_{t-n} + \varepsilon_i$$

Where,

Y_t is a dependent variable,´Y´, at period ´t´ . $\mu$is a constant parameter. e is the unexplained part (gap) of actual data and fitted line by regression equation, termed as error.$Y_{t-1}, Y_{t-2}, Y_{t-n}$ are the first, second and n lagged value of Y, ρ_1, ρ_2, ρ_n are the coefficients.

.**Result and Discussion**

Summary statistics of macro economic variables

The result in table 2 shows the descriptive statistics of the dependent variable (Forestry GDP) and Independent variable (Agricultural loan, Real Exchange Rate, Inflation rate, Nominal GDP). The mean and standard deviation of Forestry GDP is (99.33, 58.52), Agricultural loan (3066760, 4073143), Real exchange rate (82.66, 80.34), Inflation rate (19.55, 17.44), and Nominal GDP (24861.44, 34308.70) respectively. The ratio of the average forestry GDP to nominal GDP which was less than 1% showed a low contribution contribution of forestry sub sector to the over all economic growth. Many studies have reported a decline in ratio of forestry GDP for example Alabi *et al.* (2006) reported a decline in percentage share of forestry to total Agricultural GDP from 2.08% in 1986 to 0.62% in 2004 and attributed the cause to neglect of the subsector. Similarly, Faleyimu (2013) reported a decline of the contribution of forestry to the GDP in Nigeria. Figure 1shows the trend of the dependent variable (Forestry GDP) from 1981 to 2017. It was observed that there is rapidincrement from 1999 to 2017.

Table 2Summary statistics of Forestry GDP, Agriculture loan, Real exchange rate, inflation rate and Nominal GDP

Variable	Obs	Mean	Std. Dev.	Min	Max
Forestry GDP	37	99.3311	58.5212	19.31	257.21
Agricultural loan	37	3066760	4073143	24654.9	1.25e+07
Real exchange rate	37	82.6649	80.3351	0.62	305.79
Inflation rate	37	19.5473	17.4388	5.39	72.84
NominalGDP	37	24861.44	34308.70	144.83	113711.6

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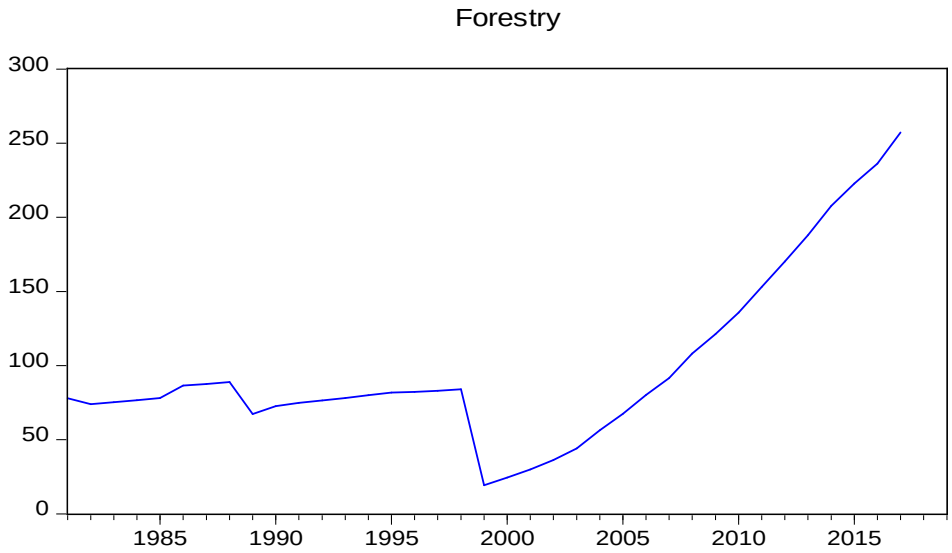

Figure 1: Time plot of Forestry GDP

Estimation of effect of depedent variables

As shown in Table 3, across all criterion specifications, most of the dependent variables were lagged because the lag with the smallest criterion specificationwill have the optimal lag structure, AIC (65.8488), HQIC (66.2015), SBIC (66.8033). The optimal lag structure is given as (2, 0, 0, 2) where Agricultural loan has 2 lags, Real exchange rate has 0 lag, the Inflation rate has 0 lag, and Nominal GDP has 2 lags.The implication of this finding is that the current value of agricultural loan and nominal GDP were influenced by their previous values.

Table 3: Estimation of effect of depedent variables

Lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-1222.37				2.2e+27	74.3254	74.3864	74.5067
1	-1067.29	310.16	16	0.000	4.9e+23	65.8963	66.2015*	66.8033*
2	-1050.51	33.568*	16	0.006	4.9e+23*	65.8488*	66.3981	67.4814
3	-1039.36	22.288	16	0.134	7.5e+23	66.1431	66.9366	68.5013
4	-1027.36	23.996	16	0.090	1.2e+24	66.3857	67.4232	69.4694

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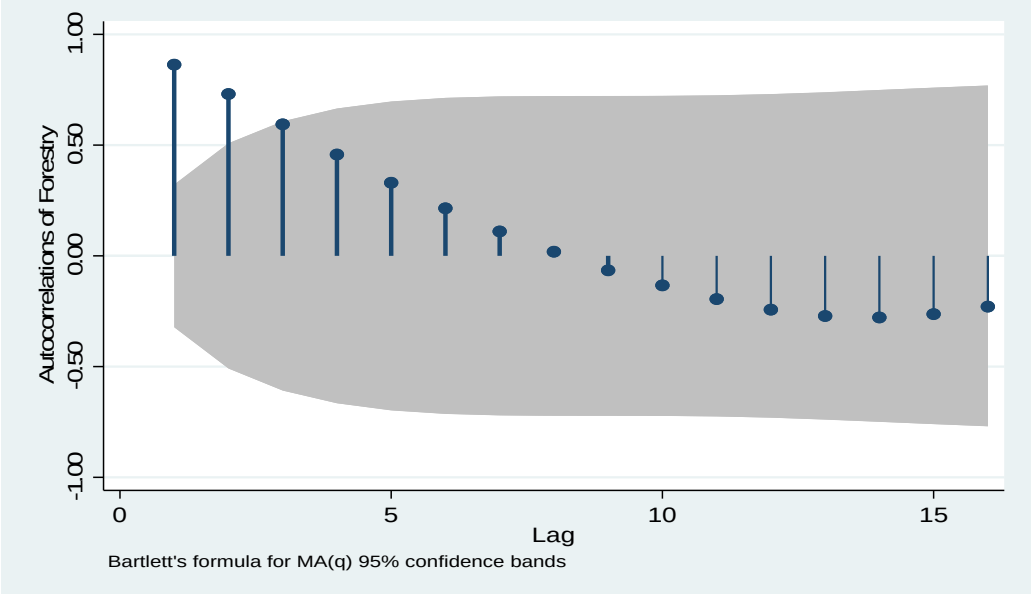


Figure 2: Auto-regressive nature of forestry GDP graph

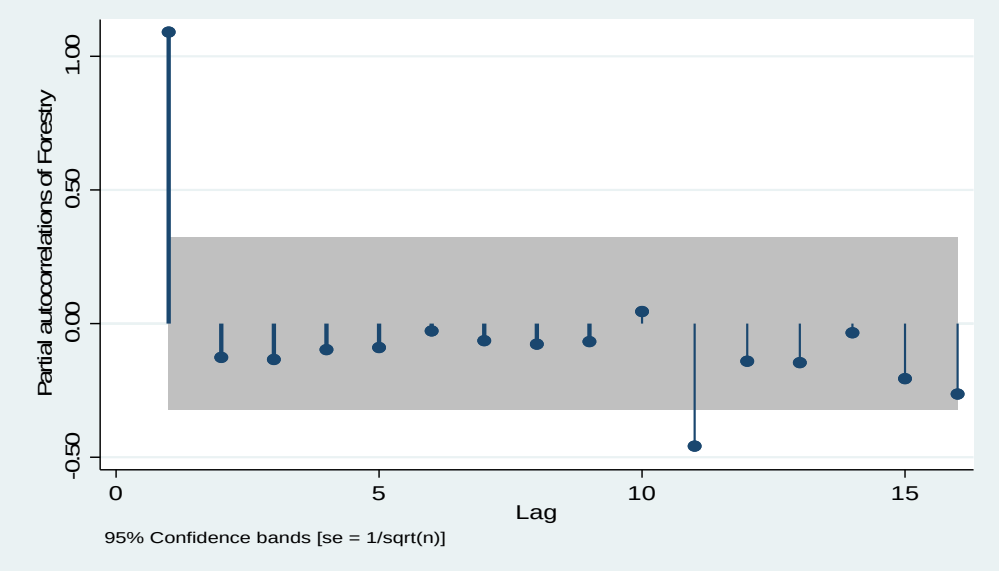


Figure 3: Partial- Auto-correlation of forestry GDP

Effect of some macro economic variables on forestry GDP

Results in Table 4 revealed that the first and second lag of Agricultural loans does have a significant effect on forestry GDP at a 15% level of significance. The real exchange rate and the inflation rate are not statistically significant at a 5% level of significance while the first and second lag of Nominal GDP is statistically significant at a 10% level of significance. For the co-efficient regression, a percent change point in the first lag of agricultural loan is associated 0.14 percentage point increase on forestry GDP on average

ceteris paribus are the 10% statistically level. For the second lag of the agricultural loan, a percentage point change is associated with a 0.358 percent decline in forestry GDP. Similarly, a percentage change in forestry GDP is associated with a 10807.89 percent decline in the real exchange rate, and a percentage change in forestry is associated with a 4660.66 percent decline in Inflation, and a percent change in forestry GDP is associated with a 699.57 percent increment and 887.32 percent decline for the first and second lag of Nominal GDP respectively.

Table 4: Estimation of Auto-regressive distributed lag (ARDL) model

Variable	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
Agricultural loan						
L1.	.1433447	.1991333	0.72	0.478	-.265243	.55193
L2.	-.3582267	.2307848	-1.55	0.132	-.8317579	.1153045
Real exchange rate	-10807.89	8178.474	-1.32	0.197	-27588.73	5972.953
Inflation rate nominal	-4660.661	15986.98	-0.29	0.773	-37463.23	28141.9
GDP						
--.	243.1073	199.0927	1.22	0.233	-165.3972	651.6118
L1.	699.5652	351.5993	1.99	0.057	-21.85693	1420.987
L2.	-887.3192	228.6453	-3.88	0.001	-1356.461	-418.1777
_cons	224350.5	612632.9	0.37	0.717	-1032668	1481369

Bond test of co-integration

From the result, since F statistic is (5.927) > the L(0) series or bound, we say that there exists a co-integration between the dependent variable (forestry GDP) and independent variables (agricultural loan, real exchange rate, inflation rate, and nominal GDP) because we reject the null hypothesis of no co-integrations. Since there exists a co-integration between the dependent and independent variable, we need to estimate the ECM (Error correction model).

Table 5: Long-run coefficients, standard errors, *t*-statistics and *p*-values for ARDL(2,0,0,2)

Long-run regressor	Coefficient	S.E	*t-statistic*	*p-value*
Real exchange rate$_{(t-1)}$	-8896.05	6469.05	-1.38	0.180
Inflation rate $_{(t-1)}$	-3836.31	13100.19	-0.29	0.771
Nominal GDP$_{(t-1)}$	45.56	22.02	2.05	*0.050

Statistically significant at 10 percent level of significance

The error correlation model consists of Adjustment (ADJ), Long run (LR), and Short-run (SR). The adjustment shows that the error of the previous period will be corrected in the

current period. The coefficient is statistically significant at a 1% level of significance with the co-efficient (-1.2148) as the adjustment term.

ARDL Bounds Test

Test Statistic	**Value**	**K**
F-statistic	**5.929**	**3**

Critical Value Bounds

Significance	**I0 Bound**	**I1 Bound**
10%	**2.72**	**3.77**
5%	**3.23**	**4.35**
2.5%	**3.69**	**4.89**
1%	**4.29**	**5.61**

Firstly, when *k*=3, Table 4.2 illustrates that the *F-value* of 5.929 lies outside the upper bounds of the critical bounds values for I(1). Thus, When the intercept and trend are unrestricted, suggesting that the null hypothesis of no level forestry equation is rejected at 1 percent, 5 percent, and 10 percent which is very high irrespective of whether the regressors are entirely I(0), entirely I(1) or jointly co-integrated. Conversely, it was discovered that the bound test conducted for both BIC and SIC methodsis not significant since the *F-statistic value* lies within the upper and lower bound.The result of the bounds testing gives rise to the estimation of the conditional long-run level relationship.

In the short run, we interpret that a percent change in forestry will result in a 0.358 percent increment in an agricultural loan which is significant at a 15% level of significance. Similarly, a percent change in forestry will result in a 187.57 percent increment change in Nominal GDP at lag 1 and 887.31 percent increment change in lag 2, which significant at a 10% level of significance.

Model Diagnostic

In other to test the adequacy of the model, several model diagnostic is used to show the adequacy of the model.

Table 6: Breusch-Godfrey LM test for autocorrelation

lags(p)	chi2	df	Prob> chi2
2	8.471	2	0.0145

Durbin-Watson d-statistic was used to test the model for auto-correlation. Durbin-Watson d-statistic (8, 35) = 2.244, the null hypothesis of no serial correlationwas rejected. This implies that there is no evidence of serial auto-correlation which is supported by theBreusch-Godfrey test P < 0.05.

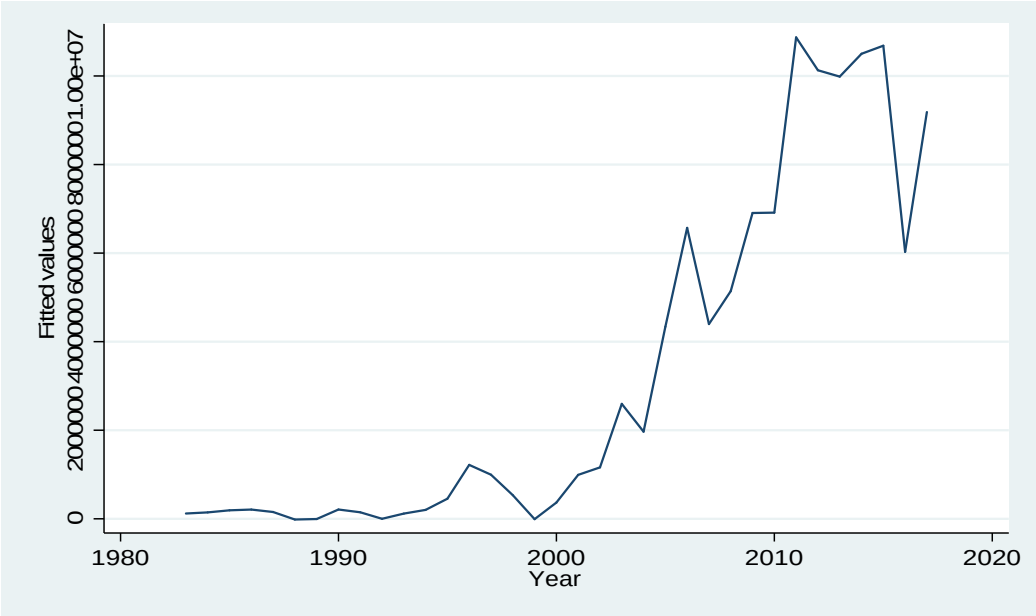
Table 7: White test for Heteroskedasticity

Source	chi2	df	P
Heteroskedasticity	35.00	34	0.4204
Skewness	-1717.78	7	1.0000
Kurtosis		1	
Total		42	

The white test for heteroskedasticity was also used to test the adequacy of the model with P > 0.4204, we fail to reject the null hypothesis of homoscedasticity and conclude that the model is heteroskedasticity free at a 5% level of significance.

Forecast Errors and Model Performance

The performance of the estimated model in the equation and table was checked by studying the behavior of the forecast errors. The actual and forecasted values were compared to ascertain level of the degree of association. The figure below shows the Forestry actual values and the forecasted values.



The graph above shows the plot of the predicted value using the ARDL model (2, 0, 0, 2). The plot shows that there existsanupward movement in the fitted valuesthat is. the values of forestry GDP continue to increase as the year increases.

Conclusion

The study showed that there is a relationship between Forestry GDP (dependent variable) and all the aforementioned independent variables.There is the need for policy strategy that can improve harness funding, exchange rate and others important sections of the economy that interact with forestry activities. Government need to provide enabling environment for research and development in forestry sector. More priority should be given

to forestry as an imoo main sector out of agricultural sector so as to give it the derservedattention.Lastly, government should formulate law that will protect the forest from invation, overuse, and encourage planting of trees especially economic trees across the country.

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