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# The Impact of the General Price Level on Rice Production in Abia State, Nigeria

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**Abstract** **Original Research Articles**

This work examined effect of the general price level on rice production in Abia State. The work employed time series data from 1980 to 2023, and used autoregressive distributed lag (ARDL) bounds test for co-integration and error correction model. The finding revealed that inflation rate has a positive but insignificant effect on rice production. Lag one period inflation rate did positively and significantly affect rice production, while lag two period inflation rate was negative but significant, too. The study concluded with recommendation that policymakers should identify the optimal inflation threshold in order to maximize rice production. The study also recommended the implementation of price stabilization policies, investment in agriculture, and building of capacity for farmers. These will increase rice production, improve food security, and the livelihood of farmers in Abia State, Nigeria.

**Keywords:** Inflation, Rice Production, ARDL, Error Correction Model.

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## 1. INTRODUCTION

Nigeria's rice sector is vital to the country's agricultural landforms, playing a crucial role in ensuring food security and contributing significantly to the promotion of its economic growth (Kularathne *et al.,* 2024). Nigeria accounts for approximately 15 percent of Africa's total rice production (Food and Agriculture Organization, 2020), which showcases the country's importance in the regional rice market. The sector, nevertheless, is threatened with numerous challenges. One of such challenges facing the rice sector is high production cost. This makes it difficult for farmers to produce rice competitively (Panyasing *et al.,* 2022). Low farmers income and poor soil fertility further exacerbates the challenge, and it has limited farmers' ability to invest in their farms and improve productivity. Inflation has also complicated the situation, increasing production costs, reducing farmers' purchasing power, and disrupting demand for rice (Timmer, 1995). Nigeria's inflation swings, which ranged from 9% in 2015 to 18.5% in 2016 (National Bureau of Statistics, 2020), has had its devastating effects on the agricultural sector, including rice production.

High cost of inputs, for example, fertilizers and seeds, have made it difficult for rice farmers to compete (Lim, 2024). Other factors, inflation rate, manufacturing output significantly influenced volume of rice production (Kularathne *et al*., 2024). For instance, a high inflation rate can lead to increased prices, which may benefit farmers in the short term but it would harm consumers and negatively affect total demand.

The rice sector, faced with inflation, would affect production costs and farmers' purchasing power. In spite of the importance of rice production to the food security and economic growth of Nigeria, there are limited studies in this area. The dearth of studies obscures knowledge in the development of effective policies to support rice farmers and promote food security. This study aims to mitigate this gap in knowledge by investigating the effect of inflation on rice production in Abia State, Nigeria.

Rice is a staple food and its production is critical and conducive to Abia State's agricultural environment. Rice serves as a primary source of food security which generates income for farmers and creates employment for many households. The sector is nevertheless bedeviled by numerous challenges, including the pervasive effect of microeconomic fluctuations. The general price level, or inflation rate, influences agricultural production through various channels. First, it affects input

costs, then market prices, thereafter farmers' purchasing power, and finally, their investment decisions. While existing literature acknowledges the influence of microeconomic variables on agriculture, there remains a significant gap in understanding their specific effect on rice production in Abia State. In particular, empirical evidence is limited on how inflationary trends affect farmers' productivity, profitability, and decision-making processes.

This knowledge gap is worsened by the absence of comprehensive data on inflation and farmers adaptive strategies in response to price fluctuations. Therefore, policy makers and stakeholders lack critical information needed to effectively formulate interventions that can stabilize rice production, enhance resilience against economic shocks, and promote sustainable agricultural development. From the foregoing, this work seeks systematic examination of the effect of price on rice production in Abia State from 1981 to 2023. Its aim is to analyze historical inflationary trends, to quantify the relationship between inflation and rice output, and to explore how price fluctuations influence production decisions and investment behaviors among farmers. The findings from this study will inform targeted policy measures to mitigate inflation's adverse effects on rice farming in Abia State.

This paper is organized in six (6) sections. Section one (1) is the introduction. (2) Covered conceptual literature, and the framework of literature. (3) Covered the methodology, model specification and the technique of model estimation. Section four (4) looked at data analysis. Section five (5) is the discussion. (6) covered summary and policy recommendations.

## GENERAL PRICE LEVEL

General Price level refers to the average price for all goods and services in an economy. (Mankiw, 2017). Simplicita, the term can be replaced with the word "inflation" in our lexis; as concept that measures the overall level of prices. This is often measured over time (Krugman, 2002). General Price level affects the economy. A decrease in the general price level, known as deflation, reduces spending and investment, and may potentially lead to recession (Elwell, 2010).

### 2.1.2 Rice production

Rice production involves several stages. It starts with preparing the land, planting the rice, harvesting, sifting the chaff, boiling, drying and milling (Chauhan *et al.,* 2017). Preparing the land involves plowing, leveling and flooding to create a suitable texture suitable for rice growth (Bautista & Javier, 2005). Rice seeds are then sown in a nursery and later transplanted to the main field, where they are spaced at regular intervals to allow for proper growth (Kolawole & Michael, 2021). Irrigation systems are used to supply water to the rice fields, and fertilizers are applied at different stages to promote healthy growth (Dobermann, 2000). As the rice plants grow, they are susceptible to various pests and diseases, such as insects, fungal diseases, and bacterial diseases and birds attack (Heong & Hardy, 2009). Crow post littered field are used to deter birds and ensure a healthy crop (Pretty & Bharucha, 2015). When the rice grains are mature and dry, they are harvested using various methods, including manual, mechanical and combine harvesting methods. (Hasan *et al.,* 2020). After harvesting, the rice is threshed to separate the grains from the straw and chaff, then put through a heating process to have the seeds develop and then dried to reduce the moisture content. Finally, the dried outer bran layers are removed, (Boa, 2019). Rice production is a labor-intensive process that produce high-quality rice.

## LITERATURE

### Cobweb theory

Cobweb theory, developed by Ezekiel (1938), explains how the fluctuations in prices affect the production of agricultural commodities. The theory is based on several assumptions, linear supply and demand curves, and a one-period time lag in adjusting production levels (Ezekiel, 1938). According to the theory, producers adjust their production levels based on the current market price, but due to the time lag, they overreact to the current market price, leading to fluctuations in prices and quantities (Pashigian, 1991).

The Cobweb Theory has been criticized for oversimplifying the complexities of agricultural markets, ignoring factors such as government policies, weather conditions, and international trade. Additionally, the theory assumes linear supply and demand curves (Ezekiel, 1938). Furthermore, the theory assumes a one-period time lag in adjusting production levels, which may not be realistic in all cases. However, despite these limitations, the theory explains how price fluctuations in agricultural markets, such as in rice production, can occur due to the time lag in adjusting production levels. This is particularly relevant to the study of inflation, as the general price changes can lead to price fluctuations in the rice market. Furthermore, the Cobweb Theory is based on the principles of supply and demand, which are also relevant to the study of the effect of the general price level on rice production. General changes in prices can affect the supply and demand for rice, leading to changes in production levels.

### Cobb-Douglas Theory

This theory explains outputs in a production process. It was developed by Cobb-Douglas who posited that the output of a firm captures quantities used in the production process (Cobb & Douglas, 1928). The theory is typically represented mathematically as:

$$Q = \mathrm{AL}Q = AL^{\alpha}K^{\beta}$$

Output, labor and capital. The Cobb-Douglas production theory assumes that, meaning quantities, labor and capital will give proportional output. Theory also assumes that the inputs, labor and capital are substitutable, but not perfectly substitutable (Varian, 2014). One of the key features of the theory is the concept, in which the quantity, labor or capital, each increases.

The Cobb-Douglas production theory has been widely useful in empirical studies in estimating the production functions of various industries and firms. The theory has also been extended and modified to incorporate other inputs, such as technology

and human capital (Solow, 1957). However, despite its widespread use and acceptance, the theory has been subjected to various criticisms and challenges. Some critics have argued that the theory is too simplistic, and so it fails to capture the complexities of real-world production processes (Kaldor, 1957). Others have questioned the altruistic constant, arguing that many industries exhibit increasing returns to scale (Sato, 1975).

Theory has significant relevance to inflation. Inflation can affect the production process by increasing the costs of inputs such as labor, capital, and raw materials. Farmers are not able to produce at the same level due to increased costs.

## 2.3 Empirical literature

Rustarto and Ali (2025) analyzed inflation, purchasing power, and consumption level in Indonesia using regression analysis and secondary data from the Central Statistics Agency. The study found significant relationship between rice price and purchasing power. The study informed agencies efforts in strengthening policies and public welfare.

Akbar-Mousavi *et al.* (2024) investigated variables and their effect on the price of rice in Iran using vector autoregression method. Term variables estimated long term and short term models showed substitute product shocks effect on price fluctuations of Caspian and Thai rice. The study also provided accurate out-of-sample forecasts of rice prices, which can inform policy decisions to control rice prices and ensure food security.

Novita *et al.* (2024) investigated the role of rice prices in driving inflation in Indonesia from 2017 to 2023. Their findings suggest that though prices affect inflation, it is not the sole underlying cause of fluctuations. The study results provided insights into policy decisions that addressed the challenge of inflation.

Kularathne *et al.* (2024) investigated rice production in Sri Lanka using machine learning tools. The study found inflation rate and manufacturing output, influence rice production.

Antonio *et al.*, (2024) employed a panel vector auto-regression model to investigate inflation and other key drivers in the Philippines, using data from 1994 to 2023. Their findings suggest rice price shocks have persistent effect on price inflation than factors, while domestic fuel price shocks and world urea price shocks also explain movements in rice price inflation.

Setiawan *et al.* (2024) explored inflation, rice prices, and farmers' Terms of Trade in food crop farming in Central Java Province, using an Autoregressive distributed lags (ARDL) model with data from January 2018 to March 2023. Their results indicate that rice prices and inflation have significantly affect farmers, while farmers' Terms of Trade are significantly and positively influenced by previous values, inflation rate, and rice prices.

Hermawan *et al.* (2023) examined Gross Domestic Product (GDP) and domestic distribution of rice in Indonesia using data from 2006 to 2020. The study found that increases in rice production and exchange rates decrease rice prices, while increases in per capita income lead to higher rice prices. The study also found that the expenditure for rice has low elasticity compared to non-rice food, and that increases in rice prices affect the income of farmers and non-farmers differently.

Pangesti *et al.* (2023) investigated the causal relationship between rice prices and the inflation rate in Indonesia. Using Granger Causality and Vector Error Correction Model (VECM) analysis, the study found a bi-directional causality pattern between rice prices and inflation. The results showed that shocks in rice prices affect inflation for up to six months, and that changes in rice prices explain 2.77% of the variation in inflation.

Feryanto *et al.* (2023) examined retailers in Indonesia. Using simultaneous equations, the study found that rice retailers apply price stabilization strategy and price-averaging strategy. The results suggest that price stabilization policies should focus on the wholesale level and consider the relationships between different rice qualities and prices.

Obayelu *et al.* (2022) examined rice prices in Nigeria. The study found that households mainly demand imported long grain rice. The results also showed that households use coping strategies, such as substitution and reduction of rice demand. The study suggested that improving technology to deal with rising cost of rice production.

Silaban *et al.* (2022) examined rice prices and inflation in Indonesia. The study found that an increase in rice commodity prices will increase the value of imports, while increase in inflation will reduce the value of imports.

Caboverde and Romero (2022) analyzed inflation in the Philippines, using Structural Vector Auto-Regression (SVAR) model with data from 2002 to 2018. Their findings reveal that positive shocks in global rice prices lead to an rise in inflation, as well as a decrease in output and depreciation of the Philippine peso.

Valera *et al.* (2022) estimated a panel vector auto-regression model using monthly prices for 17 regions in the Philippines from 2007 to 2019 and found that the effect of rice price on inflation is larger than the effect of fuel price and remittances.

Okpe and Ikpesu (2021) investigated the impact of inflation in Nigeria using data from 1981 to 2017. Their findings revealed a long-run relationship between inflation, food imports, and exports. Specifically, they found that inflation has a positive effect on food imports and a negative effect on exports. The study's tests confirmed the model is stable and reliable, and recommended that the government closely monitor inflation to prevent its adverse effects.

Ahsan *et al.* (2020) investigated the causes of increased prices of agricultural commodities in Pakistan. Using data from State Bank of Pakistan, the study found that the selected commodities are affected by various factors, including volatility, interest rates, and exchange rates. The study also found that the volatility of wheat prices has a significant effect on rice prices, and that farmers should be encouraged to use hedging mechanisms to checkmate the volatility.

Irawati *et al.* (2019) analyzed commodity prices (rice, red chilies, onion, and garlic) on in Indonesia. Using robust regression analysis, the study found that rice, red chilies, and onion prices have a positive and significant effect on inflation, while garlic prices have no significant impact.

Ahmad and Priyono (2018) conducted a study on the rice commodity market in Banyumas Regency, Central Java, with a focus on the unstable trend of commodity prices in Purwokerto. The study found that food materials, particularly hulled rice, play a dominant role in the formation of inflation structure. An analysis of the market structure revealed that the hulled rice trading market in Purwokerto tends to be a tight oligopoly at the wholesale level and a loose oligopoly at lower levels. The study also examined the distribution line of hulled rice, finding that it passes through several levels, including paddy farming, milling, wholesalers, and retail sellers, before reaching the final consumer.

Islam and Islam (2016) analyzed food imports in Bangladesh from 1975 to 2013. The study found no co-integration between food production and food imports but found food imports showed unidirectional causality between food production and food imports, but no causality between food inflation and food imports.

Khanam *et al.* (2015) examined rice price on rural livelihoods in Bangladesh. Their study found that rapid rice price inflation worsened food insecurity and poverty for millions of Bangladeshi households. The authors identified several demand and supply-side factors contributing to the rise in rice prices and noted that poor households adopted various coping mechanisms to deal with the effects of higher rice prices. The study concluded that rice prices would likely remain high and continue to rise, with adverse effects on food security and poverty reduction effort.

## RESEARCH METHODOLOGY

### Research design

The study examined rice production in Abia State from 1980 to 2023. In particular, it employed econometric methodology to analyze the relevant relationships.

### 3.2 Model specification

This study specified a rice production model anchored on the Cobb-Douglas production theory and the Cobweb Theory. The model examined the impact of general price level on rice production, using inflation rate as the key variable, while controlling for arable land, exchange rate, fertilizer utilization, government expenditure, labor force, and physical capital. The model incorporated various factors influencing rice production. Rice production (RP) and inflation rate (INF) captured general price level changes' impact. Control variables include arable land (ARL), representing land availability; exchange rate (EXR), capturing exchange rate fluctuations' impact; fertilizer utilization (FU), representing fertilizer use; government expenditure (GOVEX), capturing government spending impact; labor force (LAB), representing labor availability; and physical capital (PKY), capturing investments in machinery and equipment. These variables collectively examine inflation's impact on rice production while accounting for other relevant factors. To make the regression function in as estimation form within the context of this study, the functional form is expressed as:

$$RP_t = \mathrm{f}(EXCHR_t,\ FU_t, GOVEX_t, INFL_t,\ LAB_t,\ PKY_t, ARL_t) \quad (1)$$

Equation 1 is specified in a mathematically form thus:

$$RP_t = \alpha_0 + \alpha_1 EXCHR_t + \alpha_2 FU_t + \alpha_3 GOVEX_t + \alpha_4 INFL_t + \alpha_5 LAB_t + \alpha_6 PKY_t + \alpha_7 ARL_t \quad (2)$$

Equation 2 is specified in an econometrical form thus:

$$RP_t = \alpha_0 + \alpha_1 EXCHR_t + \alpha_2 FU_t + \alpha_3 GOVEX_t + \alpha_4 INFL_t + \alpha_5 LAB_t + \alpha_6 PKY_t + \alpha_7 ARL_t + \mu_t \quad (3)$$

Equation 3 is specified in a loglinear form thus:

$$\log(RP)_t = \alpha_0 + \alpha_1 EXCHR_t + \alpha_2 FU_t + \alpha_3 \log(GOVEX)_t + \alpha_4 INFL_t + \alpha_5 \log(LAB)_t + \alpha_6 \log(PKY)_t + \alpha_7 ARL_t + \mu_t \quad (4)$$

$\mu_t, is$ The error term.

$\alpha_0$ is *the* constant; and $\alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5, \alpha_6 and\ \alpha_7$

Are the respective coefficients of the study's model? The expected relationships suggest that inflation rate negatively affects rice production, while arable land, fertilizer utilization, government expenditure, labor force, and physical capital positively impact rice production, and exchange rate appreciation negatively affects rice production.

### 3.3 Definition of variables and theoretical expectations

i. Rice Production (RP): Dependent variable, measuring the quantity of rice produced in metric tons.

ii. Inflation rate (INF): Key independent variable, capturing the impact of general price level changes on rice production.

iii. Arable Land (ARL): Control variable, representing the availability of land for rice cultivation, expected to positively impact production.

iv. Exchange rate (EXCHR): Control variable, capturing the impact of exchange rate fluctuations on rice production, potentially affecting input costs and output prices.

v. Fertilizer utilization (FU): Control variable, representing the use of fertilizers in rice production, expected to positively impact yields.

vi. Government expenditure (GOVEX): Control variable, capturing the impact of government spending on agriculture, infrastructure, and other relevant sectors.

vii. Labor Force (LAB): Control variable, representing the availability of labor for rice production, expected to positively impact production.

viii. Physical Capital (PKY): Control variable, capturing the impact of investments in machinery, equipment, and other physical assets on rice production.

## 3.4 Sources of data

The data were yearly times series from 1980 to 2023. Data was sourced from Central Bank of Nigeria statistical bulletin and the World Bank Development Indicator.

## 3.5 Analytical Technique

The work utilized analytical tool to check how rice production responded to price. Choice of technique centered on its potency in estimating both short and long run models, in the event of the variables being stationary in mixture of levels and first difference. The determination of the stationary properties of the variables hinges on augmented Dickey fuller unit root Philip-Peron test as a confirmatory test. The test of co-integration is based on the Bounds test for co-integration is suitable for cases where the variables are in mixture of levels and first difference.

## THE STUDY

Results of the statistics in rice production, inflation rate, arable land, exchange rate, fertilizer utilization, government expenditure, labor force and physical capital variables are presented in Table 1. The average value of rice production variable is 3,144,336 metric tons, its highest value is 5,607,000 metric tons while the lowest value is 523,000 metric tons. With variable ₦120.96, its highest value is ₦460.70 while the lowest value is ₦0.55. The average value of government expenditure variable is N2.240 billion, its highest value N7810 billion while the lowest value is N9.04 billion.The average value of inflation rate variable is 18.87 per cent its highest value is 72.84 per cent while the lowest value is 5.39 percent. The average value of labor force is 46,575,190 persons; its highest value is 75,721,345 persons while the lowest value is 32,071,639 persons.

## Studies

| | Mean | Median | Maximum | Minimum | Skewness | Kurtosis |
|---|---|---|---|---|---|---|
| RP (Metric tonnes) | 3,144,336 | 3,264,000 | 5,607,000 | 523,000 | -0.3124 | 2.70617 |
| EXCHR (N) | 120.96 | 115.26 | 460.70 | 0.55 | 1.0831 | 3.30094 |
| FU (%) | 9.97 | 8.53 | 20.30 | 4.15 | 0.73051 | 2.29011 |
| GOVEX (₦ billion) | 2,420 | 1,020 | 7,810 | 9.64 | 0.77229 | 2.05159 |
| INFL (%) | 18.87 | 12.94 | 72.84 | 5.39 | 1.90324 | 5.61969 |
| LAB (Persons) | 46,575,190 | 43,574,263 | 75,721,345 | 32,071,639 | 0.54987 | 2.02072 |
| PKY ($billion) | $38.8 | 26.9 | 81.3 | 9.52 | 0.45845 | 1.54318 |
| ARL% | 36.30 | 39.16 | 40.48 | 29.07 | -0.6505 | 1.68475 |

**Source:** Author's computation (2025)

The average value of physical capital is $38.8 billion; its highest value is $81.3 billion while the lowest value is $9.52 billion. The average value of arable land variable is 36.30 per cent, its highest value is 40.48 per cent while the lowest value is 29.07 percent. The study shown in Table 1 showed that the variables exchange rate, fertilizer utilization, government expenditure, inflation rate, labor force and physical capital variables were all skewed to the right as evidenced by their respective positive values of skewness. This implies that the average values of exchange rate, fertilizer utilization, government expenditure, inflation rate, labour force and physical capital variables were greater than their respective median values, implying that they were higher than their sample average while rice production and arable land variable were skewed to the left as evidenced by their respective negative values of skewness. The kurtosis and skewness of the variables are also displayed in Table 1.

## 4.2 Correlation analysis of the study's model

The correlation matrix of estimated is presented and results of correlation coefficients of all the independent variables have positive correlation with rice production.

**Table 2:** Correlation matrix of the study's variables

| | LOG(RP) | EXCHR | FU | LOG(GOVEX) | INFL | LOG(LAB) | LOG(PKY) | ARL |
|---|---|---|---|---|---|---|---|---|
| LOG(RP) | 1 | | | | | | | |
| EXCHR | 0.6501 | 1 | | | | | | |
| FU | 0.3294 | 0.5770 | 1 | | | | | |
| LOG(GOVEX) | 0.8442 | 0.8150 | 0.2052 | 1 | | | | |
| INFL | 0.0373 | -0.2269 | 0.1583 | -0.2460 | 1 | | | |
| LOG(LAB) | 0.7120 | 0.9417 | 0.3885 | 0.9369 | -0.3040 | 1 | | |
| LOG(PKY) | 0.2785 | 0.7470 | 0.4137 | 0.6236 | -0.3740 | 0.7950 | 1 | |
| ARL | 0.8101 | 0.7516 | 0.0568 | 0.9778 | -0.2617 | 0.8825 | 0.5200 | 1 |

**Source:** Author's computation (2025)

The degree of correlation is stronger for arable land (0.8101), labor force (0.7120), government expenditure (0.8442) and exchange rate (0.6501) respectively with rice production while the degree of correlation is weaker for fertilizer utilization (0.3294), inflation rate (0.037) and physical capital (0.2785) respectively with rice production.

## 4.3 Unit test results of the study

Using ADF, PP and KPSS confirmatory presented shown stationarity (o) which method for 3: Summarized result of the unit root test**;** 1980-

| | | | | | |
|---|---|---|---|---|---|
| EXCHR | 0.3789 (0.9985) | 0.3789 (0.9985) | -5.0389 (0.0010) | -4.9140 (0.0014) | I (1) |
| FU | -1.7701 (0.7017) | -1.7701 (0.7017) | -7.6462 (0.0001) | -7.7033 (0.0001) | I (1) |
| Log(GOVEX) | 0.0454 (0.9956) | -0.1579 (0.9921) | -4.0784 (0.0135) | -7.7514 (0.0001) | I (1) |
| INFL | -3.8200 (0.0252) | -3.0814 (0.1235) | -6.0410 (0.0001) | -12.0526 (0.0001) | I (0) |
| Log(LAB) | -3.4829 (0.0543) | -3.8017 (0.0260) | -5.8400 (0.0001) | -4.7061 (0.0009) | I (1) |
| Log(PKY) | -3.8090 .0263) | -2.9829 (.1487) | -4.7686 (0.0068) | -5.6018 (0.0001) | |
| (RP) | .1410 .5088) | .1822 (.0001) | -7.5369 | -7.5202 | |
| ARLD | -0.3021 (0.9881) | -.6248 (0.0001) | -5.9658 (.0001) | -6.0652 (0.0001) | I(1) |
| KPSS unit root test method | | | | | |
| INFL | 0.0970 (0.1460) | | NA | | I (0) |
| Log(PKY) | 0.1756 (0.1460) | | 0.1274 (0.1460) | | I (1) |
| Log(LAB) | 0.1727 (0.1460) | | 0.1134 (0.1460) | | I (1) |
| Parenthesis respective probability unit root test results; NE= not estimated because of the statistical significance of the unit root results is at 5 % level of significance. | | | | | |

**Source:** Author's computation (2025)

## 4.4 Optimal lag selection of the study's model

The study used the Akaike Information Criteria (AIC) and selected three (3) lags. Selection shown of the study's model

| (RP) EXCHR FU (GOVEX) INFL (LAB) (PKY) ARL | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | |
| 0 | .44 | | 40.81 | 26.4119 | 26.7462 | 26.5336 |
| 1 | -180.53 | 550.896 | 3.28E-05 | 12.3183 | 15.32751* | 13.4141 |
| 2 | -92.781 | 102.725 | 1.48E-05 | 11.16 | 16.8441 | 13.2299 |
| 3 | 51.5532 | 112.6509* | 9.36e-07* | 7.241309* | 15.6002 | 10.28515* |
| * indicates lag order selected by the criterion | | | | | | |

**Source:** Author's computation (2025)

## 4.5 Co-integration test result of the study's model

The long run relationship test result using the Bounds test as shown in Table 5. The F-statistics value of 5.2629 which is greater than the critical value of 3.50 of the upper bound at the 5 per cent level of the upper bounds. This means that there is a cointegration or long-run relationship among the variables of the estimated model of the study.

**Table 5:** Bound test results for long run relationships among the study's model

| ARDL Bounds Test | | |
|---|---|---|
| Test Statistic | Value | K |
| F-statistic | 5.2629. | 7 |
| Critical Value Bounds | | |
| Significance | I(0) Bound | I(1) Bound |
| 10% | 2.03 | 3.13 |
| 5% | 2.32 | 3.5 |
| 2.50% | 2.6 | 3.84 |
| 1% | 2.96 | 4.26 |

**Source:** Author's computation (2025)

## 4.6 ARDL error correction results of the estimated model

The ARDL short run and error correction results of the estimated model are shown in TABLE 6. The coefficient of lag one period of rice production is 1.1374 with its corresponding probability value of 0.0272. This shows a positive and the effect is statistically substantial effect of lag one period rice production on the current rice production at a five per cent level of significance. This means that a 1 % increase in the last year's rice production will have led to about 1.14 per cent rise in current rice production in the short run holding all other factors equal.

**Table 6:** ARDL short run and error correction results of the study's model

| Dependent Variable: LOG(RP) | | | | |
|---|---|---|---|---|
| Selected Model: ARDL(3, 3, 3, 3, 2, 3, 3, 3) | | | | |
| Variable | Coefficient | Standard Error | t-Statistic | Probability value |
| DLOG(RP(-1)) | 1.1374 | 0.4399 | 2.5854 | 0.0272 |
| DLOG(RP(-2)) | 0.8563 | 0.4030 | 2.1251 | 0.0595 |
| D(ARL) | 0.0646 | 0.1122 | 0.5760 | 0.5773 |
| D(ARL(-1)) | -0.1270 | 0.0950 | -1.3372 | 0.2108 |
| D(ARL(-2)) | 0.2993 | 0.1052 | 2.8467 | 0.0173 |

| | | | | |
|---|---|---|---|---|
| D(EXCHR) | 0.0048 | 0.0028 | 1.7088 | 0.1183 |
| D(EXCHR(-1)) | 0.0043 | 0.0030 | 1.4452 | 0.1790 |
| D(EXCHR(-2)) | -0.0037 | 0.0031 | -1.2033 | 0.2566 |
| D(FU) | 0.0028 | 0.0156 | 0.1768 | 0.8632 |
| D(FU(-1)) | -0.0287 | 0.0149 | -1.9261 | 0.0830 |
| D(FU(-2)) | 0.0215 | 0.0148 | 1.4532 | 0.1768 |
| DLOG(GOVEX) | 0.4166 | 0.2145 | 1.9427 | 0.0807 |
| DLOG(GOVEX(-1)) | -0.4628 | 0.3732 | -1.2400 | 0.2433 |
| D(INFL) | 0.0016 | 0.0036 | 0.4351 | 0.6727 |
| D(INFL(-1)) | 0.0102 | 0.0044 | 2.3137 | 0.0432 |
| D(INFL(-2)) | -0.0119 | 0.0037 | -3.1953 | 0.0096 |
| DLOG(LAB) | -2.8047 | 8.3910 | -0.3343 | 0.7451 |
| DLOG(LAB(-1)) | 43.3258 | 15.7726 | 2.7469 | 0.0206 |
| DLOG(LAB(-2)) | -24.6201 | 9.1749 | -2.6834 | 0.0230 |
| DLOG(PKY) | 0.2794 | 0.3131 | 0.8925 | 0.3931 |
| DLOG(PKY(-1)) | 0.2043 | 0.2146 | 0.9521 | 0.3635 |
| DLOG(PKY(-2)) | 0.4621 | 0.3091 | 1.4951 | 0.1658 |
| ECT(-1) | -0.3113 | 0.0621 | -5.0113 | 0.0021 |
| Diagnostic test results | | | | |
| | .9603 | | | .6576 |
| F-statistic | 33.2114 | | | .0000 |

(2025)

The parameter of lag two year of rice output .8563 .0595 and substantial year rice output on the present rice output at result 1 % rise in the previous two-year rice output will have led .86 rise in present rice output holding all other things constant.

The short run parameter of present arable land .0646 .5773 shows substantial present arable land on the present rice output at 1% rise in arable land in the present year will lead to about 6.47 % rise in rice output ceteris paribus.

Parameter present .0048 .1183 substantial present exchange rate on the present rice output at a 5 % level of significance.

The parameter of lag one year of exchange rate .0043 .1790 substantial year exchange rate on the present rice output at a 5 % .1790 means 1 % rise in the previous year exchange rate will have led .43 rise present rice output holding all other things constant.

The parameter of lag two year of exchange rate .0037 .2566 substantial year exchange rates on the present rice output at result means that a 1 % rise in the previous two-year exchange rate will have led .37 decline present rice output holding all other things constant.

The parameter of the present fertilizer utilization .0028 .8632 substantial present fertilizer utilization on the present rice output at result a 1 % rise in the present year fertilizer utilization will lead to about 0.28 per cent rise in present year rice output.

The parameter of lag one year of fertilizer utilization is -0.0287 with its corresponding probability value of 0.0830. This shows a negative but not statistically substantial impact of lag one, year fertilizer utilization on the present rice output at a 5 % level of significance. This result means that a 1 % rise in the previous year fertilizer utilization will have led to about 2.87 per cent decline in present rice output. The parameter of lag two year of fertilizer utilization is 0.0215 with its corresponding probability value of 0.1768. This shows a positive but not statistically substantial impact of lag two-year fertilizer utilization on the present rice output at a 5 % level of significance. This result means that a 1 % rise in the previous two year fertilizer utilization will have led to about 2.15 per cent rise in present rice output in the short run holding all other things constant.

The parameter of the present government expenditure .4166 .0807 substantial present government expenditure on the present rice output at result 1 % rise in the present year government expenditure will led .42 per cent rise in present year rice output.

The parameter of lag one year of government expenditure .4628 .2433 substantial year government expenditure on the present rice output, but the effect is at result 1 % rise in the previous year government expenditure will have led .46 decline present rice output holding all other things constant.

The parameter of the present inflation rate .0016 .6727 substantial present inflation rate on the present rice output at a 5 % .6727 means 1 % rise in the present year inflation rate will lead to about 0.16 per cent rise in present year rice output.

The parameter of lag one year of inflation rate is 0.0102 .0432 and substantial year inflation rate on the present rice output at a 5 % .0432 less means 1 % rise in the previous year inflation rate

will have led to about 1.02 per cent rise in present rice output.

The parameter of lag two year of inflation rate .0119 .0096 and substantial year inflation rate on the present rice output at result 1 % rise previous two-year inflation rate will have led to about 1.19 per cent decline in present rice output.

The parameter of the present labor force .8047 .7451 substantial present labor force on the present rice output at a 5 % level of significance. This result % rise present year force about .8 per cent decline in present year rice output.

The parameter of lag one year of labor force is 43.33 .0230 substantial year labor force on the present rice output at a 5 % level of significance. This result means that a 1 % rise in the previous year labor force will have led to about 43.33 % rise in present rice output.

The parameter of lag two year of labor force is -24.62 .0230 and substantial year labor force on the present rice output at result 1 % rise in the previous two-year labor force will have led to about 24.62 % decline in present rice output.

The parameter of the present physical capital .2794 .3931 substantial present physical capital on the present rice output at result means that a 1 % rise in the present year physical capital will lead to about 0.20 % rise in present year rice output.

The parameter of lag one year of physical capital .2043 .3635 This shows a positive but not statistically substantial impact of lag one-year physical capital on the present rice output result means that a 1 % rise in the previous year's physical capital will have led to about 0.20 % rise in present rice output in the short run holding all other things constant.

The parameter of lag two year of physical capital is 0.4621 .1658 substantial year physical capital on the present rice output at result 1 % rise in the previous two-year physical capital will have led to about 0.46 % rise in present rice output.

The error correction parameter, otherwise called .3113 .0021 substantial 31.13 estimated model passed 7 estimated model .9603 .03% was predicted changes explanatory estimated model estimated model 33.21 the explanatory variables have a joint statistically substantial effect rice output, DW statistics for the estimated model .0576, roughly absence.

## 4.7 The long run results

ARDL long run estimated model displayed 7 long run parameter of arable land .1676 .0080 and substantial effect long run arable land on rice output in the long run at in arable land would 16.76 % decline in rice output holding all other factors equal.

**Table 7:** Results study's model

| Dependent Variable: LOG(RP) | | | | |
|---|---|---|---|---|
| | | | | |
| ARL | -0.1676 | 0.0508 | -3.3025 | 0.0080 |
| EXCHR | 0.0029 | 0.0013 | 2.2447 | 0.0486 |
| FU | -0.0035 | 0.0127 | -0.2716 | 0.7915 |
| LOG(GOVEX) | 0.6718 | 0.1191 | 5.6394 | 0.0002 |
| INFL | 0.0067 | 0.0021 | 3.1968 | 0.0095 |
| LOG(LAB) | -1.5592 | 1.0783 | -1.4460 | 0.1788 |
| LOG(PKY) | -0.3878 | 0.1131 | -3.4279 | 0.0065 |
| Constant | 39.1102 | 14.7011 | 2.6604 | 0.0239 |

**Source:** computation by Author, 2025

Parameter exchange .0029 its .0486 statistically output the long run effect is at result rise the exchange rate would lead to about 0.29 %rise in rice output holding constant.

Parameter fertilizer utilization .0035 0.7915. This shows a negative but not statistically substantial effect of fertilizer utilization on rice output in the long run at a 5 %level of significance. This means that a 1% rise in fertilizer utilization would lead to about 0.35% decline in rice output in the long run holding all other factors being equal.

The parameter of government expenditure is 0.6718 with its corresponding probability value of 0.0002 in the long run at a 1% %level of significance. This show a positive and statistically substantial of government expenditure rice output at a 5% level of significance. Government expenditure led about .67% rice output holding factors.

Parameter inflation rate .0067.0095. This shows statistically substantial of inflation rate on rice output long run. 1% rise rate would lead to about 0.67 % rise rice output holding factors.

Parameter labor force .5592 .1788 in the run substantial influence labor force on rice output a 5%. This a 1% rise labor force would lead to about 1.56 % decline in rice output holding factors.

Parameter physical capital .3878 .0065 and substantial effect long run physical capital on rice output in the long run at result rise in physical capital would .39 % decline rice output holding constant.

## 4.8 Heteroskedasticity and serial correlation test results

6.3559 .2304 as presented in Table 8.

Table results of the estimated

| Heteroskedasticity Test: Breusch-Pagan-Godfrey | | | |
|---|---|---|---|
| | 0.426121 | (30,10) | .9653 |
| | 23.00462 | (30) | .8151 |
| | 1.604814 | (30) | 1 |
| | | | |
| | 2.678234 | (3,7) | 0.1426 |
| | 6.35588 | (3) | 0.2304 |

Computation by Author, 2025

This is not statistically substantial at 5%, 23.0046 .8151 in Table 8. This is not statistically substantial at a 5%.

## 4.9 The result of the test of normality of the estimated model

The Jarque-Bera test result as showed in Figure 1, .328273 .848226, indicates we fail to of normality. Since significantly higher typical significance 0.05, it suggests result supports assumption of normality.

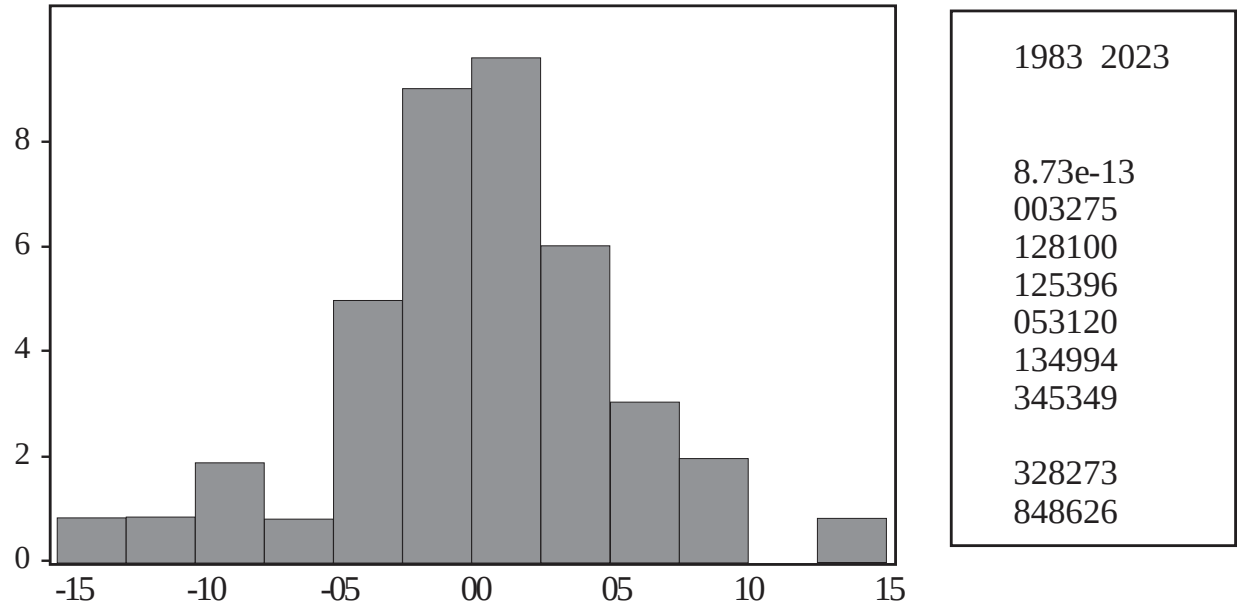
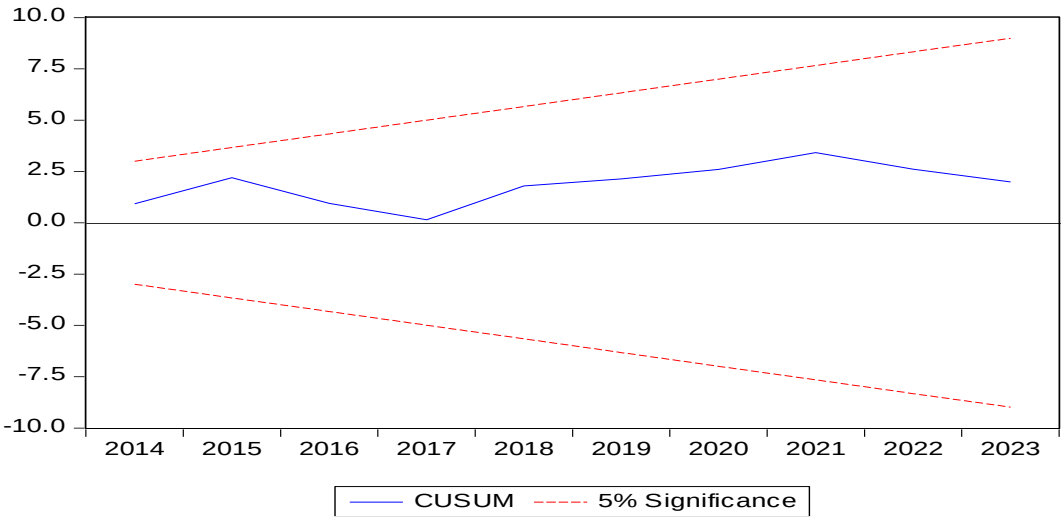


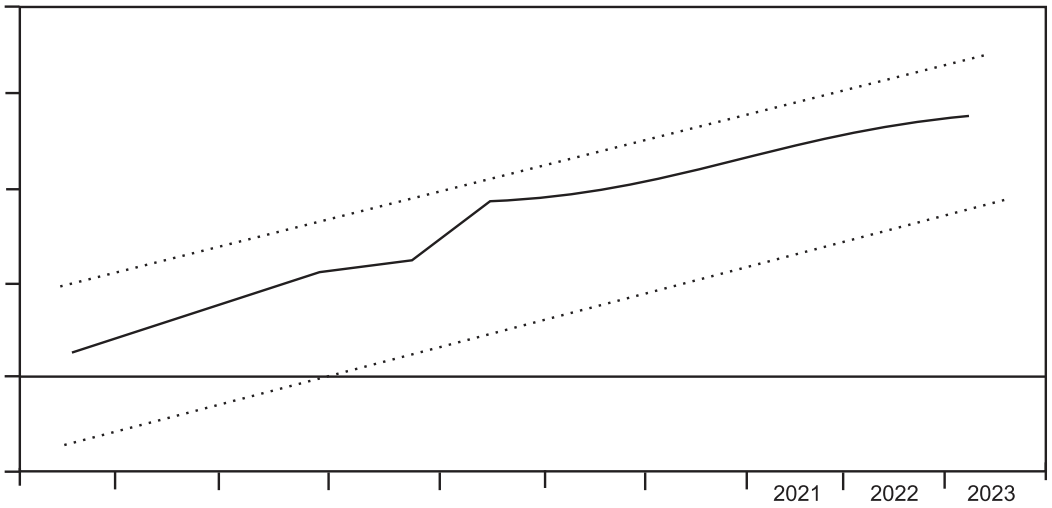

**Figure 1:** The result of the test of normality of the estimated model

The implication result, suggests data follows is that estimated parameters of the model can be reliably used. This result also supports the accuracy of estimates of parameters like means and standard deviations.

## 4.10 Study's

Using in Figure 2 Figure 3 revealed that the variables in study's model remained consistent throughout the study period.




For test stability study's

The swing the trend within the CUSUM limit at a 5 per cent significant level bound portrays this assertion. This implies, on the other hand, that the parameters of the do any structural instability over the study period, which means that all the coefficients of the equation are stable.

## 4.11. Discussion of Findings

Study found that beneficial substantial rice output in the short run at a 5% but the effect of statistically substantial long 5% level of significance. But one inflation rate beneficial and substantial effect rice output. While lag two period inflation rate was found negative substantial rice output. Contrary to a priori expectations, beneficial substantial rice output in long run, possibly due to inflation-driven investment, price incentives, or economic growth. The lagged effects of inflation rate on rice output are also notable with a beneficial effect of lag one period inflation and a negative effect of lag two period inflation, suggesting that farmers respond to price increases by increasing output, but prolonged inflation can lead to declined output due to increased costs and uncertainty. This agreed Kularathne Setiawan.

# 5. POLICY

Impact the general price level on rice production in Abia state, Nigeria 2023 due mixed stationarity of the time series data of order zero and one is as follows:

Inflation rate exists but not statistically rice production of significance, but statistically significant long per cent. But one inflation rate and rice production impact on rice production. While lag two period inflation rate, was found to have a negative and statistically significant impact on rice production. This means the inflation is beneficial for rice production in Abia state deductively as farmers are motivation by high price according to the theory of supply and for the sake of consumer welfare there is a need for optimal inflation threshold to optimize rice production and rice consumption.

## 5.2 Policy recommendations

Policy offered guided by the:

i) The CBN and the fiscal authorities, through both at the state federal levels, should work together to

achieve an optimal inflation rate of about 5 to 7 %. This could be achieved if the CBN maintained stable money supply while the fiscal authorities work helping farmers in boosting rice cultivation by giving farmers technical support and incentives. The incentives could be in the form of price support programs to ensure that farmers get.

ii) To ease rice cultivation and harvesting, the Ministry of Agriculture and Ministry of Works and Infrastructure, both at the federal and state levels, should provide access road for farm logistics and other activities.

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