PRICE BEHAVOIR OF LOCAL AND IMPORTED RICE IN RURAL AND URBAN MARKETS OF NIGER STATE, NIGERIA

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ABSTRACT

The study analysed the price behavior of local and imported rice in rural and urban markets of Niger state, Nigeria, the specific objectives were to examine the trend in prices, determine the co-integration between the price series and to ascertain the market that causes the movement and direction of prices. Secondary data which was the average monthly retailed prices of local and imported rice in rural and urban markets per kilogram of rice was used from January 2000 to December 2016 (204 observations). The data was sourced from Niger Sate Bureau of Statistic and was analysed using descriptive statistics, Augmented Dickey Fuller (ADF) test, Johansen cointegration, Error Correction Model (EC M) and Granger Causality test. The result shows that the mean prices of local rice in rural and urban markets were ₦41.13 and ₦116.22 per kilogram, while that of imported rice was ₦201.85 and ₦207.55 and the kurtosis shows that the variables are normally distributed. The graph of the trend shows an upward and irregular pattern in the prices of both local and imported rice in the two markets. The ADF test shows that the variables become stationary at first difference I(1), and the result of the Johansen indicated the presence of cointegration among the variables as shown by the trace statistics and max Eigen statistics which were significant at 5% level of probability each. The ECM result shows that there is a long run relationship among the prices but there was a low speed of adjustment in the short run as indicated by the coefficient of -0.0139. The granger causality result shows a unidirectional causal relationship between prices of imported rice in rural and urban markets and also in prices of local rice in urban and rural markets over the period of study. It is recommended that the flow of market information should be enhanced by the marketers and also government should be firm on its policy on rice.

KEY WORDS: price trend, local and imported rice, urban and rural markets

INTRODUCTION

Global demand for agricultural products is expanding rapidly and the demand for food products is foreseen to continue to grow for several decades as a result of a combination of population growth, rising per capita incomes and urbanization (Nasirin*et al.*, 2015). In developing countries, approximately 60 % of total calories consumed are derived directly from cereals, among which rice is the most important source of calories for humans. Rice is the most important staple food for about half of the human race (Imolehin and Wada, 2000).

The demand for rice in Nigeria has been soaring over the years (Ayanwale*et al*, 2011), since mid1970s, rice consumption in Nigeria has risen tremendously growing by 10.3% per annum. According to Federal Ministry of Agriculture and Rural Development (FMARD), (2011), there is an increasing demand for rice in Nigeria, as rice consumption was 5 million metric tons in 2010 and is expected to reach 36 million metric tons by 2050. According to NBS (2012), a study on household expenditure by commodity, shows that urban households spend 8.65% of their income on rice and the rural household spend 9.07% of their income on rice. A combination of various factors seems to have triggered the structural increase in rice consumption over the years with consumption broadening across all socio-economic classes, including the poor (Oyinbo*et al.*, 2013). According to (Global Agriculture Information Network GAIN, 2012), the rising demand is as a result of increasing population growth and income level.in 2016 the estimated demand for rice is 6.3 million tons, while the supply is 2.3 million tons (FMARD, 2016). And according to Daramola (2005) and Awe (2006) any shortfall in supply of rice creates incentive for rice importation in the country, which cause the country a huge sum of money.

Prices are signals that direct and coordinate not only the production and consumption decisions but also the marketing decisions over time, form and space (Kohls and Uhl, 2001). Price is a major endogenous determinant of supply and demand for rice. The price of the commodity is center to its transaction, and the quantity bought by buyers usually depend on their purchasing power in relation to the price. According to Mondal (2010), agricultural produce prices are notoriously unstable and consequently, price instability leads to uncertainty in the income of the

producers as well as the quantity purchased by the consumer.

Niger state is a rice producing state with an average production rate of 5 tons per hectare and this rank the state as the highest producer of rice in Nigeria (Jalingo,2017), also Niger State Ministry of Agriculture (2017), estimated rice production figure shows a yield of 5.31 tons per hectare. But despite this the price of rice have been increasing in the state as show by NBS price statistic and also different varieties of imported rice are seen all over the area. According to Paulin (2011), the continuous and persistentincrease in price of food commodities can lead to food insecurity and significantly affects the poor people in both urban and rural areas, as their purchasing power erodes as prices increase. According to Burakov, (2016) a rise in food prices put pressure on the house hold sector of an economy . Therefore, fluctuations in the prices of agricultural products (especially major staples) have become of great concern to economists and policy makers (Adekoya*et al.*, 2013). Thus, there is need to know the trend in the prices, the direction of the movement in prices between rural and urban markets among other things to be able to inform and guide policy makers adequately.

Objectives of the study

The aim of the study is to examine price behavior of local and imported rice in rural and urban markets of Niger state. The specific objectives are;

1. examine the trend in prices of local and imported rice in rural and urban markets in the study area,
2. to determine cointegration between prices of local and imported rice in rural and urban markets in the study area, and
3. to ascertain the market that causes the movement and direction of prices of local and imported rice in rural and urban markets in the study area.

METHODOLOGY

Study Area

The study area is Niger State (North Central) Nigeria. Niger State was carved out of the former North-Western State in 1976 and it is located in North Central Nigeria. The State lies between Latitudes 8°20′ and 11° 30′ North and Longitudes 3°30′ and7° 20′ East and share border with the Republic of Benin (West), Zamfara State (North), Kebbi (North-West), Kogi (South), Kwara (South-West), Kaduna (North-East) and South-East by FCT Abuja (National Bureau of Statistics (NBS), 2009). The 2006 population census shows that the state has a population of 3,950,249 with an annual growth rate of 3.4% (National Planning Commission (NPC), 2006). The projected population at 3.4% annual growth rate gives a population of 5,293,333 by 2016,Niger State is among the largest States in Nigeria covering about 86,000km^2 (or about 8.6 million hectares) representing about 9.3% of the total land area of the country (Development Action Plan for Niger State, 2008) and about 95% of the land is arable and serve as source of employment for the predominantly rural population whose primary occupation is farming.

Niger State experiences two distinct climatic seasons in a year, these are rainy and dry seasons. Rainfall is steady and evenly distributed, usually between May and November, varying from 1,100mm to 1,600mm in the southern part of the state. Its maximum temperature is normally 37^{0}C which is recorded between March and June, while minimum temperature is around 21^{0}C recorded between December and January (Development Action Plan for Niger State, 2008).

Method of Data Collection and sample size

This study mainly used secondary data which is average monthly retailed prices of local rice for rural and urban markets in Niger State. The data were collected fromNiger State Bureau of Statistics and Niger State Ministry of Agriculture, for a period of 17 years that is from January, 2000 to December, 2016, thus the number of observation is 204.

Method of Data Analysis

The study will apply series of statistical and econometric tools to achieve the stated objectives. The tools to be used include descriptive statistics, Augmented Dickey Fuller (ADF) test for stationarity, Vector Autoregressive Model (VAR), Co-integration and Granger Causality test

The presence of unit root in a time series means the series is nonstationary and this generates unreliable results regarding the hypothesis testing According to Upender (2012), one method of testing for unit root and the order of integration of time series is the use of ADF.

Given the autoregressive process of order one AR (1),

$$Y_t = \phi Y_{t-1} + e_t \quad (1)$$

When constant and trend is added to equation 1, it becomes

$$\Delta Y_t = \alpha_1 + \alpha_2 t + \beta Y_{t-1} + \phi_i \sum_{i=1}^{m} \Delta Y_{t-1} + e_t \quad -1 \leq \beta \leq 1 \quad (2)$$

Where; Y_t = price in time t,

Δ = first difference operator

α ,$\beta$and ϕ_i= parameters to be estimated

e_t = a serially uncorrelated white noise error term .

if $\phi = 1$, the serieY_t is nonstationary, if $\phi < 1$ then the series Y_t is stationary.

Also, a suitable lag was selected for each of the analysis using the various lag length selection criteria such as Akaike's information criterion, Schwarz information criterion, Hannan-Quinn criterion, Final prediction error and Corrected version of AIC.

Descriptive statisticwas used to achieve objective 1, where summary statistics of the prices including mean, minimum, maximum, skewness, kurtosis as well as graphs were used to examine the trend in the price series.

Johansen co-integration test was used to achieve objective 2, the variables were modelled as Vector Autoregressive Model (VAR). The general model is specified as;

$$\Delta p_t = \propto + \sum_{i=1}^{k-1} \Gamma_i \Delta p_{t-1} + \Pi p_{t-1} + \mu_t \quad (3)$$

Where;

Δ = is the first difference operator,

p_t =is a n x 1 vector containing the price,

Γi =The matrix of short run coefficients,

Π = The matrix of long–run coefficients,

μ_t = The normally distributed errors and

K = Number of lags that will be adequately large enough to capture the Short-run dynamics of the underlying VAR and to produce normally distributed white noise residuals.

An appropriate lag length was selected by minimizing one of the following information criteria. Akaike Information Criterion (AIC), Schwarz Bayesian Criterion (BIC) and Hannan-Quinn Criterion (HQC).

Granger causality test was use for objective 3,the Granger model for this study as adopted from Izekor*et al*., 2016is represented as;

$$RP_t = \alpha_0 + \sum_{i=1}^{m} \alpha_i \, UP_{t-1} + \sum_{j=1}^{n} \beta_j \, RP_{t-j} + \varepsilon_t \quad (4)$$

Where;

n = number of observations,

M = number of lag ,

RP_t = rural market price,

UP_t = urban market price,

α and β = parameters to be estimated and

ε_t = error term

Hypothesis

H_0: price of rice in one market does not determine the price of rice in the other market

H_1: price of rice in one market determine the price of rice in the other market

RESULTS AND DISCUSSIONS

The summary statistics of the prices showed that the minimum and maximum prices for local rice was ₦28.97 and ₦325.98, ₦20.01 ad ₦276.68 in urban and rural markets respectively and ₦150.04 and ₦345.87, ₦135.59 and ₦346.02 in urban and rural markets for imported rice per kg in Niger state. Furthermore, all the prices were positively skewed to the right. Price of imported rice for both rural and urban markets in Niger State were significant at 1% probability level ($P < 0.01$) while price of local rice in both rural and urban markets of the study area were significant at 5% probability level ($P < 0.05$) indicating that these variables had the kurtosis matching that of a normal distribution.

The trend in the rice price series were visualized by the use of graphical plots, the trend in urban and rural market prices of local rice in Niger state as shown in figure 1. has been increasing and the urban market price was always higher than the rural (producing) market, but at the tail end in 2016 prices were almost very close with a little difference between the rural and urban markets especially in the months of 196-200 that is April-August 2016.

Figure 2 shows the trend in imported rice prices in both rural and urban markets, the price series for both markets shows almost the same pattern throughout the period under study. This may be attributed to the fact that the rice was imported into the state

The ADF test for stationarity as presented in table 1, shows that although all the variables were non stationary at levels but became stationary at first difference with order of integration 1, I(1). This result is in accordance with the result of Emokaro and Ayantoyinbo (2014) who observed the same thing with monthly price series of local rice in their study. Also, all the variables were all significant at 1% probability level ($P < 0.01$).

Since all the variables were integrated of the same order I(1), Johansen test for cointegration was used to determine long run relationship for the variables. The result as presented in table 2 shows a tracestatistic of 351.6595 which is greater than the critical value 47.21 at 5% level of significance ($P < 0.05$); thereby indicating that there was one co-integration equation among the variables. Therefore, based on the decision rule, the null hypothesis of no co-integration among the variables price of imported rice in rural and urban areas and price of local rice in rural and urban areas of Niger State was rejected. This implies that there is a long run relationship among the variables. The result was also confirmed by the Max Eigen statistics of 133.2789 which is

greater than the critical value of 47.21 at 5% level of significance ($P < 0.05$) thereby indicating the presence of co-integration among the variables. This result is in consistence with those of Ojo*et al.*, (2015) and Akpan (2014), which all revealed the presence of co-integration between price series.

Since the variables were co-integrated, an Error Correction Model (ECM) was carried out to ascertain the speed of adjustment of the price series. Table 3 shows that in the long run, the result of ECM shows that the ECM coefficient (-1.1089) was negative and statistically significant at 1% probability level ($P < 0.01$) which is an indication that there is a long run relationship between the prices during the period under study. The result also shows that the coefficient of price of imported rice in the rural areas and price of local rice in urban areas of Niger State were positive and statistically significant at 1% ($P < 0.01$) probability level.

In the short run, the ECM coefficient as presented in table 3 was -0.0139, which indicates a low speed of adjustment of the variables towards equilibrium. This implies that the speed of adjustment at which the variables used in the model will be in equilibrium is at the rate of 1.39%. The values of the information criteria 30.8229, 31.1097 and 31.5319 for Akaike information, Hannan Quin and Schwarz respectively shows that the error in the model had been corrected.

The result of the granger causality test among the prices as presented in table 4 shows that there is a unidirectional causal relationship between price of imported rice in the rural markets of Niger State and price of imported rice in the urban markets of Niger State. That is, the price of imported rice in the rural markets of Niger State granger causes the price of imported rice in urban markets of Niger State. This implies that the price of imported rice in the rural markets of Niger State can be used to predict the price of imported rice in the urban markets of the State. Hence, the null hypothesis of no granger causality was rejected at 1% probability level ($P < 0.01$).

The result also shows a unidirectional causal relationship between price of local rice in the urban markets of Niger State and price of local rice in the rural markets of Niger State. That is, the price of local rice in the urban areas of Niger State granger causes the price of local rice in the rural areas of Niger State. This implies that the price of local rice in the urban areas of Niger State can be used to predict the price of local rice in the rural areas of the State. Hence, the null hypothesis of no granger causality was rejected at 10% probability level ($P < 0.10$).

CONCLUSION AND RECOMMENDATION

The result of the study has shown that prices of local and imported rice was increasing over the period under study, and were integrated of order one I(1). The prices are connected in the long run but have a low speed of adjustment in the short run. Though the null hypothesis of the granger causality of most of the market pairs were accepted, the alternative hypothesis was accepted for pairs of rural imported and urban imported as well as price of urban local and rural local which are all unidirectional.

It is recommended that the flow of market information should be enhanced by marketers, government policy on ban on the importation of rice should be firm and also local production should be enhanced and fully supported by government to close demand supply gap.

Table 1: Augmented Dickey Fuller (ADF) Unit Root Test of the Price series

Variable	Level	1st Difference	Order of Integration	Critical Value (1%)	Critical Value (5%)
PNUI	-0.035	-13.819***	I(1)	-3.476	-2.888
	(0.9555)	(0.0000)			
PNRI	-1.140	-15.169***	I(1)	-3.476	-2.888
	(0.6987)	(0.0000)			
PNUL	1.440	-12.078***	I(1)	-3.476	-2.888
	(0.9973)	(0.0000)			
PNRL	-0.560	-13.827***	I(1)	-3.476	-2.888
	(0.8797)	(0.0000)			

Source: Output from data analysis, 2018.

***implies significant at 1% probability levels respectively.

Figures in parenthesis are probability values.

PNUI = Price of Niger Urban Imported; **PNRI** = Price of Niger Rural Imported; **PNUL** = Price of Niger Urban Local; **PNRL** = Price of Niger Rural Local

Table 2: Johansen Co-integration Test of the monthly price series

Hypothesized No. of CE(s)	Max Statistics	Trace Statistics	Critical Value (5%)
None*	133.2789	351.6595	47.21
At most 1	90.6943	218.3806	29.68
At most 2	87.1296	127.6863	15.41
At most 3	40.5568	40.5568	3.76

Source: Output from data analysis, 2018.
* implies rejection of null hypothesis at 5% probability level.

Table 3: Estimates of the Vector Error Correction Model for the price series

Variable	Coefficient	Standard Error	t-statistics
Long Run			
ECM (-1)	-1.1089	0.1923	5.77***
PNRI (-1)	-0.5095	0.0549	9.28***
PNUL (-1)	-0.2922	0.0753	3.88***
PNRL (-1)	-0.0425	0.0451	0.94
Constant	0.0834		
Short Run			
ECM (-1)	-0.0139	0.0293	1.12
PNUI (-1)	0.1151	0.1521	0.76
PNUI (-2)	0.0635	0.0958	0.63
PNRI (-1)	-0.3672	0.0816	4.50***
PNRI (-2)	-0.1632	0.0550	2.97***
PNUL (-1)	-0.1707	0.0977	1.75*
PNUL (-2)	0.0081	0.0908	0.09
PNRL (-1)	0.0129	0.0401	0.32
PNRL (-2)	0.0434	0.0398	1.09
Constant	-0.0137	0.7043	0.02
Log likelihood	-3039.277		
AIC	30.8228		
HBIC	31.1097		
SC	31.5319		

Source: Output from data analysis, 2018.
***, ** and * implies significant at 1%, 5% and 10% probability level respectively.
PNUI = Price of Niger Urban Imported; **PNRI** = Price of Niger Rural Imported; **PNUL** = Price of Niger Urban Local; **PNRL** = Price of Niger Rural Local; **AIC** = Akaike information criterion; HBIC = Hannan Quinn Criterion; **SC** = Schwarz criterion.

Table 4: Result of granger causality test

Null Hypothesis	F-ratio	Prob> F	Decision
PNUI does not granger cause PNRI	0.18727	0.8294	Accept
PNUI does not granger cause PNUL	2.3111	0.1020	Accept
PNUI does not granger cause PNRL	0.70307	0.4964	Accept
PNRI does not granger cause PNUI	10.069	0.0001	Reject
PNRI does not granger cause PNUL	2.0137	0.1364	Accept
PNRI does not granger cause PNRL	0.0045	0.9955	Accept
PNUL does not granger cause PNUI	0.29773	0.7429	Accept
PNUL does not granger cause PNRI	2.013	0.1365	Accept
PNUL does not granger cause PNRL	2.4168	0.0920	Reject
PNRL does not granger cause PNUI	0.6477	0.5260	Accept
PNRL does not granger cause PNRI	0.0377	0.9630	Accept
PNRL does not granger cause PNUL	1.586	0.2075	Accept

Source: Output from data analysis, 2018.
PNUI = Price of Niger Urban Imported; **PNRI** = Price of Niger Rural Imported; **PNUL** = Price of Niger Urban Local; **PNRL** = Price of Niger Rural Local.

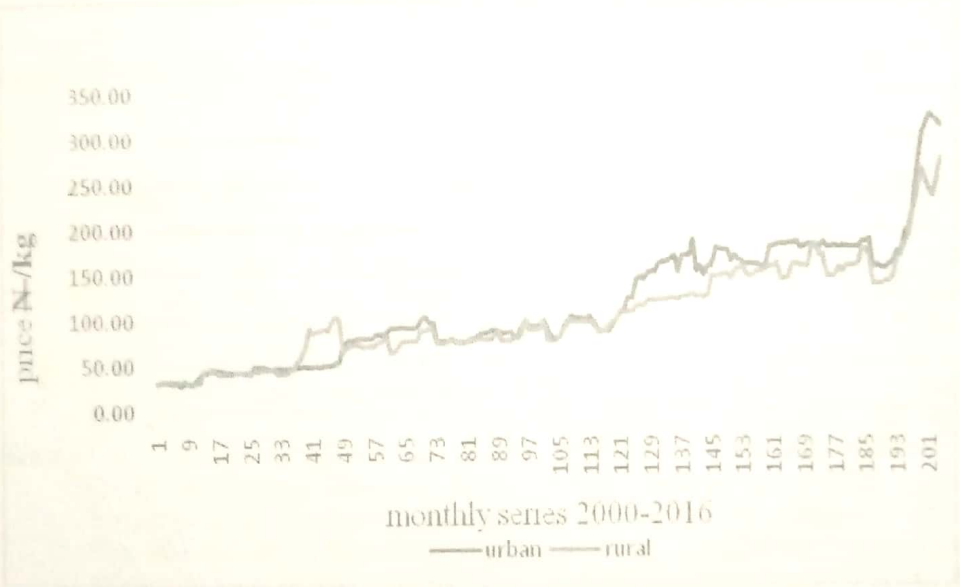
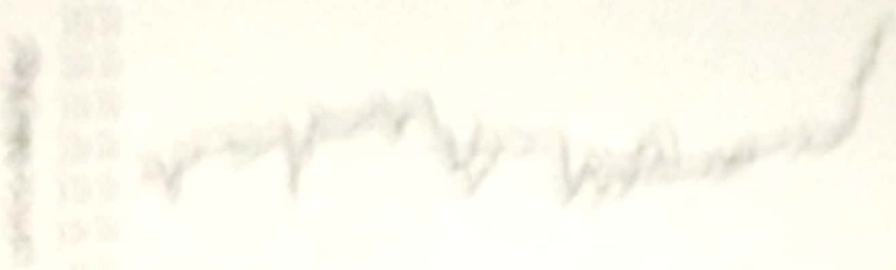


Figure 1: Trend in urban and rural market prices of local rice in Niger state



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