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Price Variability, Co-integration and Exogeniety in the Market for Locally Produced Rice: A Case Study of Southwest Zone of Nigeria

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Abstract

Most studies on local rice in Nigeria were centred on increasing production, consumption or competitiveness with very few addressing the issue of marketing efficiency. Filling this gap requires a study on extent of pricing contacts in the market for local rice. In this study, secondary data consisting of urban monthly retail price series in the six southwest states of Nigeria were collected and analyzed. Analytical techniques used included Augmented Dickey Fuller (ADF), Johansen Co-integration and Granger Causality models. Empirical results indicated that growth in retail prices was highest in 2004 in Ogun Market (48.7%) and Ondo Market (45.4%) implying that local rice was more costly in these states. Retail prices were more volatile in Lagos Market (37.3%) and least volatile in Ogun Market (30.4%). The ADF test showed all price series were non-stationary at their levels but were stationary after first-difference. Pair-wise market integration model indicated that prices were co-integrated connoting high degree of marketing efficiency. The Multiple Co-integration model also indicated five co-integrating equations in six, validating the result of pair-wise market integration test. Granger causality model revealed that the supply-deficient markets in Lagos and Osun States were driving prices elsewhere. These results may have arisen from the storability of rice and closeness of the market locations examined. Despite high level of linkage, there is need for all stakeholders in the market to continue to effectively perform their roles so that economic benefits derivable from this scenario of strong pricing contacts can be fully realized and sustained.

Keywords: Rice; Local production; Price movements; Market linkage; Price leadership; Nigeria

Introduction

The status of rice in the average Nigerian diet has been transformed from being a luxury food item to that of a staple which is gradually taking part of the share formerly accounted for cassava and yam [1-3]. According to Akanji [4] and Akpokodge et al. [5], a combination of factors has triggered the structural increase in rice consumption. These include: rapid urbanization and ease of preparation that fits easily to the lifestyle of urban workers. Besides household's demand which keeps rising, there is an increase in fast food joints as a result of increasing urbanization. It is expected that the demand for rice will continue to increase [1,6-8]. Furthermore, as more women enter the workforce both in the formal and informal sectors, the opportunity cost of their time increases and convenience food such as rice; which can be prepared quickly, becomes the preferred choice [3,7].

Nigeria's annual rice demand is estimated at 5 million tonnes out of which only about 2.2 million tonnes is produced locally. The annual rice supply gap of about 2.8 million tonnes (or 56% of demand) is bridged by importation [2,8-10].

Over the years, most research efforts have been geared toward increasing local rice production to meet the quest for self-sufficiency in its production, make local rice compete favorably with imported rice, and also halt the excessive outflow of foreign exchange for importing rice by raising local rice consumption in Nigeria [2,7]. Sadly, little importance has been given to research and development of the country's rice marketing and distribution system to the extent it deserves. Only a few studies have been devoted to examining the competitiveness and efficiency of the local rice market in Nigeria. However, unless agricultural markets are integrated, producers and consumers will not realize the gains from trade liberalization, since the correct price signals will not be transmitted between and among contiguous market locations. The consequence of this is that, farmers will not be able to specialize according to long-term comparative advantage [11,12]. Making the market and the distribution systems work better for farmers, processors and consumers is a continuing challenge [13] that should be adequately met through an expanded research programme.

The major objective of this paper therefore, is to examine price co-integration in the market for locally produced rice in South west, Nigeria. The specific objectives are to (i) determine the extent of variability in retail prices; (ii) determine the degree and extent of market integration among different spatial markets and (iii) identify markets exhibiting leadership positions in price formation and transmission.

Theoretical Framework

Co-integration is a statistical property possessed by some time series data that is defined by the concept of stationarity and order of integration of the series. It deals with relationship among a group of variables where (unconditionally) each has a unit root. It means that despite being individually non-stationary, a linear combination of two or more time series can be stationary.

A stationary series is one with a mean value which is time invariant. In contrast, a non-stationary series will exhibit a time varying mean. The order of integration of a series is given by the number of time the

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series must be differenced in order to produce a stationary series. A series generated by the first difference is integrated of order I denoted as I(1). Thus, if a time series is I(0), it is stationary; if it is I(1), then its change is stationary and its level is non-stationary.

The concept of co-integration and the method for estimating a co-integrated relation or system [14-17] provide a framework for estimating and testing for long run equilibrium relationships between or among non-stationary integrated variables. If two prices in spatially separated markets (or different levels of the supply chain) p_{1t} and p_{2t}, contain stochastic trends and are integrated of the same order, say I(d), the prices are said to be co-integrated if:

$$p_{1t} - \beta p_{2t} = \mu \text{ is } I(0)$$

β is referred to as the co-integrating vector (in the case of two variables, a scalar), whilst the equation p1t −βp2t is said to be the co-integrating regression. Co-integration implies that these prices move closely together in the long run, although in the short run they may drift apart, and this is consistent with the concept of market integration [18]. Co-integration analysis thus provides a powerful discriminating test for spurious correlation: conducting co-integration analysis between apparently correlated I (1) series and finding co-integration confirms the regression.

Several methods have been used to measure market integration. Advocated by Granger and Elliot (1967), simple bivariate correlation coefficient, also called the Law of One Price (LOP), has long been the most common measure used. Later, this method was strongly criticized, most notably by Ravallion [19]. Advances in time series econometrics led to the development of models that address some of the perceived weaknesses in the correlation coefficient approach. In this respect, Ravallion [19] proposed a dynamic model of spatial price differentials incorporating time lags.

One major drawback however remained. Both the LOP and Ravallion models test whether price changes in one market will be translated on a one-for-one basis to the other market, either instantaneously (LOP) or with lags (Ravallion model). But prices in different markets will only move on a one-for-one basis if the inter-market price differential is equal to transfer costs. Thus, price movements inside the band-with set by the transfer costs do not harm the hypothesis of market integration, whereas these models possibly reject this hypothesis.

Palakas and Harris-White [20], Alexander and Wyeth [21] extended Ravallion's model using co-integration and Granger causality ordinary least squares (OLS) techniques. This allowed testing for more general notions between markets and measures whether prices in two markets wander within a fixed band [11]. A limitation of these models, however, is that all models are in fact "static". Markets are either integrated or not. This requires the assumption of a constant market structure throughout the sample period. It implies that when observations for different sub-periods are limited, then doing integration analysis is not feasible.

Presently, the most common approach to test for market integration is the Johansen co-integration technique and Vector Error Correction Model applied among others by Mafimisebi [18], Rufino [22], Mohammad and Wim [23]. This paper used this approach.

Methodology

Sources of data and scope of study

The secondary data used for this study were sourced from National Bureau of Statistics (NBS), Nigeria. These are monthly retail prices of urban local rice markets in the six south western states of Nigeria which comprises Lagos, Oyo, Osun, Ogun, Ondo and Ekiti. The data covered from January 2001 to December 2010, giving a total of 120 data points per state.

Analytical procedure

The data analytical techniques that were used in this study comprised of descriptive statistical techniques and co-integration technique (Johansen co-integration test). The descriptive statistics that were used included frequency counts, means and co-efficient of variation. Augmented Dickey Fuller Tests (ADF) and Philip Perron (PP) tests were used for the stationarity tests. Johansen co-integration test was used to test for long run market integration between spatial markets that are stationary of the same order.

Mean spatial prices and variability index: Average monthly growth rate of prices for the whole period considered were computed as well as coefficients of variation (CV).

Test for order of econometric integration (unit root test): A stationary series is one with a mean value which will not vary with the sampling period. In contrast, a non-stationary series will exhibit a time varying mean [17]. Before examining integration relationships between or among variables, it is essential to test for unit root and identify the order of stationarity, denoted as I(0) or I(1). This is necessary to avoid spurious and misleading regression estimates. The framework of ADF methods is based on analysis of the following model

$$\Delta pt = \alpha + \beta p_{t-1} + yT + \sum_{k=1}^{n} \delta_k \Delta p_{t-k} + \mu_t \qquad (1)$$

Here, p_t is the rice price series being investigated for stationarity, Δ is first difference operator, T is time trend variable, μ_t represents zero-mean, serially uncorrelated, random disturbances, k is the lag length; α, β, γ and δ_k are the coefficient vectors. Unit root tests were conducted on the β parameters to determine whether or not each of the series is more closely identified as being I(1) or I(0) process. Test statistics is the t statistics for β. The test of the null hypothesis of equation (1) shows the existence of a unit root when $\beta=1$ against alternative hypothesis of no unit root when $\beta \neq 1$. The null hypothesis of non-stationarity is rejected when the absolute value of the test statistics is greater than the critical value. When p_t is non-stationary, it is then examined whether or not the first difference of p_t is stationary (i.e. to test $\Delta p_t \text{-} \Delta p_{t-1} \approx (1)$ by repeating the above procedure until the data were transformed to induce stationarity.

The Philips-Perron (PP) test is similar to the ADF test. PP test was conducted because the ADF test loses its power for sufficiently large values of "k", the number of lags [24]. It includes an automatic correction to the Dickey-Fuller process for auto-correlated residuals [25]. The regression is as follows:

$$\Delta p_t \text{-} \Delta p_{t-1} \Delta \ \ y_t = b_o + b_1 y_{t-1} + \mu_t \qquad (2)$$

Where y_t is the rice price series being investigated for stationarity, b_0 and b_1 are the coefficient vectors and μ_t is serially correlated.

5.2.3. Testing for Johansen co-integration (trace and eigenvalue tests): If two series are individually stationary at same order, the [16,17] model can be used to estimate the long run co-integrating vector using a Vector Auto regression (VAR) model of the form:

$$\Delta_{Pt=\alpha} \sum_{i=1}^{k-1} \Gamma i \Delta p_{t-1} + \Pi p_{t-1} + \mu_t \qquad (3)$$

Where p_t is a nx1vector containing the series of interest (rice price series) at time (t), Δ is the first difference operator.

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Γi and Π are nxn matrix of parameters on the *i*th and *k*th lag of $p_t, \Gamma i = (\Sigma_{i=1}^{k} A_i) - I_g, \Pi = (\Sigma_{i=1}^{k} A_i) - I_g$, Ig is the identity matrix of dimension g, α is constant term, μ_t is nx1 white noise error vector. Throughout, p is restricted to be (at most) integrated of order one, denoted I(1), where I(j) variable requires *j*th differencing to make it stationary. Equation (2) tests the co-integrating relationship between stationary series. Johansen and Juselius [16] and Juselius [17] derived two maximum likelihood statistics for testing the rank of Π, and for identifying possible co-integration as the following equations show:

$$\lambda_{trace}(r) = -T\sum_{i=r+1}^{m} In(1-\lambda) \quad (4)$$

$$\lambda_{trace}(r, r+1) = -T\ln\sum_{i=r+1}^{m} In(1\text{-}\lambda) \quad (5)$$

Where r is the co-integration number of pair-wise vector, λ_t is ith eigenvalue of matrix Π. *T* is the number of observations. The λ_{trace} is not a dependent test, but a series of tests corresponding to different *r* -value. The λ_{max} tests each eigenvalue separately. The null hypothesis of the two statistical tests is that there is existence of r co-integration relations while the alternative hypothesis is that there is existence of more than r co-integration relations. This model was used to test for; (1) integration between pair-wise price series of local rice in the six markets, and (2) integration among the six rice price series in local rice market taken together as a unit.

Test for Granger-causality: After undertaking co-integration analysis of the long run linkages of the various market pairs, and having identified the market pair that are linked, an analysis of statistical causation was conducted. The causality test uses an error correction model (ECM) of the following form;

$$\Delta p_t^i = \beta_o + \beta_1 p^i(t-1) + \beta_2 p^j(t-1) + \sum_{k=1}^{m}\delta_k \Delta p^i(t-k) + \sum_{h=1}^{n}\Delta\sigma\Delta_h \Delta p^j(t-h) + \mu_t$$

Where m and n are number of lags determined by Akaike Information Criterion (AIC).

If the null hypothesis that prices in market j do not Granger cause prices in market i is rejected (by a suitable F-test) that $\sigma_h = 0$ for h = 1, 2 ….n and β=0, this indicates that prices in market j Granger-cause prices in market i. If prices in i also Granger cause prices in j, then prices are said to be determined by a simultaneous feedback mechanism (SFM). This case is then referred to as bi-directional Granger causality. If the Granger-causality is in only one direction, it is called uni-directional Granger-causality and the market which exhibited sufficient strength to have Granger-caused the other is referred to as the exogenous market [12].

Results and Discussion

Descriptive analysis

Average growth rate in retail prices of local rice: Analysis of prices of local rice indicates that the growth in retail prices of local rice was highest in 2004 in most of the states in the region. Table 1 showed that growth was highest in Ogun (48.69%), followed by Ondo (45.36%) and Lagos (36.01%). This implied that local rice costs more in these states than in other states during that year. In 2010, growth in retail prices was negative in most states with the least growth occurring in Lagos (-11.91%), followed by Osun (-5.56%) and Ondo (-5.51%). This interpretation is that there was a fall in the price of the commodity in these states during that year. The average growth rate of retail prices for the entire period of observation was highest in Lagos (15.72%), followed by Ekiti (11.80%) and Osun (11.70%) but least in Ogun (10.49%).

The negative average growth rates in the retail prices of rice in most states in the year 2009 and 2010 possibly resulted from government policy on liberalization of rice imports to provide a short term solution to increasing rice prices in these years. If this negative growth rate in local rice prices continues, then the welfare of rice consumers may be secured at the expense of the self-sufficiency drive in rice production which can be achieved on the long run. This will result because local rice producers will experience relatively low price increases which may not yield sufficiently remunerative prices and profit incentive for continued production. This will serve as a disincentive to further investment in rice cultivation.

Period	Lagos	Ogun	Ondo	Osun	Oyo	Ekiti
2002	34.90	7.95	4.84	7.41	-6.10	2.60
2003	9.70	14.78	7.02	23.27	21.36	19.05
2004	36.01	48.69	45.36	25.20	19.16	18.64
2005	26.47	-3.48	14.12	18.03	22.01	20.55
2006	-4.77	19.98	0.95	-5.16	0.70	11.70
2007	-5.00	-16.45	1.85	2.88	-5.25	-2.31
2008	39.74	16.82	6.12	33.88	39.15	12.06
2009	16.37	11.61	19.72	5.32	10.37	19.76
2010	-11.91	-5.51	-0.25	-5.56	0.09	4.15
Average	15.72	10.49	11.08	11.70	11.28	11.80

Source: Computed from National Bureau of Statistics (NBS) data

Table 1: Growth Rates in Retail Prices of Local Rice.

Another implication of negative growth rate is a further decline in the level of local rice output and its attendant increase in the prices of the product which may engender further increases in foreign rice importation and depletion of the foreign reserves of the country. The negative growth in rice prices observed in recent years could be a reflection of deliberate government policies toward securing cheap food items for its citizens. These findings concur with that of Akande and Akpokodje [1].

Variability in average retail price: Variability is one of the major attributes that explain the characteristics of most price data. This attribute has important implications for policy and the welfare of food consumers and a nation's economy. The degree of variability in the prices of rice is reflected in the coefficient of variation computed for local rice in the region (Table 2). The retail prices of local rice were more volatile in Lagos (37.29%) while the least price volatility was recorded in Ogun (30.41%). In general, the relatively low price variability in local rice implied that, all things being equal, consumers can effectively plan their expenditure with a fairly high degree of certainty that prices are not likely to substantially deviate from their prevailing levels. On the part of policy, this makes for effective planning of both production and consumption.

Order of econometric integration of local rice price series: The augmented Dickey-Fuller (ADF) test showed that all price series in the model were non-stationary at their level; this means that they all contained a unit root since the absolute values of their test statistics was less than their critical values at both 1% and 5% levels of significance. However, stationarity was reached after the first difference as shown in Table 3. As discussed in the methodology section, this means that all the price series were integrated of order one I(1), a requirement for Johansen's co-integration analysis [16,17].

To bolster our findings concerning the I (1) and I (0) nature of the price series at their level and their first difference, respectively, the Phillip-Perron (PP) test was also conducted. The PP test, like the ADF test, indicated significance for all variables, rejecting the null hypothesis of stationarity at the 1% and 5% levels of significance. The findings here

State	Coefficient of Variation (%)
Ekiti	33.81
Lagos	37.29
Ogun	30.41
Ondo	30.47
Osun	32.68
Oyo	33.64

Source: Computed from National Bureau of Statistics (NBS) Data

Table 2: Coefficient of Variation in Retail Prices of Local Rice.

Variables	Price Level 1(0)		First Difference 1(1)	
(Market Price Series)	ADF Statistics	PP Statistics	ADF Statistics	PP Statistics
Ekiti	-1.4409	-1.6042	-11.5337	-19.2139
Lagos	-1.0567	-1.7997	-8.8527	-41.2822
Ogun	-1.3519	-1.5975	-18.9991	-30.5026
Ondo	-1.5214	-1.6406	-11.6777	-18.4598
Osun	-1.2456	-2.2268	-8.9768	-43.6053
Oyo	-0.9827	-0.9979	-14.7398	-14.7208

Source: Compiled from results of stationarity test
Notes: Critical values are -3.4870 and -3.4861 at the 99% and -2.8859 and -2.8861 at the 95% Confidence levels for price level and first difference series, respectively.
If the absolute value of the ADF or PP is lower than their critical statistics, we fail to reject the null hypothesis of non-stationarity

Table 3: Results of Econometric Test of Price Series.

concur with earlier findings and conclusion by previous authors that food commodity price series are mostly stationary of order one i.e. I (1) [12,18,26-28]. According to Mafimisebi [18], the result is probably explained by the fact that most food price series contain trends arising from inflation, thus causing them to exhibit mean non-stationarity.

Long-run integration test results: The co-integration test result is presented in Table 4. The results indicate price co-integration in all the market pairs at both 1% and 5% levels of significance. Since the test statistics was greater than the critical value for all the market pairs, we reject the null hypothesis in favour of the alternative for both the maximal Eigen value and trace tests. Thus, it can be said that 100% of the markets for local rice in the Southwest Nigeria were strongly linked together in the long-run despite a potential short-run divergence among them. The implication of this is that there is high degree of marketing efficiency in local rice marketing in the region since market integration is a proxy for marketing efficiency [12,27,29].

Multiple co-integrations in local rice market: The result of Johansen's multiple co-integration model for local rice price series is displayed in Table 5. Both the Trace tests and Maximum eigenvalue statistics indicated five (5) co-integrating equations at the 5% level, meaning that there are five co-integrating relationships (out of six) existing in the local rice markets in the region. This, according to Johansen procedure means that there are five linear combinations that exist among the variables over the entire period of study. This result validates and strengthens the findings of pair-wise markets co-integration tests earlier reported. The overall economic implication of the result is that, local rice markets in Southwest, Nigeria, were strongly linked together thus suggesting a stable long-run equilibrium.

Exogeneity in local rice market price series: The result of pair-wise Granger causality test is shown in Table 6. Twenty (20) market pairs out of the 30 tested rejected the null hypothesis of no causality. Ten (10) market links of the 20 displayed bi-directional (two-way) Granger causality. The remaining 10 exhibited uni-directional (one-way) causality. In the fifth (5th) market link, Lagos was stronger as it Granger-caused Osun prices at 1% level while the latter Granger-caused the former at 5% level. Ekiti was also stronger in the twelfth market link as it Granger caused Ogun prices at 1% level of significance while Ogun prices Granger-caused Ekiti prices at 5% level. In the 2nd, 3rd, 8th, 9th, 16th and 17th market pairs, the markets shown in these links demonstrated equal strength as they Granger-caused themselves at 1% level. This means that they influenced one another in terms of price formation and transmission probably stemming from the proximity between these states which facilitated free flow of price information. It is also interesting to note that, apart from Lagos Market which exhibited bi-directional causality with Ondo and Osun Markets, it also displayed uni-directional causality with Ogun, Oyo and Ekiti Markets.

Worthy of note is the case of Osun that displayed bi-directional causality with Lagos and also exhibited uni-directional causality with Ondo. Based on these results, Lagos and Osun Markets were identified as occupying leadership positions in the local rice price formation and transmission processes in Southwest Nigeria. While Lagos leads price formation process in Ekiti, Ogun and Oyo Markets, Osun Market however leads prices in Ondo Market. The implication of these findings is that the local rice deficit markets of Lagos and Osun drive the market for local rice in the region. Since rice production statistics for Southwest Nigeria revealed that Lagos and Osun States have the lowest local rice production output in the region, this may mean that the forces of demand are stronger than that of supply in local rice price formation.

Market Pairs	Trace Test Statistics	Maximal Eigenvalue Test Statistics
Pi-Pj		
Lagos/Ogun	26.671**	25.056**
Lagos/Ondo	28.903**	27.540**
Lagos/Osun	29.791**	28.077**
Lagos/Oyo	24.077**	23.452**
Lagos/Ekiti	24.984**	23.594**
Ogun/Ondo	29.815**	27.545**
Ogun/Osun	29.576**	27.021**
Ogun/Oyo	23.925**	23.635**
Ogun/Ekiti	32.098**	29.579**
Ondo/Osun	21.876**	19.300**
Ondo/Oyo	20.716**	20.362**
Ondo/Ekiti	27.349**	25.562**
Osun/Oyo	41.043**	39.479**
Osun/Ekiti	22.765**	20.721**
Ekiti/Oyo	26.396**	26.175**

Source: Compiled from the result of Co-integration Test
* (**) means significant at 5% (1%) level of significance
The critical values for trace test and maximal eigenvalue test are 19.937 and 18.520 at 99%, and 15.495 and 14.265 at 95% level of significance, respectively

Table 4: Pair-wise Co-integration Test Result.

Null hypothesis	Trace Statistics	95% critical value	Maximum eigenvalue	95% critical value
r=0	932.71*	95.75	619.56*	40.08
r=1	313.15*	69.82	146.08*	33.88
r=2	167.06*	47.86	83.69*	27.58
r=3	83.37*	29.80	53.26*	21.13
r=4	30.11*	15.49	28.78*	14.26
r=5	1.33	3.84	1.33	3.84

Source: Compiled from the result of Co-integration Test
Both Trace and Maximum eigenvalue tests indicate 5 co-integrating equations at the 0.05 level of significance
* denotes rejection of the null hypothesis at the 0.05 level of significance

Table 5: Multiple Co-integration Results.

Null hypothesis	F-Statistics	Probability
Lagos→Ogun	9.039**	0.0002
Ondo→Lagos	4.706**	0.0109
Lagos→Ondo	8.643**	0.0003
Osun→Lagos	3.997*	0.0210
Lagos→Osun	6.569*	0.0020
Lagos→Oyo	9.708**	0.0001
Lagos→Ekiti	7.638**	0.0008
Ondo→Ogun	6.701**	0.0018
Ogun→Ondo	6.353**	0.0024
Osun→Ogun	10.867**	5.E-05
Oyo→Ogun	7.717**	0.0007
Ekiti→Ogun	6.243**	0.0027
Ogun→Ekiti	3.668*	0.0286
Osun→Ondo	5.763**	0.0041
Oyo→Ondo	4.647**	0.0115
Ekiti→Ondo	5.276**	0.0064
Ondo→Ekiti	4.898**	0.0091
Osun→Oyo	13.457**	6.E-06
Osun→Ekiti	5.941**	0.0035
Oyo→Ekiti	10.285**	8.E-05

Source: Compiled from the result of Granger-Causality Test
* (**) means significant at 5% (1%) level of significance
→ indicates direction of causality

Table 6: Pair-wise Granger-causality Test for Local Rice Markets.

Summary, Recommendations and Conclusion

Summary and recommendations

This study examined spatial price linkage in local rice markets in Southwest Nigeria. The trend analysis in retail prices of local rice showed that there was less fluctuations in the retail prices of the commodity over the period studied. The smaller values of the coefficient of variation provided more evidence to support this position. The negative growth rate in the retail prices of local rice observed in some years could be a reflection of deliberate government policies toward securing cheap food items for its citizens. The economic implication of this is that if growth in price maintains this trend, then the welfare of rice consumers in the study area may be secured. This however, will be at the expense of local rice producers, who will be experiencing relatively small increases in the prices of their product. This could bring about disincentive to further investment in rice farming activities, increase in price occasioned by reduction in local rice output and loss of foreign exchange to other countries from which the country shall be forced to import rice to meet the increasing shortfall.

The result of the stationary tests indicated that the price series for local rice exhibited stationary after first differencing. From the result of the study was discovered existence of a high level of spatial pair-wise integration in local rice markets across the six states. All market pairs for local rice had long-run price linkages. The multiple (Johansen) co-integration tests also largely confirmed these results. This implied that short-run deviations from equilibrium will be readily corrected through efficient price setting and transmission of price signals.

The Granger causality tests conducted on all inter-state market pairs showed that Lagos and Osun Markets, which are situated in states with low volume of local rice production, lead price formation and transmission processes in local rice marketing in the region.

Based on the results of the study, some important policy implications and recommendations for the rice industry emerge for the various Governments in Southwest Nigeria. It is recommended that the problem of highly inefficient and fragmented distribution and transportation systems be addressed for the rice traders to take advantage of the high level of spatial market integration. Also, development of infrastructures in inter-state rice markets, government price support and other market-oriented policies should be pursued as they will achieve intended goals.

Conclusion

The existence of high level of integration in the markets for locally produced rice in the Southwest, Nigeria, has been discovered in the study. The results of the study did not support findings by past researchers of low agricultural commodity market integration in Nigeria attributed generally to fragmented distribution system and oftentimes inefficient transportation system. This may be as a result of the fact that rice is not a highly perishable agricultural commodity that stores up to one year before spoilage, if well dried. The closeness of the markets examined may also have been a factor in the strong linkage detected among these markets. It should be noted that the result may have been widely different if samples of rice markets have been taken across all the six zones in Nigeria. There is, however, the need for all the stakeholders in the Southwest rice market to continue to effectively perform their roles so that the economic benefits derivable from this very high level of integration can be fully realized and sustained.

References

1. Akande SO, Akpokodge G (2003) Rice Prices and Market Integration in Selected Areas in Nigeria. A Study Report, WARDA-NISER Collaborative Study.
2. Daramola AG (2005) Government Policies and Competitiveness of Nigerian Rice Economy. A Paper Presented at the Workshop on Rice Policy and Food Security in Sub-Saharan Africa Organized by WARDA, Republic of Benin.
3. Odusina OA (2008) Urban Rice Demand Analysis: A Case Study of Ijebu-Ode Township. Middle-East Journal of Scientific Research 3: 62-66
4. Akanji BO (1995) Hedonic-Price Analysis of the Demand for Grain Crops in Nigeria: The Case of Rice and Cowpea. Nigeria.
5. Akpokodge G, Lancon F, Erenstein O (2001) Nigeria's Rice Economy: State of the Art. A Paper Presented at the WARDA-NISER Nigerian Rice Economy Workshop, Ibadan, Pp 4-9.
6. FAO (2005) Marketing Integration, Price Transmission and Import Surges. FAO Import Surge Working Paper 6: 1-9.
7. Bamidele FS, Abayomi OO, Esther OA (2010) Economic Analysis of Rice Consumption Patterns in Nigeria. Journal of Agricultural Science and Technology. 12: 1-11
8. Odularu GO (2010) Rice Trade Policy Options in an Open Developing Economy: The Nigerian Case Study. Journal of Development and Agricultural Economics. 2: 166-177.
9. Rahji MA, Adewumi OM (2008) Market Supply Response and Demand for Local Rice in Nigeria: Implications for Self-Sufficiency Policy". Journal of Central European Agriculture. 9: 567-574.
10. Kassali R, Kareem RO, Oluwasola O, Ohaegbulam OM (2010) Analysis of Demand for Rice in Ile-Ife, Osun State, Nigeria. Journal of Sustainable Development in Africa. 12: 63-78.
11. Baulch B (1997) Transfer Costs, Spatial Arbitrage and Testing Food Market Integration. American Journal of Agricultural Economics. 79: 477-487.
12. Mafimisebi TE (2012) Spatial Equilibrium, Market Integration and Price Exogeniety in Dry Fish Marketing in Nigeria. Journal of Economics, Finance and Administrative Sciences. 17: 31-37.
13. Intal, Jr P, Rani LO (2001) Literature Review of the Agricultural Distribution Services Sector: Performance, Efficiency and Research Issues. PIDS Discussion Paper Series.
14. Engle RF, Granger CWJ (1987) Co-integration and Error Correction: Representation, Estimation and Testing. Econometrica. 55: 251-276

15. Johansen S (1988) A Statistical Analysis of Co-integration Vectors. Journal of Econometric Dynamics and Control, 12: 231-254.
16. Johansen S, Juselius K (1990) Maximum Likelihood Estimation and Inference on Co -integration with Application to the Demand for Money. Oxford Bulletin of Economic Statistics, 52: 231-254.
17. Juselius K (2006) The Co-integrated VAR Model: Methodology and Applications. Oxford University Press
18. Mafimisebi TE (2008) Long-run Price Integration in the Nigerian Fresh Fish Market: Implication for Marketing and Development. Delhi Business Review, 9: 55-67
19. Ravallion M (1986) Testing Market Integration. American Journal of Agricultural Economics, 68: 102-109
20. Palakas T, Harris White B (1993) Testing Market Integration: New Approaches with case Materials from the West Bengal Economy. J of Development Studies, 30: 1-57.
21. Alexander C, Wyeth J (1994) Co-integration: An Application to the Indonesian Rice Market. Journal of Development Studies, 30: 303-328
22. Rufino CO (2008) Inter-regional Integration of the Philippine Rice Market. DLSU-AKL Working Paper Series 2008-06.
23. Mohammad IH, Wim V (2010) Evaluation of Rice Markets Integration in Bangladesh. The Lahore Journal, 15: 77-96
24. Ghosh A, Saidi R, Johnson K (1999) Who Moves the Asia-Pacific Stock Markets, US or Japan? Empirical Evidence Based on Theory of Co-integration. The Financial Review, 34: 159-170
25. Brooks C (2008) Introductory Econometrics for Finance 2nd Edition. Cambridge, University Press.
26. Mafimisebi TE (20t01) Spatial Price Equilibrium and Fish Market Integration in Nigeria. University of Ibadan, Nigeria Pp201.
27. Okon RN, Egbon PC (2003) The Integration of Nigeria's Rural and Urban Food Stuff Markets. A Report of African Economic Research Consortium (AERC) Sponsored Research. Pp. 1-17.
28. Oladapo OO (2003) Market Integration for Pineapples in Nigeria. An Unpublished Ph.D Thesis, University of Agriculture, Nigeria.
29. Hopcraft P (1987) Grain Marketing Policies and Institutions in Africa. Finance and Development, 24: 37

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