ANALYSIS OF MARKET INTEGRATION AND PRICE VARIATION IN GARRI MARKETING IN EDO STATE, NIGERIA

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ABSTRACT

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The study was conducted to examine the market integration and price variation in garri marketing in Edo State, Nigeria. Price behaviour between rural and urban markets for garri was examined to determine the level of market integration and price transmission. Secondary data used for the study were sourced from Edo State Development Programme. These included the average monthly retail prices (₦ per kg) of Garri from January, 2001 to December, 2012 (12years) in urban and rural markets in the study area. Data collected were analysed using coefficient of variation, Pearson correlation coefficient, Johansen co-integration, Augmented Dickey Fuller test (ADF), Vector Error Correction Model (VECM) and the Granger Causality procedure. Result from the study showed that the ADF tests indicated non-stationarity in both urban and rural series at their price levels with ADF test statistics of -2.39 and -2.69 for the rural and urban markets respectively while in first differences they were -11.95 and -13.15 showing that all the price series were integrated of order one (I(1)). Both the trace statistics and maximum eigen statistics indicated two integrating equations for garri market price at 5% level of significance implying that rural-urban markets for these commodities in Edo State co-integrate and there is significant existence of long run market relationship. The granger causality test showed that the rural market price determined the urban market prices while the urban market price did not determine the rural market prices implying the rural markets were the dominant market for determining the price of garri in the State. The study established that garri market in the study area had a prefect transfer of price information with a unidirectional price transmission from rural to urban markets and rural/urban long run price equilibrium. It is therefore recommended that rural markets which have been shown in this study to be the lead market should be the target of government developmental reforms.

Keywords: Market integration, garri, price transmission, granger causality

INTRODUCTION

Cassava (Manihot esculenta) is not only a very important staple food for urban and rural populace in Nigeria, but is also part and parcel of the rural livelihoods of the people (Food and Agriculture Organization, 2013). Nigeria is ranked as the largest producer of cassava in the world with an annual output of 37.5 million tons of tuberous roots. It is important as a food crop as well as a major source of income to a large number of households in comparison with other staples (Obisesan, 2012). Cassava is the most important food crop for Nigeria by production quantity next to yam, which is the most important food crop by value (FAO, 2013). According to Nyerhovwo (2004), among the starch staples, cassava gives a carbohydrate production which is about 40% higher than rice and 25% more than maize with the result that cassava is the cheapest source of calories for both human nutrition and animal feeding. However, consumption of cassava products is not possible without processing. More so, Cassava being an agricultural product is bulky and perishable. Fresh cassava roots cannot be stored for long because they rot within 3 – 4 days of harvest. It therefore, exerts various pressures on handling, packaging, transportation and sales with adverse antecedent effect on market prices (Ugwumba and Okoh, 2010). It is processed into various products such as garri, fufu, tapioca, starch, cassava chips, cassava flour (lafun), livestock feed and other industrial products (Ukpongson et al., 2011). Cassava, in its processed form, is a reliable and convenient source of food for tens of millions of rural and urban dwellers in Nigeria. It is estimated that more than 90% of cassava production is processed into food (Philips, et al., 2006). When processed into any of the products such as flour or garri, its shelf life increases. Garri is the most consumed and traded of all food products made from cassava roots. It is a creamy-white, partially gelatinized, roasted, free flowing granular flour with a slightly fermented flavour and sour taste. It accounts for 70% of the entire cassava production in Nigeria (IITA, 1990).

A common problem identified in cassava processing and marketing is that of price fluctuation (Muhammad – Lawal et al., 2013). Processors are constantly faced with problems of seasonal variation in product prices (Olagunju et al., 2012). Prices are an important feature of a market; it plays an important role in efficiently distributing resources and signaling shortages and surpluses which help farmers to respond to changing market conditions (Haji and Gelaw, 2011). Prices are the 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). The ability of a marketing system to efficiently carry out its development function is contingent on the ease with which price changes and responses are transmitted spatially and temporally at different market levels.

Market integration refers to the co-movement of prices and/or flows between them. More generally, it also refers to the smooth transmission of price signals and information across spatially separated markets (Goletti et al., 1995). It is a concept that explains the relationship between two markets that are spatially or temporally separated (Asche et al., 2005). Markets that are not integrated may convey inaccurate price signal that might distort...
producers’ marketing decisions and contribute to inefficient product movement (Goodwin and Schroeder, 1991), and traders may exploit the market and benefit at the cost of producers and consumers. In more integrated markets, farmers specialize in production activities in which they are comparatively proficient, consumers pay lower prices for purchased goods, and society is better able to reap increasing returns from technological innovations and economies of scale (Vollrath, 2003). However, there are indications of existence of gaps in price relationship among markets in Nigeria. Some markets have been found to affect appreciably the price of commodities in another market. The wide gap between rural and urban prices weakens the farmers’ morale thereby reducing productivity and in some cases leads to complete stoppage of production (Dickey and Fuller, 1979). The key research questions that come to mind are: Are there linkages or causality between garri markets in urban and rural areas? What is the degree of market integration among the rural and urban markets for garri? What is the nature of the price transmission? The specific objectives were thus to examine the price behaviour between rural and urban market for garri, determine the level of market integration between the rural and urban markets for garri as well as to determine the price transmission.

MATERIALS AND METHODS
The study was carried out in Edo State, Nigeria. The State lies within the geographical co-ordinates of Longitudes 05° 04’ East and 06° 43’ East of the Greenwich meridian and Latitude 05° 44’ North of the Equator and 07°34’. It has 18 Local Government Areas (LGAs) with the capital in Benin City and an estimated population of 3,218,332 persons (Census, 2006). The State has a tropical climate characterized by two distinct seasons: the wet and dry seasons with average temperatures of about 25 °C (77 °F) in the wet season and about 28 °C (82 °F) in the dry season which is quite conducive for cassava production. The State is mainly agrarian, producing crops such as yam, cassava, cocoyam, rice, maize, plantain, oil palm and rubber and others. Secondary data on prices used for the study were sourced from Edo State Agricultural Development Programme (EDADP). The data included the average monthly retail prices (N/Kg) of Garri covering January, 2001 to December, 2012 (12years) from Urban and Rural markets.

The study made use of a combination of analytical tools to achieve this objective namely: Coefficient of Variation, Pearson Correlation Coefficient, Johansen co-integration, Augmented Dickey Fuller test (ADF), vector error correction model (VECM) and the Granger causality procedure.

Coefficient of Variation and Pearson correlation Coefficient were used to examine the price behaviour of rural and urban markets of garri in the study area. This was computed as:

\[
CV = \frac{\text{Standard deviation}}{\text{Mean}} \times 100% 
\]

Pearson correlation coefficient \( r \) can be written as:

\[
r = \frac{\sum_{t=1}^{T} (P_{it} - \bar{P}_i)(P_{jt} - \bar{P}_j)}{\sqrt{\sum_{t=1}^{T} (P_{it} - \bar{P}_i)^2 \sum_{t=1}^{T} (P_{jt} - \bar{P}_j)^2}} 
\]

Where, \( P_i \) and \( P_j \) = Price variables at time \( t \); \( \bar{P}_i \) and \( \bar{P}_j \) = mean of the variables; \( T \) = number of years

Pearson correlation coefficients were used to examine the strength of price linkages across markets. Given price series from two markets at time \( t \), \( P_i \) and \( P_j \), the degree of linear association between the markets can be measured by the sign and magnitude of the correlation coefficient, \( r \). Correlation analysis of the prices in the markets has become the most common approach for measuring co-movement of prices, which underlies the intuitive idea of market integration, owing to its simplicity.

**Johansen multivariate co integration procedure**

Johansen Co-integration Procedure was used to determine the existence of co-integration (long run equilibrium) as follows:

**Testing for stationarity**

A standard test for non-stationarity is the Augmented Dickey Fuller (ADF) test (Dickey and Fuller 1979). For each price series \( X_t \), the test statistic was measured by the following regression.

\[
\Delta X_t = \alpha + \delta X_{t-1} + \sum_{i=1}^{k} \beta_i \Delta X_{t-k+i} + \epsilon_t \]  

Where

- \( X_t \) = Price at time \( t \)
- \( \Delta \) = first difference operator.
- \( t \) = time indicator.
- \( \epsilon_t \) = the error term.
- \( \delta, \alpha \) and \( \beta \) = Parameters to be estimated.
- \( k \) = Number of lag of the price variables to be included.
k is the lag length chosen for ADF to ensure that \( \varepsilon_t \) is empirical white noise. The first stage is to test whether each series is stationary at level I(0). If the null hypothesis of non stationarity cannot be rejected, that is the absolute value of the ADF statistic is smaller than the critical Augmented Dickey Fuller (ADF) value, then the next stage is to test whether the first differences are stationary. If the null hypothesis of non stationarity cannot be rejected, then the series is still not stationary. Therefore, differencing continues until the series becomes stationary and order noted. The process is considered stationary if \( \delta < 1 \), thus testing for stationarity is equivalent to testing for unit roots (\( \delta < 1 \)) under the following hypotheses:

\[ H_0: \delta = 0 \quad \text{the price series is non-stationary or existence of unit root.} \]

\[ H_1: \delta \neq 0 \quad \text{the price series is stationary or there is white noise in the series.} \]

The hypothesis of non stationarity was accepted at 0.01 or 0.05 levels if ADF is less than the critical value. Vector Error Correction Model (VECM) If prices are integrated of the same order and prices of each model are co integrated, a Vector Error Correction Model (VECM) is appropriate to determine the multivariate relationships among prices. The procedure is based on maximum likelihood estimation of the error correction model and each two-variable system is modelled as a Vector Auto Regression (VAR) as in the following equation (Ojiako, et al., 2012)

\[
X_t = \mu + \sum_{i=1}^{r} \Gamma_i \Delta X_{t-i} + \Pi X_{t-k} + \varepsilon_t + \beta_t \quad \text{-----------------------------------------(4)}
\]

Where

\( X \) = the vector of endogenous variables

\( \Gamma_i \) = the matrix of short run coefficients

\( \Pi \) = the matrix of long run coefficients

\( \varepsilon_t \) = the vector of independently normally distributed errors.

\( K \) = number of lags, and should be adequately large enough both to capture the short-run dynamics of the underlying VAR and to produce normally distributed white noise residuals.

If the coefficient matrix \( \Pi \) has reduced rank \( r<s \), then there exist \( n \times r \) matrices \( \alpha \) and \( \beta \) such that \( \Pi = \alpha \beta' \) and \( \beta'X_t \) is stationary \( r \) is the number of co integrating relationships, the elements of \( \alpha \) are known as the adjustment parameters in the vector error correction model and each column \( \beta \) is a co integrating vector. It can be shown that for a given \( r \), the maximum likelihood estimator of \( \beta \) defines the combination of \( X_{t-k} \) that yields the \( r \) largest canonical correlations of \( \Delta X_t \) with \( X_{t-1} \) after correcting for lagged differences and deterministic variables when present. Johansen proposes two different likelihood ratio tests of the significance of these canonical correlations and thereby the reduced rank of the \( \Pi \) matrix. The procedure for testing co-integration is based on the error correction model (ECM) representation of \( X_t \) given by (Ojiako, et al., 2012):

\[
\Delta X_t = \mu + \sum_{i=1}^{r} \Gamma_i \Delta X_{t-i} + \Pi X_{t-k} + \varepsilon_t + \beta_t \quad \text{-----------------------------------------(5)}
\]

Where

\( \Delta \) = the difference operator

\( X_t \) = (nx1) Vector of I(1) (i.e integrated of order one) Prices

\( \Gamma_i \) = - (I - \( \Pi_1 \) - \( \Pi_2 \) - \( \Pi_k \) ) each of \( \Pi_i \) is an \( n \times r \) matrix of parameters

\( \Pi \) = number of lags

\( \varepsilon_t \) = an identically and independently distributed \( n \)-dimensional vector of residuals with zero mean and variance matrix

\( \beta \) = Co-integrating vector (containing the long-run)

\( \mu \) = constant term

\( t \) = Time trend.

Since \( X_{t-k} \) is I(1), but \( \Delta X_t \) and \( \Delta X_{t-1} \) variables are I(0)(i.e., integrated of order zero), Equation (6) will be balanced if \( \Delta X_{t-1} \) is I(0). So, it is the \( \Pi \) matrix that conveys information about the long-run relationship among the variables in \( X_t \). The rank of \( \Pi \) determines the number of co-integrating vectors, as it determines how many linear combinations of \( X_t \) are stationary. If \( r = n \), the variables are stationary in their levels. If \( r = 0 \), no linear combination of \( X_t \) is stationary.

If \( 0 < \text{rank}(\Pi) = r < n \), and there are \( n \times r \) matrices \( \alpha \) and \( \beta \) such that \( \Pi = \alpha \beta' \) then it can be said that there are \( r \) co-integrating relations among the elements of \( X_t \). The co-integrating vector \( \beta \) has the property that \( \beta'X_t \) is stationary even though \( X_t \) itself is non-stationary. The matrix \( \alpha \) measures the strength of the co-integrating vectors in the ECM, as it represents the speed of adjustment parameter.
For this study, it was hypothesized that rural and urban market price for cassava tubers and its products are jointly determined or endogenous, given an implicit representation of the model with two endogenous variables without an exogenous variable as:

\[ X_t = (ln \_ RP_t, ln \_ UP_t) \]  \hspace{1cm} (6)

Where

- \( X_t \) = Price variable at time T
- \( ln \_ RP_t \) = Natural log of rural market price
- \( ln \_ UP_t \) = Natural log of urban market price

The long run co-integrating equation can be specified explicitly for rural market price as:

\[ \text{ln}_R P_t = \Phi_0 + \Phi_1 \text{ln}_R P_{t-1} + V_i \]  \hspace{1cm} (7)

Where

- \( \Phi_0 \) = the log of a proportionality coefficient, a constant term capturing the transportation and other forms of cost
- \( \Phi_1 \) = Long run coefficient

VECM model in this study was estimated as

\[ \Delta \text{RP}_t = \psi_{10} + \sum_{i=1}^{p} \psi_{11i} \Delta \text{RP}_{t-i} + \sum_{i=1}^{p} \psi_{12i} \Delta \text{UP}_{t-i} - \rho (\text{RP}_{t-1} - \text{UP}_{t-1}) + V_{1t} \]  \hspace{1cm} (8)

\[ \Delta \text{UP}_t = \psi_{20} + \sum_{i=1}^{p} \psi_{21i} \Delta \text{UP}_{t-i} + \sum_{i=1}^{p} \psi_{22i} \Delta \text{UP}_{t-i} - \rho (\text{RP}_{t-1} - \text{UP}_{t-1}) + V_{2t} \]  \hspace{1cm} (9)

Where

- \( \Delta \) = the difference operator
- \( \text{RP} \) = rural markets prices for garri
- \( \text{UP} \) = Urban markets prices for garri
- \( \psi_{11i} \) and \( \psi_{12i} \) = Short run coefficients
- \( \rho \) = error correction instrument measuring the speed of adjustment from the short-run state of disequilibrium to the long-run steady-state equilibrium
- \( V_i \) = an error term assumed to be distributed as white noise
- \( \psi_{10} \) and \( \psi_{20} \) = Constants.

Granger causality test

The Granger Causality test was used to determine the leading markets between urban and rural markets.

The Granger model used in this study was represented by:

\[ \text{RP}_t = \alpha_0 + \sum_{i=1}^{n} \alpha_i \text{UP}_{t-i} + \sum_{j=1}^{M} \beta_j \text{RP}_{t-j} + \varepsilon_t \]  \hspace{1cm} (10)

Where

- \( n \) = number of observation
- \( M \) = number of lag
- \( \text{RP}_t \) = Rural market price
- \( \text{UP}_t \) = Urban market price
- \( \alpha \) and \( \beta \) = Parameters to be estimated.

RESULTS AND DISCUSSION

Price behaviour among rural and urban cassava markets in the study area

Average annual retail prices of garri and its variability

The average annual retail price of garri from 2001 to 2012 are presented in Table 1. The result showed that average annual retail price of garri in the rural markets was ₦60.84 per kg while that of the urban markets was ₦65.89 per kg. This showed that the average annual retail prices were higher in the urban markets than in the rural markets. This is in line with the findings of Ojiako and Ezedinma (2007) who reported that average price of lafun in the urban market was higher than its price in the rural markets. Ojiako, Ezedinma, Okechukwu, and Asumghua, (2013) also reported that the average retail price of garri was higher in the urban markets than in the rural markets in Nigeria.

Furthermore, a coefficient of variation of 0.30% and 0.29% observed for the rural and urban market respectively shows that the rural retail prices were more volatile than the urban retail prices. Therefore, the average annual retail prices from the urban markets were more stable than those of the rural markets. Nevertheless, prices in both markets followed the same trend as shown in Figure 1. However, there was a low level of price variability which may imply that the consumers could effectively plan their expenditure with a fairly high degree of certainty that
prices may likely not deviate too far away from their prevailing levels. This finding is in agreement with that of Akande and Akpokodje (2003) and Mafimisebi et al. (2014) for Rice in Nigeria

Table 1: Average Annual Retail Price of Garri (2001 - 2012)

<table>
<thead>
<tr>
<th>Year</th>
<th>Rural Price (₦)</th>
<th>Urban Price (₦)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>41.91</td>
<td>47.59</td>
</tr>
<tr>
<td>2002</td>
<td>47.12</td>
<td>53.07</td>
</tr>
<tr>
<td>2003</td>
<td>43.74</td>
<td>52.7</td>
</tr>
<tr>
<td>2004</td>
<td>42.48</td>
<td>45.40</td>
</tr>
<tr>
<td>2005</td>
<td>73.81</td>
<td>80.83</td>
</tr>
<tr>
<td>2006</td>
<td>59.65</td>
<td>65.65</td>
</tr>
<tr>
<td>2007</td>
<td>46.44</td>
<td>50.79</td>
</tr>
<tr>
<td>2008</td>
<td>62.00</td>
<td>64.32</td>
</tr>
<tr>
<td>2009</td>
<td>68.97</td>
<td>79.15</td>
</tr>
<tr>
<td>2010</td>
<td>75.79</td>
<td>77.90</td>
</tr>
<tr>
<td>2011</td>
<td>77.21</td>
<td>78.67</td>
</tr>
<tr>
<td>2012</td>
<td>90.96</td>
<td>94.58</td>
</tr>
<tr>
<td>Average</td>
<td>60.84</td>
<td>65.89</td>
</tr>
<tr>
<td>Minimum</td>
<td>41.91</td>
<td>45.40</td>
</tr>
<tr>
<td>Maximum</td>
<td>90.96</td>
<td>94.58</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>18.03</td>
<td>19.38</td>
</tr>
</tbody>
</table>

Source: Price series from January 2001 to December 2012 collected from EDADP (2015)

Price relationship between urban and rural cassava markets in the study area
Pearson correlation coefficient was used to determine the behaviour of retail prices of garri between rural and urban market in the study area. The result is presented in Table 2 and it shows a correlation coefficient of 0.86 which suggests a high co-movement between the retail and urban prices implying that price movement in the rural markets had strong positive relationship with the price movement in the urban markets. The positive correlation implies that an increase in the retail price in one market would follow a price increase in the other market and as such suggest the existence of price integration and a good price transmission between both markets. It further corroborates the findings of Ojiako and Ezedinma (2007) and Brownson et al. (2014), that reported a positive correlation between rural and urban prices for garri in Enugu State and cassava derivatives (garri and fufu) in Akwa Ibom State respectively.

Johansen multivariate co-integration test results
Testing for stationary
The result in Table 3 shows the stationarity test for urban and rural prices for garri using ADF procedure. The ADF test statistics calculated at price levels for garri was -2.39 and -2.69 for the rural and urban markets respectively. The results indicate that the variables were not stationary at their price levels since the values of the ADF t-statistics were smaller in absolute terms than the critical value. Therefore, the null hypothesis of non-stationary was accepted for all the variables at their price levels. The values in first difference for the rural and urban retail price series were -1.95 and -1.35 respectively. This showed that at first difference higher t – values were obtained for both sets of prices of the three commodities. Therefore, the null hypothesis was rejected in favour of the alternative. This means that all the price series were integrated of order one 1(1), a requirement for the Johansen co-integration analysis. The result corroborates earlier findings that food commodity price series are mostly stationary of order one (Akindtunde et al., 2012; Mafimisebi et al., 2014). The result is probably explained by the fact that most food price series have trends in them because of inflation and therefore exhibit mean non-stationarity. They need to be first-differenced to become stationary.

Testing for co-integration between urban and rural market price of garri
Co-integration test carried out on all the variables to determine the existence of long-run relationship between the price variables using the Johansen’s co-integration test gave the result presented in Table 4. Both the trace statistics and maximum Eigen statistics indicated two integrating vectors for garri market price at 5% level of significance. Thus, the null hypothesis of no co-integration, r=0 is rejected. This is because calculated trace statistics for the null hypothesis of r=0 were greater than the critical values at 0.05. This implies that rural-urban markets for these commodities in Edo State co-integrate and there is significant existence of long-run market relationship. It also implies that a perfect transmission of price information exist in the markets. When there is perfect transmission of price information in a network of markets, producers, marketers and consumers will realize the appropriate gains from trade because correct price signals will be transmitted down the marketing chain thus enabling producers to specialize according to comparative advantage. Markets that are not integrated...
will convey inaccurate price information that has the tendency to distort production and marketing decisions and contribute to inefficient product movements (Baulch 1997). This finding is in line with those of Ojiako et al., (2012) who observed that rural and urban market price of garri in selected markets in Nigeria were co-integrated. Brownson et al., (2014), also observed the existence of the long-run equilibrium relationship between the rural and urban market prices of garri in Akwa Ibom State.

Table 2: Pearson correlation coefficients between retail prices of garri in urban and rural markets in Edo State

<table>
<thead>
<tr>
<th>Market</th>
<th>Correlation Coefficients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural</td>
<td>1.00 0.86</td>
</tr>
<tr>
<td>Urban</td>
<td>0.86 1.00</td>
</tr>
</tbody>
</table>

Source: Price series from January 2001 to December 2012 collected from EDADP (2015)

Table 3: Unit root test on price series of garri

<table>
<thead>
<tr>
<th>Market</th>
<th>Price levels I(0)</th>
<th>First differences I(1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural</td>
<td>-2.39</td>
<td>-11.95</td>
</tr>
<tr>
<td>Urban</td>
<td>-2.69</td>
<td>-13.15</td>
</tr>
<tr>
<td>ADF Test Critical value at 1%</td>
<td>-3.47</td>
<td>-3.47</td>
</tr>
<tr>
<td>ADF Test Critical value at 5%</td>
<td>-2.88</td>
<td>-2.88</td>
</tr>
</tbody>
</table>

Table 4: Testing for co-integration between urban and rural market price of Garri

<table>
<thead>
<tr>
<th>Market Pair</th>
<th>Trace statistics</th>
<th>Critical value (5%)</th>
<th>Maximum eigen value</th>
<th>Critical value</th>
<th>Hypothesize No. of co-integrating equations</th>
</tr>
</thead>
<tbody>
<tr>
<td>r = 0</td>
<td>74.22</td>
<td>15.49</td>
<td>68.57</td>
<td>14.26</td>
<td>None*</td>
</tr>
<tr>
<td>r ≤ 1</td>
<td>5.64</td>
<td>3.84</td>
<td>5.64</td>
<td>3.84</td>
<td>At most 1*</td>
</tr>
</tbody>
</table>

*significant (p< 0.05)

**Testing for short run market integration with the vector error correction model (VECM)**

The estimates of the Vector Error Correction Model (VECM) used to determine the speed of adjustment of rural and urban prices of garri in Edo State in the short run as presented in Table 5. The speed of adjustment was determined by the long run parameter estimates or estimated adjustment coefficient given as -0.10 and 0.98 for the rural and urban market prices of garri. The results indicate that if there is a positive deviation from the long run equilibrium the market tends to respond with a decrease in the rural prices or an increase in the urban prices for the three commodities. The urban price of the commodity appears to respond faster relative to rural price. The adjustment coefficient was statistically significant at 5% suggesting that the rural price is weakly exogenous. This implies that movement in the rural price is less affected by price in the urban market while movements in the urban price are controlled by the rural market. This means that the long run equilibrium after an exogenous shock is restored primarily by correction made by the urban market. This finding is similar to that of Ojiako et al. (2012) who indicated that long run equilibrium after exogenous shocks were restored primarily by corrections made by the urban market prices.

Table 5: Vector Error Correction Estimates for garri

<table>
<thead>
<tr>
<th>Adjustment Coefficient</th>
<th>Rural</th>
<th>Urban</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coint Eq1</td>
<td>-0.098302</td>
<td>0.975117</td>
</tr>
<tr>
<td></td>
<td>(0.10981)</td>
<td>(0.14486)</td>
</tr>
<tr>
<td></td>
<td>[-0.89524]</td>
<td>[6.73130]</td>
</tr>
</tbody>
</table>

All figures in brackets (...) are standard errors and all figures in parenthesis [...] are t–values.

**Granger-causality test result**

The result showed that the rural market price of garri determined the urban market prices the rural market price with F values of 37.12 while the urban market price did not determine the rural market prices. This implies that there was a unidirectional causation between rural and urban markets and the rural markets were the dominant market for determining the price of garri in the State. This result further corroborates the findings of Ojiako et al. (2013) that concluded that the Granger causality runs one-way from the rural to the urban market for garri. The finding is also in line with that of Adenegan and Adeoye (2011) with the finding that rural tomato market granger cause urban tomato market in Oyo State and Emokaro and Ayantoyinbo (2014), that report a significant causality link between the rural and urban rice markets with rural rice markets occupying the leadership position in price formation and transmission in Osun State.

The result of the Wald test is presented in Table 7. The F values of 6.99 with probability value of 0.009 for the long-run integration, and 11.01 with probability of 0.001 for the short-run integration were significant at 1% The long-run and short-run hypotheses that garri market price are integrated are therefore accepted. This shows that there existed both long-run and short-run market integration between the rural and urban markets Thus,
changes in the prices in the rural market would cause the prices in the urban market to adjust immediately. A finding in line with that of Emokaro and Ayantoyinbo (2014) and Alufohai and Ayantoyinbo (2014), who concluded that changes in the price of rice and maize respectively in rural markets, would cause the price of rice and maize in urban markets in Osun State to adjust immediately.

Table 6: Granger causality test for urban and rural market price of *garri*

<table>
<thead>
<tr>
<th>Null Hypothesis</th>
<th>F-statistics</th>
<th>Probability Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Garri</em> urban does not Granger cause <em>garri</em> rural</td>
<td>2.35080</td>
<td>0.12748</td>
</tr>
<tr>
<td><em>Garri</em> rural does not Granger cause <em>garri</em> urban</td>
<td>37.1249</td>
<td>1.0E-08*</td>
</tr>
</tbody>
</table>

*Significant at 1% probability level.

Wald test results for market integration

Table 7: Wald test for *garri*

<table>
<thead>
<tr>
<th>Null hypothesis</th>
<th>F-statistics</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long-run market integration</td>
<td>6.995917</td>
<td>0.009*</td>
</tr>
<tr>
<td>Short-run market integration</td>
<td>11.01749</td>
<td>0.001*</td>
</tr>
</tbody>
</table>

*Significant at 1% probability level

CONCLUSION AND RECOMMENDATION

The study established that *garri* market in the study area had a prefect transfer of price information with a unidirectional price transmission from rural to urban and rural/urban long run price equilibrium. It is therefore recommended that rural markets which have been shown in this study to be the lead market should be the target of government developmental reforms. Furthermore, improvement in the dissemination of market information could be achieved by establishing information centres to facilitate adequate flow of information between markets.

REFERENCES


