

# MODELING OF SOME ECONOMIC GROWTH DETERMINANTS IN ECOWAS COUNTRIES: A PANEL DATA APPROACH

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## **Abstract**

The study considers an empirical analysis of panel data with autocorrelation and little (insignificant) heteroscedasticity. The findings revealed that Feasible Generalized Least Square is more appropriate than other estimation methods in the data; viz-a- vis; Pooled Ordinary Least Square and Between estimators. In addition, it was discovered that capital and trade-openness have an insignificant influence on the economic growth of the fifteen (15) Economic Community of West African States (ECOWAS).

**Keywords:** *Panel data, Empirical, Estimator, Autocorrelation, Heteroscedasticity*

## **Introduction**

Economic growth is one of the indices important to all countries of the world. Countries devise many special plans and policies because increase in economic growth leads to increase in social welfare and generally increase in the country's economic development in the long-term. It should be noted that many variables are effective on economic growth; viz-à-vis Foreign Direct Investment, Capital, Trade Openness, Labour Force, Government Expenditure, Import and Export, Official Exchange Rate etc. The growth rate of the gross domestic product is the main indicator used in evaluating performance of every economy.

Trade openness is the liberation of the exchange of goods and services across borders through increased integration among countries. These countries are joined together in terms of free movement of capital and labour, and free foreign trade and finance (Igudia, 2004).

Gross capital formation formerly gross domestic investment consists of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories.

In this context, the main objective of this paper is to study the effect of some determinants of economic growth such as Trade Openness and Capital on GDP in Economic Community of West African States (ECOWAS).

Based on the foregoing, panel data analysis is the major econometric tool or technique that will be used to achieve the objectives of the study as both time series and cross-section information are available for the GDP and economic variables under study. The essence of using panel data in this case, is that the method has a better capability in identifying and measuring the effect that are not readily predictable in cross-sectional or specific time studies.

Several scholars have carried out analytic study on panel data using both simulated and empirical or real- life data which serves as guides in this study. Some of these works are reviewed as follows;

Borensztein et al. (1998) examined the role of FDI on economic growth for developing countries. Their findings indicated that FDI was an effective intermediary between technology and economic growth.

Bhargava et al., (2001) investigated the effects of health on economic growth .Their result showed that adult survival rate has a positive effect on GDP growth rates in low-income countries.

Li, Zhang and Zhou (2003) utilized regression analysis in a study they conducted in Tianjin, China. Thus, they explained the relationship between logistics costs and GDP and found the correlation between the development of the logistics industry and the economic development. The study ignored the direction of the change of the correlation between the growth in the logistics industry and the per capita income growth rate. However, it was demonstrated that the developments in national economies were significant in determination of the presence of and the change in the correlation between logistics industry and national economy.

Datta and Agarwal (2004) investigated the effect of telecommunication infrastructure investments on economic growth in the long term in 20 OECD countries using dynamic panel analysis method in their study. Phone lines per 100 individuals were used as a variable in this study. Correlations between consumer spending, population increase, openness of the country, past GDP and delayed growth were also investigated in the study model. The study concluded that telecommunication infrastructure investments affected economic growth positively in the long run and countries that increased these investments would gain more economic growth impetus.

Khataee and Mousavi (2008) employed a panel data model to examine the effect of exchange rate fluctuations on the level of economic growth considering the level of financial markets development. The results of their study show that in lower level development of financial markets, the effect of exchange rate fluctuations on economic growth is negative and in upper levels this effect can be positive.

Zahra et.al (2008) studied the effect of development in communications infrastructure on economic growth using panel data analysis method. The study was conducted in low income, medium income and high income group countries. The correlation between economic growth and fixed investments, population increase, public expenditures and communications infrastructure in

scrutinized nations were also examined in the study. Their findings showed that communication infrastructure, investments significantly increase economic growth.

Aibin et.al (2010) established the relationship between the logistics industry and economic growth in Xuzhou region. GDP was taken as the dependent variable and cargo space was taken as an explanatory variable for logistics capacity. Their findings revealed that there is a mutual correlation between economic growth and logistics in Xuzhou region.

Shahbaz and Rahman (2010) also examined the impact of FDI on economic growth in Pakistan; they found that there exists a positive long-term effect of foreign capital flow on economic growth.

Seifipour (2010) examined the effect of financial development on economic growth using panel data for 85 countries. The results show that in countries with high-income which are financially more developed in money and investment market improving financial development leads to economic growth.

Narayan et al (2010) examined the relationship between health and economic growth: based on evidence from a panel of 5 Asian countries they found that in the long-run, while health, investment, exports, EDRD (Education, research and Development), and R&D have contributed positively to economic growth, imports have had a statistically significant negative effect while education has had an insignificant effect. They drew important policy implications from their findings.

Tiwari and Mutascu (2011) established that both FDI and internationally commercial activity fostered economic growth in twenty- three Asian countries; they found a profound effect of FDI on economic growth.

Koojaroenprasit(2012) examined the impact of FDI on economic growth in Korea. He found a strong positive effect of FDI on Korea's economic growth, while human capital, export, and employment also positively affected subsequent growth.

Chu (2012) studied the correlation between logistics and their economic growth in China using panel data analysis method. In his study, effects of investments, population, human capital, employment, public expenditures and logistics (communication, storage and telecommunication) investments within total investments on economic growth were examined where he found out that logistics investments contributed meaningfully to the economic growth in the long run.

Heydari Somayeh et al (2013) investigated the effect of health on the economic growth of 16 developed countries and 14 developing countries using Panel Data Model. The study revealed that capital stock and life expectancy have a statistically significant positive effect on economic growth in both groups of countries. Mortality rate has a statistically significant negative effect on economic growth in both groups of countries. Also fertility rate has a statistically significant

positive effect on economic growth in developed countries and statistically significant negative effect on economic growth in developing countries.

Ijirshar (2019) studied the impact of trade openness on economic growth among ECOWAS countries using panel model. The results revealed that trade openness has positive effects on growth in ECOWAS countries in the long-run.

Ayansola and Adejumo (2020) considered four estimation methods vis-à-vis Between Estimator (BE), Feasible Generalized Least Square (FGLS), Maximum Estimator (ME) and Modified Maximum Estimator (MME). The results of the Monte- Carlo study revealed that FGLS is identified to have a better performance in the class of estimation methods when there is presence of autocorrelated error and heteroscedasticity in the panel data.

## METHODOLOGY

### Model Specification

The study aims at examining the impact of Capital and Trade- openness on economic growth in Nigeria. Based on this, the proposed research model is expressed as follows:

$$GDP_{growth} = \beta_0 + \beta_1 CAP_{it} + \beta_2 TRA_{it} + \varepsilon_{it}$$

Where

$\beta_0$  is the intercept

$\beta_1$  and  $\beta_2$  respectively are the estimation coefficients to be estimated.

$\varepsilon_{it}$  is the error term

GDP is the Gross Domestic Product.

CAP is the Capital

TRA is the Trade Openness

Subscripts i and t denote economic growth determinant and year (i= 1, 2, 3...15; t=1, 2..., 10)

### Diagnostic testing

Diagnostic tests will be conducted to identify if there exists the problem of autocorrelation and heteroscedasticity.

a. Test for autocorrelation using Wooldridge test.

Wooldridge (2002) is attractive because it is applicable under general conditions. It is easy to implement. The test has good size and power properties in reasonably sized samples.

b. Test for heteroscedasticity using Lagrange Multiplier Breusch-Pagan test.

$$y = X\beta + u$$

$$\sigma_i^2 = \sigma^2 f(\alpha_0 + \alpha' z_i)$$

Where  $z_i$  is a vector of independent variables

$$H_0: \alpha = 0 \text{ (Homoscedasticity)}$$

$$H_0: \alpha \neq 0 \text{ (Heteroscedasticity)}$$

Lagrange Multiplier Breusch-Pagan Procedure is as follows

i. Estimate  $y_{it}$  by OLS

ii. obtain the residuals  $\hat{e}_1, \hat{e}_2, \dots, \hat{e}_n$

$$\hat{e}_i = (y_i - x_i' \beta)$$

$$\text{iii. LM} = \frac{1}{2} [g' z (z' z)^{-1} z' g]$$

$$\text{Where } g_i = \frac{e_i^2}{e'e/n} - 1$$

Let  $Z$  be the  $n * p$  matrix of observation on  $(I, Z_i)$

LM has a limiting chi-squared distribution with d.f = Number of variables in  $z_i$

### Estimation

The study will make use of the following estimation methods; of which an appropriate method for the data would be identified.

These estimators are as stated as follows

$$(i) \quad \hat{\beta}_{FGLS} = (X^* \hat{\Omega}^{-1} X^*)^{-1} X^* \hat{\Omega}^{-1} Y^*$$

$$(ii) \quad \hat{\beta} = (X' X)^{-1} X' Y$$

$$(iii) \quad \hat{\beta} = B_{XX}^{-1} B_{XY}$$

$$\text{Where } B_{XX} = X^1 (P - J_{NT}) X$$

$$B_{XY} = X^1 (P - J_{NT}) Y$$

$$\text{and } P = \text{diag}[J_{Ti}]$$

## Hypothesis Testing

Test of significance on the variables of interest will be carried out. i.e.

$$(i) \quad H_0: \beta_1 = \beta_2 = \beta_3$$

$$H_1: \beta_1 \neq \beta_2 \neq \beta_3$$

## ANALYSIS

**Table 1: Diagnostic Tests**

<b>Breusch-Pagan LM Test</b>	H <sub>0</sub> ;Homoscedastic.	$\chi^2 = 0.4088 > 0.05$	Do not reject H <sub>0</sub>
<b>Wooldridge Test</b>	H <sub>1</sub> ; No Autocorrelation	F = 0.0219 < 0.05	Do not Accept H <sub>0</sub>

**Table 2: Estimated Standard Error for Coefficients of the Model**

	Trade Openness/Capital		
	Se( $\beta_0$ )	Se( $\beta_1$ )	Se( $\beta_2$ )
FGLS	1.0392	$1.95*10^{-11}$	0.01351
Pooled OLS	1.0497	$1.97*10^{-11}$	0.0136
Between	1.1501	$2.03*10^{-12}$	0.0151

Number of Observation = 150

Number of groups = 15

Time periods = 10

Prob > chi square = 0.0632

**Table 3: Outcome of the Significance Tests**

GDP	Z	P> Z	
Trade-openness	1.86	0.063	Accept H <sub>0</sub>
Capital	0.89	0.374	Accept H <sub>0</sub>
Constant	0.11	0.908	Accept H <sub>0</sub>

**Table 4: Model Parameter Coefficients**

GDP	Coefficients
Trade-openness	0.0251023
Capital	$1.74*10^{-11}$
Constant	0.1194601

## Discussion of Results

- i. The results of the Langrangian Multiplier Breusch- Pagan test and Wooldridge test in table 1 revealed that there is absence of significant heteroscedasticity and presence of autocorrelation in the data.
- ii. The data was analyzed by Feasible Generalized Least Square (FGLS), Pooled Ordinary Least Square and Between estimations. The FGLS is found to be better than other estimators due to the fact that it has the least value of the estimated standard error of some coefficients; the indication is that FGLS is more precise than POLS and Between estimations. This is shown in table2.
- iii. The results in Table3 revealed that trade-openness and capital contributes insignificantly to the economic growth of ECOWAS states.
- iv. Table4 displayed the value of the coefficients of the intercept and slopes; hence, the model is given as;

$$GDP_{growth} = 0.1195 + 1.74 * 10^{-11}CAP_{it} + 0.0251TRA_{it}$$

## CONCLUSION

It was learnt from past experience that capital and trade openness is of great importance for they significantly influence economic growth. Therefore, these necessitate the use of panel data analysis to examine the impact of these influential factors on economic growth of fifteen (15) ECOWAS member countries. The study discovered that FGLS outperforms other methods in the presence of autocorrelation and insignificant heteroscedasticity. The results revealed that capital and trade openness have insignificant impact on the economic growth of the ECOWAS states. The outcome suggests the need to intensify efforts at promoting international trade and invest on capital growth. In addition to this, common currency among ECOWAS states will boost their economy and be able to compete with other regions in Africa and outside African continent.

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