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ECONOMETRICS ANALYSIS ON SIGNIFICANT OF TRANSPORTATION SECTOR TO THE NATION GROSS DOMESTIC PRODUCT (GDP)

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ABSTRACT: This research work centered on econometrics analysis on significance of transportation sector to the Nation Gross Domestic Product (GDP) in Nigeria economic. The aim of this research work is to test for significance of transportation sector to the Nation Gross Domestic Product. The literature review explains extensively on the important of using econometrics to carry out this research and why is desirable to fit the model. The methodology employs the use of multiple regression analysis, test of parameter and coefficient of determination. The road, sea, rail and air transportation are useful in predicting the value of Gross Domestic Product. The value of R-square show that combination of RT, ST, RailT and AT explain variation in GDP which is significantly implies that the four variables are important in GDP and the Sea transportation contribute majorly to the nation Gross Domestic Product. Testing the significant of the parameter, it is observed that there is presence of multicollinearity, heteroscedasticity and autocorrelation and necessary correction are made on them.

KEYWORD: Gross Domestic Product, Transportation, Road Transportation, Air Transportation, Sea Transportation, Rail Transportation

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INTRODUCTION

Transportation is about mobility of people, goods and services. World demand for transport services is growing at alarming rate. For example, global demand for passenger transport service is predicted to grow from 26 trillion passenger kilo meters in 1990 to 103 trillion passenger kilometers in 2050 on average (Schater and Victor 1997; USA DOT, 1990). Unfortunately, the rapid growth in transport demand strains the transport capacity unit as a result of inadequate expansion in transport physical infrastructure. In Nigeria, we should begin to think of having a dramatic shift and concern for the understanding of an effective management of the industry via the use of statistics of another available sources of information people are already asking if certain principle could be applied more widely to the major mode of transportation with a larger systematic view of the entire notion such that a transport policy or strategy could be evolved to make real sustainable improvement to our quality of life.

Transportation has been with us from the earliest history of man and its various crude forms. It has passed through various stages and development and grows into what we are witnessing today both in terms of magnitude, diversity and variety.

Transport is to carry or move goods and passenger from one place to another and the transportation sector, comprises of district modes like road, air, rail and ocean and activities which are extremely complex and have numerous inter-relationships with other sectors of the economy.

One indicator often uses in national accounts to monitor economic progress in the Gross Domestic Product (GDP).

Transportation activities are disaggregated into road, rail and pipelines, water, air and transport services subsectors in the National account of Nigeria. Transportation experienced relative freeze in real growth, declining slightly to 6.83% in 2009 from 6.9% in 2008. Virtually, all subsectors contributed to the relative stability in growth with rail and pipelines subsector experiencing marginal declines in term of contribution to GDP growth, transportation activities accounted for 2.70% in 2009 as against 2.71% 2008.

The less than impressive performance of transportation sector during the period could largely be attributed to the poor state of transport infrastructure. The rail system had remained inactive for many years with obsolete tracks and equipment. While, water transportation has been undone by poor state of water routes, the growth of road transport activities has been largely constrained by the poor state of roads.

More positively, there was the re-opening of the Port Harcourt Airport in 208 while government demonstrated renewed efforts to revive the rail system.

The aim of this research work is to test for significance of transportation sector to the nation Gross Domestic Production (GDP).

Objectives of the study are: to check for autocorrelation among the independent variables (mode of transportation; to check for multicollinearity among the independent variables.

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LITERATURE REVIEW

The analysis of Econometrics is the most important techniques of making inference about the future on the basis of what has happened in the past. According to **Schmidt (2005),** he came to conclusion that the knowledge of econometrics analysis and analysis of residuals could help to develop a good model for prediction**. Okunamiri (2003)** also reflected the effectiveness of econometrics analysis on the effect of crude oil on Gross Domestic Product and inflationary growth on the Nigerian economy.

Literally interpreted, econometrics means "economic measurement" although measurement in an important part of econometrics the scope of econometrics is much broader as can be seen from the following quotations.

Gerhard Tintner (2016) in Methodology of Mathematical Economics and Econometrics defined econometrics as the result of a curtain outlook on the role of economics consists of the application of mathematics statistical to economic data to lend empirical economics and obtain numerical results.

Samuelson, Koopmans and **Stone (2017)** in report of the evaluation of committee for econometrics defined econometrics as the quantitative analysis of actual economic phenomenal based on the concurrent development of theory and observation related to appropriate methods of inference.

Hauburig (2017), defined econometrics as an integration of economic theory, mathematics and statistical techniques for the purpose of testing hypothesis about economic variable or phenomenon.

According to **Koutsoyiannis (2001)**, defined econometrics as the integration of Economics, Mathematics and statistics for the purpose of providing numerical values for the parameter of economic relationships and verifying economic theories. An Econometrics combines the roles of an economist, a mathematician and a statistician. As an economist, he applies economic theory on economic data to formulate economic problem in commercial and industrial sectors of the economy. As a Mathematician, he formulates appropriate mathematical models for economic problems. As a Statistician, he uses statistical tools to estimate the parameter of the mathematical model, draw statistical inferences on the parameter for policy makers to take decision on.

To summarize above definitions, we can therefore define econometrics as the application of statistics techniques on a mathematical model of an economic data to estimate its parameters and draw statistical inferences on the parameters to facilitate correct decisions on economic phenomena.

Methodology

Test Of Assumptions

The power of the least square method depends on the validity of the assumption made.

The assumptions to be tested for are:

1) Test for Multicollinearity

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2) Test for Heteroscedasticity

3) Test for Autocorrelation.

Multicollinearity

Multicollinearity occur when two or more explanatory variables in the regression model are highly correlated thereby making it impossible to isolate their individual effect on the dependent variable. If multicollinearity exists, then some of the X- variables are linearly dependent and hence β may not be found.

DATA ANALYSIS

The analysis of this paper examines the application of the various statistical tests based on econometrics which can be used to establish the validity of ordinary least square (OLS) assumption, assumption of multicollinearity, heteroscedasticity and autocorrelation as being discussed in methodology to the significance of road, sea, rail and air transportation on the Gross Domestic Product.

The data for this analysis work is yearly data from 2000-2018 recorded yearly with respect to the amount (₦'billion).

DATA

YEAR	Y	ROAD (X1)	SEA (X2)	RAIL (X3)	AIR (X4)
2000	46.386	3476.16	0.72	170.87	116.81
2001	44.138	133447.27	4.98	835.41	1889.79
2002	59.116	1646965.61	5.07	829.33	2519.23
2003	67.655	210768.50	5.36	842.40	2759.18
2004	87.845	344913.02	6.41	909.92	3009.64
2005	112.248	365605.26	6.94	982.88	3282.82
2006	145.437	416240.26	7.53	1061.25	4023..88
2007	166.451	444989.96	9.55	1170.70	4567.79
2008	208.062	450329.84	9.66	1184.75	4622.60
2009	169.481	457590.70	10.22	1248.38	5243.09

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2010	369.062	464518.00	10.35	1262.54	5439.11
2011	411.954	469955.88	11.02	1355.72	6012.18
2012	460.954	475322.13	11.85	1378.44	6259.32
2013	514.966	503342.45	12.34	1431.14	7128.46
2014	568.499	570019.53	12.98	1463.78	7867.28
2015	481.066	582458.81	13.15	1516.04	8522.97
2016	404.653	615994.76	13.76	1592.29	8643.06
2017	375.770	697988.00	14.09	1628.52	9419.00
2018	397.472	728569.23	14.64	1673.88	9989.10

Where:

Y= Real Gross Domestic Product at Current Prices with the year 2000-2018 (RGDP)

X1= Road transportation

X2= Sea transportation

X3= Rail transportation

X4= Air transportation

Descriptive Statistics

	Mean	Std. Deviation	N
Y	267.95868	181.085070	19
(X1)	504341.86158	329606.407604	19
(X2)	9.50632	3.818819	19
(X3)	1186.22316	369.131391	19
(X4)	5332.38474	2753.820019	19

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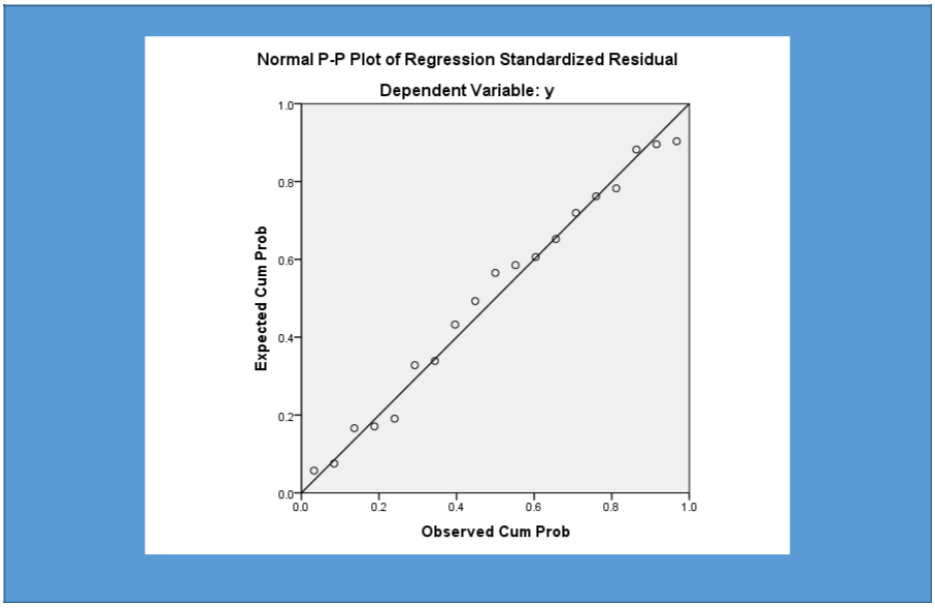
SCATTER DIAGRAM OF DATA



Interpretation: Since the information in figure above conform to the linearity assumption of OLS, this implies that their relationship between the dependent variable Y and the set of independent variables Xi's. Hence, there is no need for transformation of the original data

MODEL FORMATION AND TEST OF SIGNIFICANCE OF COEFFICIENTS.

Coefficients[a]

Model		Unstandardized Coefficients		Standardiz 67ed Coefficien t S	t	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Toleran ce	VIF
1	(Consta nt)	103.315	116.503		.887	.390	-146.559	353.188		
	(X1)	7.721E-006	.000	.014	.111	.913	.000	.000	.781	1.280
	(X2)	125.262	50.515	2.642	2.480	.026	16.918	233.606	.011	91.437
	(X3)	-.849	.392	-1.731	-2.165	.048	-1.691	-.008	.019	51.527
	(X4)	-.004	.036	-.064	-.117	.909	-.082	.073	.041	24.431

a. Dependent Variable: y

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The linear regression model for the research work is:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + U_t$$

$$Y = \beta_0 + \beta_1 (RT) + \beta_2 (ST) + \beta_3 (RailT)\ \beta_4 (AT) + U_t$$

From the above table, we can conclude that our linear regression model for estimating and forecasting will be $Y = 0.772 + 0.006(RT) + 125.262(ST) - 0.849(RailT) - 0.004(AT) + U_t$

Interpretation of the model:

From Table 4.3 the estimated coefficients and the intercept from Table 4.3 above are interpreted as follows:

i. The coefficient of $\beta_0 (intercept) = 0.772$ is the expected mean value of Y i.e. Gross domestic product when X_i's are all zero. This shows that if the contribution of $X_1, X_2,\ X_3, and\ X4$ are zero, the total GDP will be increased by ₦0.772billion.

ii. The coefficient of $\beta_1\ i.e. RT = 0.006$ suggests that for every increase in the road transportation, the gross domestic product in Nigeria is expected to increase by ₦0.006.

iii. The coefficient of $\beta_2\ i.e. ST = 125.262$ suggests that for every increase in sea transportation, the gross domestic product in Nigeria is expected to increase by ₦125.262.

iv. The coefficient of $\beta_3\ i.e. RailT = -0.849$ suggests that for every increase in rail transportation, the gross domestic product in Nigeria is expected to decrease by ₦0.849

v. The coefficient of $\beta_4\ i.e. AT = -0.004$ suggests that for every increase in Air transportation, the gross domestic product in Nigeria is expected to decrease by ₦0.004

Test of significance

Hypothesis:

$H_0 : \beta_i = 0$ There is no statistical significance between the parameters

$H_1 : \beta_1 \neq 0$ There is a statistical significance between the parameters

Decision Rule: reject H_0 if the significance value (Sig.) is less than 0.05, if otherwise, accept H_0.

Conclusion: from the regression coefficients, we can therefore conclude that parameter β_0 is significant for it Sig value is less than 0.05, while the parameters $\beta_1, \beta_2, \beta_3 and\ \beta_4$ are insignificant for their Sig value is greater than 0.05.

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TESTS FOR LINEARITY OF THE MODEL

Regression model

$$Y = 0.772 + 0.006(RT) + 125.262(ST) - 0.849(RailT) - 0.004(AT) + U_t$$

ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	487692.602	4	121923.151	16.643	.000[b]
	Residual	102559.842	14	7325.703		
	Total	590252.444	18			

a. Dependent Variable: y

b. Predictors: (Constant), (X4), (X1), (X3), (X2)

Decision rule: Reject Ho if the sig value < 0.05. If otherwise, accept Ho.

Conclusion: Since the sig value < 0.05, I therefore reject Ho and conclude that the model is adequate and fit for estimation and forecasting

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.909[a]	.826	.777	85.590321	.826	16.643	4	14	.000	.824

a. Predictors: (Constant), (X4), (X1), (X3), (X2)

b. Dependent Variable: y

Interpretation: from the table above and test of significance of T-Ratio, we can say that R^2 = 0.777 is high {Coefficient of determination between the dependent and independent variable(s) is 78%}. From the test of significance, we could see that all of the coefficients are not significant. In this wise, we have to reject Ho and conclude that the independent variables are inter-correlated and there is multicollinearity.

2. Method of eigenvalues and condition index: this method can also be used to detect multicollinearity by finding condition number k which is defined as:

$$CI = K = \frac{maximum\ eigen\ value}{minimum\ eigen\ value}$$

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Decision rule: If k is between 100 and 1000, there is strong multicollinearity, if exceed 1000 there is severe multicollinearity.

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions (Constant)	(X1)	(X2)	(X3)	(X4)
1	1	4.650	1.000	.00	.01	.00	.00	.00
	2	.232	4.480	.00	.76	.00	.00	.00
	3	.112	6.451	.18	.09	.00	.00	.02
	4	.005	29.241	.49	.00	.04	.09	.67
	5	.001	76.734	.33	.14	.96	.91	.31

a. Dependent variable: y

$$K = \frac{4.650}{0.001} = 4650$$

Decision rule: if Condition index exceeds 15, there exist multicollinearity, or if K lies between 100-1000, there exist a strong multicollinearity. If K exceeds 1000, there exist a severe multicollinearity.

Conclusion: Since the K exceeds 1000, there exist a severe multicollinearity.

3. Farrar-Glauber Test: Here, we obtain the correlation matrix of the independent variables and further obtain the determinant D of the correlation matrix.

Correlations

		y	(X1)	(X2)	(X3)	(X4)
Pearson Correlation	y	1.000	.164	.872	.822	.861
	(X1)	.164	1.000	.268	.312	.297
	(X2)	.872	.268	1.000	.988	.977
	(X3)	.822	.312	.988	1.000	.959
	(X4)	.861	.297	.977	.959	1.000
Sig. (1-tailed)	y	.	.252	.000	.000	.000
	(X1)	.252	.	.133	.097	.108
	(X2)	.000	.133	.	.000	.000
	(X3)	.000	.097	.000	.	.000
	(X4)	.000	.108	.000	.000	.
	y	19	19	19	19	19

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N	(X1)	19	19	19	19	19
	(X2)	19	19	19	19	19
	(X3)	19	19	19	19	19
	(X4)	19	19	19	19	19

We obtain $\chi^2 = -\left[n - 1 - \frac{1}{6}(2k + 5)\ln D\right]$ where n is the sample size and k the number of independent variables.

Compare χ^2_{cal} with $\chi^2_{\frac{(k(k-1))}{2},\ \alpha}$, if calculated value > tabulated value, then there exists multicollinearity.

From the correlation matrix, determinant $D = 0.08038$. Therefore $\ln D = -2.520$

$$\chi^2 = 35 - 1 - \frac{1}{6}(2 * 4 + 5)(-2.520)$$

$$\chi^2 = 39.41$$

Tabulated Value:

$$\chi^2_{\frac{(k(k-1))}{2},\ \alpha} = \chi^2_{\frac{4(3)}{2},\ 0.05} = \chi^2_{6,0.05} = 12.30$$

Decision Rule: Reject H_0 if calculated value > tabulated value. If otherwise, accept H_0
Conclusion: Since the calculated value > Tabulated value, we therefore reject H_0 and conclude that there is presence of multicollinearity and the independent variables are inter-correlated.

TEST FOR AUTOCORRELATION

Detection of autocorrelation: In this section, **Durbin Watson statistic** test will be employed in testing for autocorrelation.

Hypothesis:

H_0: $\rho = 0$ i.e. no autocorrelation

H_1: $\rho \neq 0$ i.e. autocorrelation exist

The test is carried out using

$$d = 2(1 - \rho)$$

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Decision rule:

ρ = 0, d= 2, no autocorrelation

ρ = 1, d = 0, perfect +ve autocorrelation

ρ = -1, d = 4, perfect -ve autocorrelation

0 ≤ d ≤ 2, presence of +ve autocorrelation.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.909[a]	.826	.777	85.590321	.826	16.643	4	14	.000	.824

a. Predictors: (Constant), (X4), (X1), (X3), (X2)

b. Dependent Variable: y

$d = 2(1 - \rho) = 0.824$

$$\rho = 0.588$$

By using Durbin-Watson Table:

$n = 19, k = 4$

$$d_L = 1.283, d_u = 1.653, (4 - d_L) = 2.717, (4 - d_u) = 2.347, d^* = 0.236$$

1. if $d^* < d_L$, H_0 is Rejected i.e. there is positive autocorrelation

2. If $d^* > (4 - d_L), H_0$ is Rejected i.e. there is presence of negative autocorrelation.

3. If $d_u < d^* < (4 - d_u), H_0$ is Accepted i.e. there is no autocorrelation.

Conclusion: $d^* = 0.236 \; and \; \rho = 0.882$, the value of ρ is not equal to zero i.e. ρ > 0, and $d^* < d_L$, thus, we reject H_0 and conclude that there is a positive autocorrelation.

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SUMMARY

The main purpose of this study is to examine the significance of transportation sector on nation Gross Domestic Product between 2000-2018.

Efforts have been made to base the present work on reasonable empirical and theoretical foundations which vividly examined contribution of Road, Sea, Air and Rail transportation system to the Nigeria GDP per year and their gross effect since 2000 to 2018 as shown in Table 4.2 from the result obtained, sea transportation has the highest contribution with about (2%) follow by Road with about (89.5%) followed by air (8%) and lastly rail (1%).

Multiple regression analysis was conducted and the model obtained as found to be $Y = \beta_0 + \beta_1(RT) + \beta_2(ST) + \beta_3(RailT)\ \beta_4(AT) + U_t$ which the coefficient of the model is this $Y = 0.772 + 0.006(RT) + 125.262(ST) - 0.849(RailT) - 0.004(AT) + U_t$ adequacy of the model was tested and confirmed. The parameter and the model were individually and jointly significant, meaning that sea transportation contribute mostly significantly to the Real GDP of Nigeria between the aforementioned period above.

The coefficient of determination (R^2) obtained from the analysis of original data is approximately equal to 1 which implies that the model explained all the variability of the response data around its mean.

However, having carried out all the necessary analysis and test, it was observed that there is presence of several multicollinearity which was reduced by removing X1 which is the most collinear variable

Also, the test for autocorrelation indicates presence of autocorrelation among the observation

CONCLUSION

Based on results and finding above, the Real Gross Domestic Product which is a measure of economic growth in Nigeria is significantly influenced by transportation sector, (Road, Sea, Rail and Air transportation sector respectively). Based on this result, it is hereby concluded that the most influential channel is Sea transportation, followed by Road, Air and Rail transportation respectively

REFERENCES

Brown, W. (1991); Introducing Econometrics. West Publishing Company. St. Paula USA
Creel Michael (2010); Econometrics, Universitat Autonoma de Barcelona press Spain.
Goldberger, A. S (1971); Econometrics Theory, John Wiley and Sons, New York, USA
Greene W. H (2003); Econometrics analysis, 5th edition, Upper Sadler River, New Jersey, USA.
Gujarati, D. N (2003); Basic Econometrics McGraw Hill Publishing Company London.
Howland, F. M and Barneto, A (1992); Introductory Econometrics, McGraw Hill Publishing Company, London.

Article DOI: 10.52589/AJESD-VMW0SOFN
DOI URL: https://doi.org/10.52589/AJESD-VMW0SOFN

Johnston J. and Dinardo J. (1996); Econometrics methods, McGraw Publishing Company, New York, USA.
Keller, G. Etal, (2000): Statistics for Management and Economics (5thEd.) Duxbury International Publisher Pacific Grove, USA.
Koutsoyiannis, A. (2001); Theory of Econometrics Palgrove Publishing Ltd, New York, USA
Nicola Dunne (2008); An Econometrics analysis of U. S GDP - Democrat Vs Republican: Who gets your vote? Student Economic Review, Vol 22, 2008
Osakwe, J. O. (1982); Application of Residual analysis to model for Prediction. Journal of the Nigeria Statistical Association
Rao, K.C., (1965): Multiple Regression Analysis (2nd Ed.), York USA.
Spiegel, R. M., (1972): Regression analysis (3rd Ed.), solid Rock Enterprise, New West Point.
Stock, James H. and Mark W. Watson (2014); Introduction to Econometrics 3rd edition, Pearson
Stock, James H. and Mark W. Watson (2015); Factor models and structural vector auto regressions in Macroeconomics, " in Handbook of Macroeconomics, Volume 2, edited by John B. Taylor and Harald Uhlig, Elsevier
Wooldrige, J. (2006); Introductory Econometrics, Thompson Publishing Inc, USA. Statistical Bulletin of the Central Bank Of Nigeria 2018.

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