Monthly Price Analysis of Cassava Derivatives in Rural and Urban Markets in Akwa Ibom State, Southern Nigeria

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Abstract

The study examined the price transmission and extent of market integration of yellow Garri and Fufu (fermented cassava tubers) in the rural and urban markets of Akwa Ibom State in Southern region of Nigeria. Average monthly prices (measured in naira per kilogram) of Garri and Fufu in the rural and urban markets were used in the analysis. The data was obtained from the quarterly publications of the Akwa Ibom State Agricultural Development Programme [AKADEP] (2013). The data covered January 2005 to June 2013. The trend analysis showed that, prices of Garri and Fufu in the rural and urban markets have exponential growth rates less than unity, which suggests possible co-movement of these prices in the study area. Also, the Pearson correlation coefficient generated for the pair of rural and urban prices of Garri and Fufu revealed significant linear symmetric relationships. The Granger causality test further revealed bi-directional relationships between the rural and urban price of Garri and Fufu in Akwa Ibom State, Nigeria. The results of the co-integration test revealed the presence of co-integration between the rural and urban prices of Garri. The theory of one price was tested for; in the Fufu markets and the result implies weak Fufu market integration in the study area. The results of the error correction model (ECM) confirm the existence of short run market integration between rural and urban prices of Garri in the study area. In addition, the result shows that, the price of Garri in urban market adjusted faster than that of the rural market once there is exogenous shock in the marketing system in the State. The estimated index of market connection (IMC) supported the high short run market integration between prices in rural and urban markets for Garri. Based on the findings, it is recommended that, the Akwa Ibom State government should continue to provide marketing infrastructures and reduced externality costs in order to improve the symmetric nature of information among participants in Garri and Fufu marketing in the state. Also, individuals and government should established market information units or centers and awareness programmes on mass media to facilitate efficient communication of market information in the state.

Keywords: Market, garri, fufu, price, integration, Akwa Ibom, Nigeria

1. Introduction

Cassava *(Manihot esculenta)* cultivation, procesing and consumption are integral parts of the culture of inhabitants of Akwa Ibom State in southern Nigeria. As such, cassava cultivation and processing

as well as marketing are undertaken in all Local Government areas of the state. The state is the highest cassava consuming state in Nigeria (Federal Ministry of Health, Abuja, Nigeria, 2004). However, recent studies in the area have indicated that, cassava farming population is fast aging; there is also increase in rural poverty and youth diverfication from agricultural activities, rural-urban migration and rural labour constrained as well as unemployment among youth (National Bureau of Statistics, 2011; Akpan, 2010; Akpabio, 2012). These identified problems need urgent proactive policy interventions. It is proposed that, energizing cassava production, processing and distribution is one of the viable policy options available (Presedential Initiatives on cassava, 2003). This assertion is based on the fact that, cassava plays a critical role in the self food sufficiency drive of the federal government. Contemporary economic thought perceived that, efficient pricing system can stimulate agricultural production. Price is crucial in determing efficient distribution of resources in a market system. Price also acts as indicator or signal for scarcity and surpluses which help farm firm response to changing market situations. Consumers' preference and producer rationing capability is modeled by price. Market failure will occur when the signalling and incentive functions of the price mechanism fail to operate optimally in the economy. In such case, resources will be inefficiently allocated due to imperfections in the market mechanism. This will lead to loss of economic and social welfare; such as increase in externality costs, information asymmetry among markets and prevalence of other social vices. In such situation, there is a clear economic case for government intervention in markets where some form of market failure is taking place. Hence, undersanding the price movement of agricultural commodities is one way of promoting farm resource use efficieny and curbing some of the spilled over vices such as unemployment. By implication, it means that, good and efficient pricing system will enhance cassava production, which in turn could help to correct some distorted situations in the economy. One way to assess the efficiency of pricing system in any economy is to analyse the price transmission and market integration mechanisms among tradeable commodities.

   Garri, Fufu and cassava chips (called edita iwa in Efik/Ibibio) are the most popular cassava derivatives in most parts of Nigeria including Akwa Ibom State (AKADEP, 2013). Garri; a roasted granule is the dominant cassava product and is widely accepted in both rural and urban areas of the state. The yellow Garri (Garri enriched with palm oil) is more popular than the white one (garri without palm oil). On the other hand, Fufu is a fermented cassava tuber that is usually stirred into a dough-like consistency or a paste and used as a complement to variety of soups. It is usually white and may be sticky depending on the species and extent of fermatation of cassava tubers used. Cassava fufu is tasteless on its own, but depends on the richness of the complementary soups or sauce to make the meal delicious. Fufu is eaten by taking a small ball but easily digestible of it in one's fingers and then dipping into an accompanying soup or sauce and subsequently swallow. Garri is the most widely traded, processed cassava product or derivative in the state. Almost 100% of cassava and its derivative produced in the state are consumed also in the state. In addition, it is estimated that, about 50% of cassava derivatives especially Garri, consumed in Akwa Ibom State are brought in from the neighboring states and the middle belt of Nigeria (AKADEP, 2013). This make Akwa Ibom State an important and suitable domain for experimenting any policy or programme related to cassava production and consumption in Nigeria. Due to uncertainties in supply and increasing demand for cassava derivatives in the state; the price of these commodities over the years has remained unstable. The price of cassava derivatives in the state has often been used as a reliable indicator of the strength of demand and supply of these commodities. Akintunde, Akinremi, and Nwauwa (2012) asserted that, agricultural prices serve as market signals of the relative scarcity or abundance of a given product and also serve as incentives to direct the allocation of farm resources. Consequently, prices of agricultural products vary from month to month and even from day to day due to seasonality, gestation period, pest and bargaining power of consumers among other factors. Prices also vary between alternative markets due to the arbitrage activities of participants. There is upward trend of prices of agricultural products in Nigeria. A survey conducted

by the Central Bank of Nigeria [CBN] in 2011 indicated that, the domestic retailed prices of seven out of the fourteen food items trended upward when compared with their respective levels in 2010.

Agricultural commodity price fluctuations among markets are normal phenomena across Nigeria. In spatially separated markets, when there is significant price difference between homogenous goods, such that the differences exceeded the transfer cost; the arbitrage activities will be stimulated. The arbitrageur will purchase commodities from lower-price markets and resale in higher-price markets. This is a situation where spatially separated markets are not integrated. On the other hand, market is integrated when there is co-movement or there exist a long-run relationship among prices due to the smooth transmission of price signals and information across spatially separated markets (Okoh & Egbon, 2005). Market integration could be perfect if price changes in one market are fully reflected in alternative markets (Goodwin & Schroeder, 1991).

Over the years there have been a number of studies on price transmission and market integration of foodstuffs in Nigeria's markets. Some of the major studies on this issue include: Adekanye (1988), Ejiga (1988), Dittoh and Breth (1994), Okoh (1999), Okoh and Akintola (2002), Okoh and Egbon (2005), and Akpan, Inimfon, and Samuel (2014) among others. Also, majority of these researches were conducted in the Western region of Nigeria (Dittoh & Breth, 1994; Okoh, 1999; Okoh & Egbon, 2005; Adenegan & Adeoye, 2011; Adeoye, Dontsop Nguezet, Badmus & Amao, 2011) and results were used to generalize for all regions in the country. This situation might give wrong signal to marketing policies for other regions in the country. To avert this phenomenon in South –South region, there is need to verify assertions postulated by studies conducted in western region and other regions of the country. Though subsequent attempts by Mafimisebi (2008), Adeoye *et al*. (2011), Akintunde *et al*. (2012), Abunyuwah (2012), Ifejirika, Arene, & Mkpado (2013) and Akpan *et al.,* (2014) have employed time series analysis, but there were no comparative results with the previous methodologies used in the country. The study tried to bridge this gap in agricultural price transmission study in the country by employing correlation, trend and time series analyses simultaneously and making comparative results.

Understanding market integration is important particularly in needs assessment as policy makers need to avoid over-estimating or under-estimating the ability of markets to respond to price or any exogenous shock. Market integration or price transmission helps to optimize resource use; increase farm incomes; widen commodity markets; promote growth of agro-based industries, encourage value addition and also create employment (Acquah & Owusu, 2012). The prevalence of spatial integrated markets also promotes production specialization among farmers and enhances economies of scale (Vollrath, 2003). Market integration provides the basic data for understanding how specific markets work which is the basis for marketing policies. In addition, since markets integration implies that a deficit or surplus in one market will be transmitted to other markets, an improvement in spatial integration of food markets will ensure regional balance among food-deficit and food-surplus regions in the country (Ghosh, 2011). The analysis of spatial market integration, thus, provides indication of competitiveness, the effectiveness of arbitrage, and the efficiency of pricing (Sexton, Kling, & Carman, 1991). Contrary, markets that are not integrated may convey inaccurate price signal that may result in distortion in producers' marketing decisions and inefficient product movement (Goodwin & Schroeder, 1991). It could also increase poverty level among low income earners in the society and negate government objectives on self-food sufficiency (Polaski, 2008; Akpan & Aya, 2009).

Akwa Ibom State government had initiated several agricultural programmes to boost the performance of the cassava sub-sector in the state. Such programmers like fertilizer subsidies, Fadama cultivation, agricultural credit and seed distribution programmes among others were meant to improve arable crop production in the state. As part of several ways to increase agricultural production and economic growth of the state, efficiency marketing policy based on sound empirical facts is one of the prerequisites. Hence, understanding the magnitude of cassava derivative price

transmission between rural and urban markets in the state will provide indispensable input to policy makers to formulate workable policies for the agricultural sector in the state. This area of research had not received wide empirical patronage among researchers in the region. As such, a study like this will provide useful literature and serve as basis to stimulate wider researches on agricultural price transmission in the region and the country at large.

1.1 Objective of the Study

The main objective of the study is to analyze the monthly price of cassava derivatives in rural and urban markets in Akwa Ibom State, Southern Nigeria. The specific objectives are:

➢ To examine the trends in price of cassava derivative (Garri and Fufu) in Akwa Ibom State.

➢ The study also aimed at examining the efficiency of information flow or price transmission in garri and fufu markets in the State.

➢ It also accessed the extent of market integration in the rural and urban prices for Garri and Fufu in the state.

1.2 Literature Review of Some Empirical Studies on Price Transmission and Market Integration in Nigeria

Several empirical investigations have dealt with agricultural price transmission and market integration of food commodities in Nigeria. For instance, Amusa (1997) in her study of the trend analysis of agricultural food prices in Nigeria reported that, food items such as vegetable oil, Garri, brown beans, ripe plantains, fresh tomatoes, green vegetables, onion bulbs, shelled melon seeds, experienced increase and fluctuations in their prices. Okoh and Egbon (2005) examined the integration of Nigeria's rural and urban foodstuffs markets. The study concludes that, the rural and urban foodstuffs markets are well integrated. The result further suggests that, the urban market price drives the rural market price. The size of the adjustment coefficient for the rural foodstuffs price reveals that, the speed of adjustment from disequilibrium was moderate. The persistence profile further showed that, it would take about five months for the effect of a shock on the market system to die out.   Similarly, Ohen, Abang, and Idiong (2007) studied the vertical and horizontal price linkages for live catfish in Nigeria. The price variables used in the analysis were non-stationary and therefore were made stationary by first difference. The Johansen co-integration analysis was used to test for the relationship between the prices. Results indicated that producer and export prices were co-integrated. Furthermore, the Granger causality Wald test suggested that, the retail prices do have a causal relationship with producer prices. The dynamic regression analysis of prices also revealed that, the markets for live catfish have strong price linkages and thus are spatially integrated.

In western Nigeria, Adeoye *et al.* (2011) examined the price transmission and market integration of banana and plantain in Oyo state, Nigeria. Six market links rejected their respective null hypothesis of no Granger causality (P>0.05), two of the market links exhibited bi-directional granger causality or simultaneous feedback relationship; while four market links exhibited uni-directional granger causality at 5% and 10% level of significance. Urban plantain market occupies the leadership position in the commodity price formation and transmission in the markets investigated. The Index of market connection or concentration (IMC) indicated that, the markets exhibits low short run integration. Still in the region, Adenegan and Adeoye *et al.* (2011) examined the level of tomato market integration in the rural and urban markets of Oyo State. Secondary data on tomato price spanning from 2003 to 2010 were sourced from Oyo State Agricultural Development Programme (OYSADEP). The results of the analyses revealed that, prices of tomato were stationary at their level. Also, the urban tomato market did not granger causes rural tomato market (P > 0.05), while rural tomato market granger causes urban tomato market (P< 0.05). None of the markets links exhibited bi -directional Granger causality or simultaneous feedback

relationship. Also, Ojiako, Ezedinma, Asumugha, and Nkan (2012) studied the spatial integration and price transmission in selected cassava products' (Lafun) markets in Nigeria. The study employed vector error correction model (VECM) methodology. The result revealed the presence of the long-run equilibrium following exogenous shocks in the markets. In addition, the result discovered unilateral Granger causality that runs from the rural to the urban market. The impulse response analysis revealed that, the rural price was more responsive to shocks emanating from the rural market, the effect of which was computed as 95.6% using the forecast error variance decompositions. The study further discovered that, the effects of rural prices' shock on urban price were very negligible at 3.2% after 10 weeks. The implication is that the rural market was the dominant market for determining the price of lafun in the short-run. The error correction model revealed significant causality link between the peripheral and central markets, suggesting a clear trend in price leadership.

Still in the western region, Akintunde *et al.,* (2012) studied the long run price integration of grains in Oyo state. Empirical results revealed that, the price series in all the markets were non-stationarity at their levels at 5% significance level. The integration test showed that, none of the markets examined had prices tied together in the long- run. The Index of market concentration (IMC) indicated that, the markets exhibits low short run market integration. In the South-South region, Akpan *et al.,* (2014) examined the price transmission and market integration of local and foreign rice in rural and urban markets of Akwa Ibom State. The findings showed that, price of local and foreign rice in rural and urban markets has constant exponential growth rate of 0.59% which suggests perfect co-movement for rural and urban prices of local and foreign rice in the study area. Also, the Pearson correlation coefficient matrix revealed that, the rural price of local and foreign rice has linear symmetrical relationships with their corresponding urban prices. The Granger causality test revealed bidirectional relationship between rural and urban price of local and foreign rice. The results of the co-integration test revealed the presence of co-integration between the rural and urban prices of local and foreign rice as well as support the hypothesis of perfect price transmission between the two markets. The results of the error correction model (ECM) also confirm the existence of the short run market integration between the rural and urban prices of local and foreign rice in the study area. In addition, the result shows that, the price of local rice in both rural and urban markets adjusted faster than prices of foreign rice once there is an exogenous shock in the marketing process of rice. The index of market connection (IMC) supports the high short run market integration between prices in rural and urban markets for local and foreign rice commodities and the quick adjustment of rural price of local rice in relative to rural price of foreign rice.

1.3 Limitation Spotted from the Reviewed Literature on Agricultural Commodity Price Transmission and Market Integration in Nigeria

➢ Most of these studies did not use comparative methods to ascertain the consistency of results (Okoh & Egbon, 2005; Adeoye *et al.,* 2011; Adenegan & Adeoye, 2011).

➢ Most of these researches were conducted in the western part of the country, there is need to explore the knowledge base of the subject matter in the South- South region of the country.

This study was design to specially fill these identified gaps in the literature. Price has important roles to play in the efficient production and distribution of agricultural commodities.

2. Method

2.1 Study Area and Data Source

The study was conducted in Akwa Ibom State, located in the coastal South-South region of Nigeria. The region is popularly called the Niger Delta region or the oil rich region of Nigeria. The state is

located between latitudes $4°32^1$ and $5°33^1$ north and longitudes $7°25^1$ and $8°25^1$ east. It has a total land area of areas of 7,246km^2. It is bordered on the east by Cross River State, on the west by Rivers State and Abia State, and on the South by the Atlantic Ocean. Akwa Ibom State has a population of about 3,902,051 (National Population Commission [NPC], 2006). The state is basically an agrarian society where crops like maize, okra, cassava, yam and rice are cultivated in large quantities. Politically and for ease of administration, the state is divided into 31 Local Government Councils or Areas; it has six distinct Agricultural Development Project (ADP) Zones. These are: Oron, Abak, Ikot Ekpene, Etinan, Eket and Uyo zones.

2.2 Source of Data

Secondary data were used in this study. The data came from the quarterly publication of the AKADEP (2013). It consisted of the average monthly retailed price in naira per kilogram of Garri and Fufu from sampled markets in the rural and urban areas of Akwa Ibom State. The study period covers the period January 2005 to June 2013. A total of 102 weeks' retailed average monthly prices (₦/Kg) of Garri and Fufu were used in the study.

2.3 Analytical Techniques

The study applied series of statistical and econometric techniques to test for the relationship between the rural and urban prices of Garri and Fofo in Akwa Ibom State. The tests applied include: the trend analysis, bivariate correlation analysis, Granger causality tests, co-integration and Error Correction Model (ECM) as well as Market Concentration Index. Each of the tests is explained vividly as shown below:

2.3.1 *The Trend Analysis of Average Monthly Retailed Prices of Garri and Fufu in Rural and Urban Markets in Akwa Ibom State, Southern Nigeria*

To investigate the nature of growth rate in prices of Garri and Fofo in rural and urban markets in Akwa Ibom State, we specified the exponential growth rate equation as thus:

$$P_t = b_o e^{bt} e^{ut} \tag{1}$$

$$log_e P_t = b_0 + b_1 t + U_t \tag{2}$$

To ascertain whether the growth rate in prices of Garri and Fufu in the rural and urban markets actually increase at accelerated or decelerated rates over the period considered, the quadratic exponential trend equation was specified as thus:

$$log_e P_t = b_o + b_1 t_1 + b_2 t_2^2 + u_t \tag{3}$$

If $b_2 > 0$; the price variable investigated had accelerated growth rate: when $b_2 < 0$; the price variable has decelerated growth rate over time. In this study, "P_t" was represented by:

$P_{1t} = Average\ monthly\ Price\ of\ yellow\ Garri\ in\ rural\ market\ measured\ in\ naira/Kg$

$P_{2t} = Average\ monthly\ Price\ of\ yellowGarri\ in\ Urban\ market\ measured\ in\ naira/Kg$

$P_{3t} = Average\ monthly\ Price\ of\ Fufu\ in\ rural\ market\ measured\ in\ naira/Kg$

$P_{4t} = Average\ monthly\ Price\ of\ Fufu\ in\ urban\ market\ measured\ in\ naira/Kg$

$t = Time\ trend, i.e., 1, 2, 3, …, 103$

The exponential growth rate equation was adopted in this study to investigate the nature of growth in prices of Garri and Fufu in rural and urban markets because, these cassava derivatives have continuously shown seasonal pattern of short-term price instability especially during the off season in Akwa Ibom State (Akpan & Aya, 2009). The volatility in price of these cassava derivatives has been attributed to several factors including variances in bargaining power among consumers, cyclical income fluctuations among sellers and consumers, natural shocks such as flood, pests, diseases, and inappropriate response by farmers to price signals (Gilbert, 1999; Udoh & Akpan, 2007; Adebusuyi, 2004). Based on these observations, it is assumed that, changes in prices of these cassava derivatives should be tested in a non-linear form in Akwa Ibom State.

2.3.2 *Pearson Correlation Matrix of Average Monthly Retailed Prices of Garri and Fofo in Rural and Urban Markets in Akwa Ibom State in Nigeria*

To test for the symmetrical and linear relationship between rural and urban prices of Garri and Fofo in Akwa Ibom State, the Pearson correlation coefficients were estimated. The formula is as described below:

$$P_r = \frac{n \sum P_{1t} P_{2t} - (\sum P_{1t})(\sum P_{2t})}{\sqrt{\{n \sum P_{1t}^2 - (\sum P_{1t})^2\}\{\sum P_{2t}^2 - (\sum P_{2t})^2\}}} \tag{4}$$

Where, "Pr" is the correlation coefficient between urban and rural market prices of Garri and Fofo in the study area. A significant relationship between the rural and urban prices of Fofo and Garri in the area will suggest perfect price transmission between the two markets; while insignificant association suggests otherwise.

2.3.3 *Bilateral Granger Causality Test on Average Monthly Retailed Prices of Fofo and Garri in Rural and Urban Markets in Akwa Ibom State, Southern Nigeria*

Granger causality test is one of the important econometric tools used to determine whether past change in time series variable say "X" has impact on the current variable "Y" or whether the relation works in the opposite direction (Oyatoye, Arogundade, Adebisi, & Oluwakayode, 2011). The Granger causality test is a statistical hypothesis test for determining whether one time series is useful in forecasting another. A time series *X* is said to Granger-cause *Y* if it can be shown, usually through a series of t-tests and F- test on lagged values of *X* (and with lagged values of *Y* also included), that those *X* values provide statistically significant information about future values of *Y* (Granger,1969). As usual, we use the term "Granger-cause" when the historical values for one time series contain additional information that is useful in explaining and predicting another time series (Baumöhl & Výrost, 2010). If a time series is a stationary process, the test is performed using the level values of two (or more) variables. If the variables are non-stationary, then the test is done using first (or higher) differences. To determine the number of lags (and to control for serial correlations) in a model, the Akaike, Schwarz or Hannan-Quinn information criteria are generally applied (Baumöhl & Výrost, 2010). This test assumes that, the information relevant to the prediction of X and Y is contained solely in the time series data on these variables (Gujarati & Porter, 2009). In this study, the bilateral Granger Causality tests were conducted on the average monthly retailed prices of Garri and Fofo in urban and rural markets in Akwa Ibom State. The primary model in Vector Autoregressive Regression forms are represented as thus:

$$\begin{cases} \Delta LnP_{1t} = \beta_0 + \beta_1 \sum_{i=1}^{n} \Delta LnP_{1t-1} + \beta_2 \sum_{i=1}^{n} \Delta LnP_{2t-1} + \varepsilon_{1t} & (5) \\ \Delta LnP_{2t} = \delta_0 + \delta_1 \sum_{i=1}^{n} \Delta LnP_{2t-1} + \delta_2 \sum_{i=1}^{n} \Delta LnP_{1t-1} + \varepsilon_{2t} & (6) \end{cases}$$

$$
\left\{
\begin{array}{ll}
\Delta LnP_{3t} = \gamma_0 + \gamma_1 \sum_{i=1}^{n} LnP_{3t-1} + \gamma_2 \sum_{i=1}^{n} \Delta LnP_{4t-1} + \varepsilon_{3t} & (7) \\
\Delta LnP_{4t} = \alpha_0 + \alpha_1 \sum_{i=1}^{n} \Delta LnP_{4t-1} + \alpha_2 \sum_{i=1}^{n} \Delta LnP_{3t-1} + \varepsilon_{4t} & (8)
\end{array}
\right\}
$$

For equation 5 and 6, there is bilateral Granger causality from urban markets price of Garri to rural market price of Garri, if $\beta_2 \neq 0$ and $\delta_2 = 0$. Similarly, there is Granger causality from the rural market price to urban market price of Garri if $\beta_2 = 0$ and $\delta_2 \neq 0$. The causality is considered as mutual or bidirectional if $\beta_2 \neq 0$ and $\delta_2 \neq 0$. Finally, there is no link between average monthly price of Garri in rural markets and average monthly price of Garri in urban markets if $\beta_2 = 0$ and $\delta_2 = 0$. The same interpretations follow for equations 7 and 8. The variables are as defined previously in equation (3). A bidirectional Granger causality test indicates the presence of market integration or perfect price transmission between prices of rural and urban markets for Garri and Fufu in Akwa Ibom State.

2.3.4 Co-integration *Test for Average Monthly Retailed Prices of Garri and Fofo in Rural and Urban Markets in Akwa Ibom State, Southern Nigeria*

The concept of co- integration as developed by Granger (1981) involved the determination of the static or long-run associations among non-stationary time series. If the geographically separated markets are integrated, then there exists an equilibrium or long run relationship among these markets (Goodwin & Schroeder 1991; Gonzalez-Rivera & Helfand, 2001; Sexton *et al.*, 1991). The study applied the Engle and Granger two-step technique and Johansen co-integration approach to examine the co-integration relationship between rural and urban market prices of Garri and Fufu in Akwa Ibom State. Hence, the time dependent rural price equation for Garri and Fufu is specified as follows:

$$
LnP_{1t} = \gamma_0 + \gamma_1 \sum_{i=1}^{n} LnP_{2t} + U_{1t} \tag{9}
$$

$$
LnP_{3t} = \varphi_0 + \varphi_1 \sum_{i=1}^{n} LnP_{4t} + U_{2t} \tag{10}
$$

Following the Granger Representation Theorem, we specify the error correction model (ECM) model for the co-integrating series in the study. The general specification of the error correction model (ECM) specified for the rural price of Garri and Fufu in the study area is shown below:

$$
\Delta LnP_{1t} = \gamma_0 + \gamma_1 \sum_{i=1}^{n} \Delta LnP_{1t-1} + \gamma_2 \sum_{i=1}^{n} \Delta LnP_{2t-i} + \gamma_3 ECM_{t-1} + U_{1t} \tag{11}
$$

$$
\Delta LnP_{3t} = \vartheta_0 + \vartheta_1 \sum_{i=1}^{n} \Delta LnP_{3t-1} + \vartheta_2 \sum_{i=1}^{n} Ln\Delta P_{4t-i} + \vartheta_3 ECM_{t-1} + U_{2t} \tag{12}
$$

The variables are as defined previously in equation (3), and coefficients (γ_3) and (ϑ_3) of the $ECM_t (-1 < \gamma_3, \vartheta_3 < 0)$ measures the deviations from the long-run equilibrium in period $(_{t-1})$ in both

P_{1t} and P_{3t}. In order to obtain a parsimonious dynamic ECM for the rural price equation, the study adopted Hendry's (1995) approach in which an over parameterized model is initially estimated and then gradually reduced by eliminating insignificant lagged variables until a more interpretable and parsimonious model is obtained.

2.3.5 *Index of Market Connection (IMC)*

The index of market connection (IMC) was used to measure the degree of price transmission or price relationship between integrated markets. Following Oladapo, Momoh, Yusuf, and Awoyinka (2007) methodology, the relationship between the price of Garri and Fufu in rural and urban markets is given by equations below:

$$P_{1t} = \delta_0 + \delta_1 P_{1t-1} + \delta_2(P_{2t} - P_{2t-1}) + \delta_3 P_{2t-1} + \varepsilon_{1t} \qquad (13)$$

$$P_{3t} = \varphi_0 + \varphi_1 P_{3t-1} + \varphi_2(P_{4t} - P_{4t-1}) + \varphi_3 P_{4t-1} + \varepsilon_{2t} \qquad (14)$$

Then IMC = δ_1/δ_3 for Garri market and = φ_1/φ_3 for Fofo market. *When*

IMC < 1, implies high short run market Integration; IMC > 1, implies low short run market Integration; IMC = ∞, implies no market integration; IMC = 1, implies high or low short run market integration. Variables are as defined in equation 3.

3. Results and Discussion

In time series analysis, stationary of series is examined by the unit root tests. One of the most commonly used tests in the literature to ascertain the stationary levels of series is Augmented Dicker Fuller (ADF) test developed by Dickey and Fuller in (1979). The result of the ADF unit root tests as presented in Table 1 show that, Garri prices were non-stationary at levels but stationary at first difference.

Table 1. Result of the unit root test for price variables of Garri and Fufu used in the analysis

Logged Variables	Augmented Dicker Fuller Test for unit root					
	With Constant			Constant and Trend		
	Level	1st diff.	OT	Level	1st diff.	OT
LnP_{1t}	-2.448	-12.58**	1(1)	-3.548	-12.53**	1(1)
LnP_{2t}	-2.569	-13.79**	1(1)	-3.783	-13.73**	1(1)
LnP_{3t}	-4.115**	-	1(0)	-5.915**	-	1(0)
LnP_{4t}	-4.976**	-	1(0)	-6.587**	-	1(0)
1%	-3.50	-3.50		-4.05	-4.50	

Note: OT means order of integration. Critical value (CV) is defined at 1% significant level and asterisks ** represent 1% significance level. Variables are as defined in equation 3

   The result implies that, the Garri price variables should be tested for the existence of co-integration (Johansen, 1988; Johansen & Juselius, 1990). Contrary, Fofo price variables were stationary at levels implying that; co-integration might not exist between them. It also implies that, Fufu price variables can be specified at level without the risk of obtaining spurious regression.

3.1 Descriptive Analysis of Average Monthly Prices of Garri and Fufu in Akwa Ibom State (from January 2005 to June 2013)

Table 2. Descriptive statistic of price variables used in the model

Parameters	Garri Price		Fofo Price	
	Rural Market (N/Kg)	Urban Market (N/Kg)	Rural Market (N/Kg)	Urban Market (N/Kg)
Mean	89.56	89.84	66.87	72.40
Median	78.23	79.13	61.19	67.72
Minimum	48.34	42.68	33.33	32.91
Maximum	185.54	192.90	129.01	145.57
Standard deviation	32.69	32.32	20.45	23.05
Coefficient of Variation	0.37	0.36	0.31	0.32
Skewness	1.17	1.21	0.79	0.07
Kurtosis	0.76	1.05	0.99	1.15

Note: Computed by authors, and prices are expressed in nominal terms. (1 dollar = 155.75 Naira as of 30th January, 2014)

The descriptive statistics of price variables used in the analyses is shown in Table 2. The average prices of Garri in rural and urban markets in Akwa Ibom State were ₦89.56/kg or about $0.58 and ₦89.84/kg ($0.58) respectively. Also, the average prices of Fufu in the study area were ₦66.87/kg ($0.43) and ₦72.40/kg ($0.47) in rural and urban markets respectively. In addition, coefficients of variability in prices of Garri in rural and urban markets were 37% and 36% respectively. For Fofo, it stood at 31% and 32% for rural and urban markets respectively.

3.2 Exponential Trend Analysis of Prices of Garri and Fufu in Rural and Urban Markets in Akwa Ibom State (2005 to 2013)

The exponential trend equation for each of the price variables specified in equation 3 is presented in Table 3. The result also contains the calculated exponential growth rate for each of the price variables and the nature of such growth rate over time (i.e. from 2005 to 2013). The result revealed that, trends in prices of Garri and Fufu in rural and urban markets in Akwa Ibom State showed positive significant relationship with time. This implies that, changes in prices of Garri and Fufu in rural and urban markets in Akwa Ibom State are influence by time. Price of Garri in rural and urban market has exponential growth rates of 0.75% and 0.72% respectively. In the similar way, about 0.66% and 0.63% exponential growth rates were identified for rural and urban price of Fufu respectively. These results suggest that, dispersion in prices of Garri and Fufu in rural and urban markets in the study area might be insignificant. This suggests the prevalence of perfect price transmission or market integration between rural and urban price of Garri and Fufu in Akwa Ibom State. The nature of exponential growth in each price variable investigated showed that, over time the price of Garri in rural and urban markets increase significantly in the state. On the other hand, prices of Fufu in rural and urban markets did not exhibit significant relationships with increase in time.

Table 3. Exponential trend analysis of monthly average prices of
Garri and Fufu in rural and urban markets in Akwa Ibom State (2005 to 2013)

Variables	LnP_{1t}	LnP_{2t}	LnP_{3t}	LnP_{4t}
Constant	4.05(80.49)***	4.07 (80.67)***	3.82 (85.30)***	3.94 (80.16)***
Time	0.007(8.75)***	0.007 (8.48)***	0.006 (8.66)***	0.006 (7.58)***
F- cal.	76.64***	71.82***	74.90***	57.52***
R-square	0.434	0.418	0.428	0.365
Exponential GR (%)	**0.75**	**0.72**	**0.66**	**0.63**
Nature of Growth Rate				
Constant	4.16(55.14)***	4.19 (55.70)***	3.87 (56.76)***	3.88 (52.15)***
Time (b_1)	0.0012 (0.35)	0.0002 (0.05)	0.004 (1.29)	0.008(2.48)**
Time (b_2)	6.074e-05(1.91)*	6.83e-05 (2.15)**	2.51e-05(0.87)	-1.97e-05 (-0.63)
F- cal.	41.15***	39.53***	37.74***	28.78***
R-square	0.454	0.444	0.433	0.368
Inference	**Accelerated GR**	**Accelerated GR**	**Decelerated GR**	**Decelerated GR**

Note: Values in bracket represent t-values. The asterisks *, ** and *** represent 10%, 5% and 1% significance levels respectively. Variables are as defined in equation 3.

To further verify the above result graphically; Figure 1 depicts the linear trend in prices of Garri in rural and urban markets in Akwa Ibom State. The price trends show undulated fluctuations throughout the study period. Both prices experienced steady increase from January to May (period of dry season) from 2005 to 2011. This trend was however different in 2012 and 2013. On average the rural and urban price of Garri exhibited similar pattern of fluctuations in the study period; which further suggests that both price move together in the period of investigation.
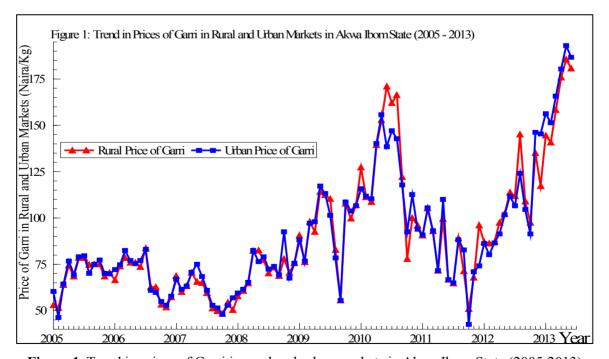

Figure 1: Trend in Prices of Garri in Rural and Urban Markets in Akwa Ibom State (2005 - 2013)

Figure 1. Trend in prices of Garri in rural and urban markets in Akwa Ibom State (2005-2013)
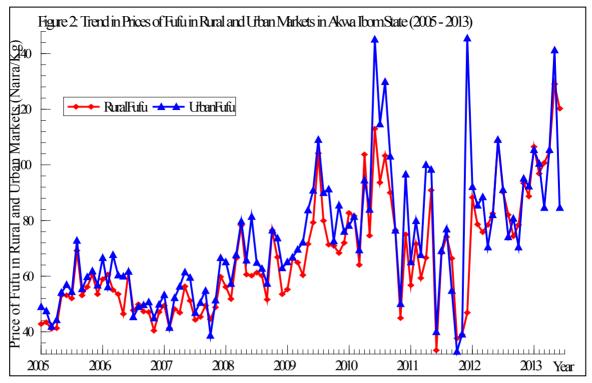
Figure 2. Trend in prices of Fufu in rural and urban markets in Akwa Ibom State (2005-2013)

Figure 2, shows the linear trend in price of Fufu in rural and urban markets of Akwa Ibom State. The result also showed undulated fluctuations during the period of investigation. The extent of dispersion between these two prices is conspicuous compare to trend in Garri prices. The pattern of fluctuation in prices of Fufu was almost similar for urban and rural markets. In some few months, there were noticeably deviations of rural market price from urban market price. In this instance, the inference based on the nature of fluctuations in the price of Fufu in the rural and urban markets, might point to the prevalence of weak price transmission mechanism or market integration between the two prices. The trend analysis results corroborate the research finding of Amusa (1997) and Akpan *et al.,* (2014) on different food stuffs in Nigeria.

3.3 Pearson Correlation Matrix of Average Monthly Prices of Garri and Fufu (₦/Kg) in Rural and Urban Markets in Akwa Ibom State, Southern Nigeria

The linear and symmetric relationship in the average monthly price of Garri and Fufu in rural and urban markets in Akwa Ibom State was captured by the Pearson correlation coefficient. Table 4 shows the correlation matrix of rural and urban prices of Garri and Fufu from January 2005 to June 2013 in Akwa Ibom State, Southern Nigeria. The result indicates that, prices of Garri and Fufu in the rural market have positive significant (at 1% probability level) associations with their corresponding prices in the urban markets. This means that, the price of Garri in rural market has a strong linear relationship with its own price in urban market in Akwa Ibom State. The same result was also applicable to the Fufu market in the study area. These results imply that, there is existence of price integration or good price transmission mechanism between the rural and urban markets for cassava derivatives in Akwa Ibom State, Nigeria. It could also be deduced from the result that, factors that influence price of Garri and Fufu in rural markets are similar to those in urban markets in Akwa Ibom State. Akpan *et al.,* (2014) has reported similar result for grain crops in Southern Nigeria.

Table 4. Pearson correlation matrix for prices of
Garri and Fufu in Rural and Urban Markets in Akwa Ibom State

Variables	P_{1t}	P_{2t}	P_{3t}	P_{4t}
P_{1t}	1.000	0.973 (0.000)***	0.848 (0.000)***	0.752 (0.000)***
P_{2t}		1.000	0.842 (0.000)***	0.696 (0.000)***
P_{3t}			1.000	0.833 (0.000)***
P_{4t}				1.000

Note: variables are as expressed in equation 3. Values in bracket are probabilities of t-values; while values not in brackets are bi-variate correlation coefficients.

3.4 Bilateral Granger Causality Test for Prices of Garri and Fufu in Rural and Urban Markets in Akwa Ibom State

The long run causality relationship between rural and urban prices of Garri and Fufu was investigated in Akwa Ibom State. The result of the analysis is presented in Table 6. The result in Table 5 shows the optimal lag period used in the causality equation specified in equations 5 to 9. The asterisks below indicate the best (that is, minimized) values of the respective information criteria, AIC = Akaike criterion, BIC = Schwarz Bayesian criterion and HQC = Hannan-Quinn criterion.

Table 5. The optimal Lag length for the causality equation

Lag	Loglikelihood	P(LR)	AIC	BIC	HQC
1	393.084	-	-7.609*	-6.973*	-7.352*
2	405.167	0.086	-7.529	-6.467	-7.099
3	421.994	0.006	-7.546	-6.059	-6. 945

The corresponding lag length indicates the best lag length for generating a more parsimonious causality equation for the specify series. The result of the exercise indicated that lag 1 was more appropriate for the causality equations. This implies that the causality equations generated were done by using one period lagged of the variables involved. The estimated results are presented in Table 6.

Table 6. The vector autoregressive regression Granger causality estimates

Hypotheses	Lag	Sample size	F-Statistic	Prob.	Decision
ΔLnP_{1t} does not Granger Cause ΔLnP_{2t}	1	100	6.167	0.003***	Rejected
ΔLnP_{2t} does not Granger Cause ΔLnP_{1t}	1	100	2.837	0.063*	Rejected
LnP_{3t} does not Granger Cause LnP_{4t}	1	101	28.895	0.000***	Rejected
LnP_{4t} does not Granger Cause LnP_{3t}	1	101	53.334	0.000***	Rejected

Note: Variables are as defined in equation 3. Asterisks * and *** mean significant at 10% and 1% probability levels respectively.

The result in Table 6 suggests that, there is evidence of bi-directional Granger causality between urban price and rural price of Garri and Fufu from January 2005 to June 2013 in Akwa Ibom State. The result means that, the causality runs from urban market to rural market and vice versa. Alternatively, the result implies that, urban price of Garri and Fufu impact positively on their respective rural prices; and in the same manner the average monthly rural price of Garri and Fufu influence the urban prices. The result could also be interpreted this way; that the previous price in urban market significantly predicted the current price in the rural market for Garri and Fofo in Akwa Ibom State, Southern Nigeria. Furthermore, the previous price in rural market significantly determined the current price in the urban market for Garri and Fofo in Akwa Ibom State. The presence of the bi-directional Granger Causality between the rural and urban prices of Garri and Fufu indicate that, the rural and urban market are co-integrated or there is a perfect price transmission mechanism between the two markets in Akwa Ibom State. The flow of markets information between the rural and urban markets for Garri and Fufu segment in this situation could be described as symmetric because the effect of externality costs are not significant. In addition, the result suggested a perfect competitive market structure for Garri and Fufu markets in the study area. This result is in agreement with the research reports of Ohen *et al.* (2007), Adeoye *et al.* (2011), Ojiako *et al.* (2012), and Akpan *et al.* (2014).

3.5 Co-Integration Model for Prices of Garri in Rural and Urban Markets in Akwa Ibom State, Southern Nigeria

The co-integration test result using Engle and Granger two-step technique on equations 9 and 10 is presented in the lower portion of Table 7. The results show that at 1% probability level of significance, the Engle–Granger co-integration tests rejected the null hypothesis of no co-integration for equation 9. (Note equation 10 was not tested because prices of Fufu in both rural and urban markets were stationary at level). The result for equation 9 implies that, there is a long run equilibrium relationships between the rural and urban price of Garri (and vice versa) in Akwa Ibom State. The upper part of Table 7 presents the long run estimates for equation 9 and it reverse equation.

Table 7. Long run relationships between prices of
Garri and Fofo in urban and rural markets in Akwa Ibom State (2005 – 2013)

Variable	$LnP_{1t} = f(LnP_{2t})$	Variable	$LnP_{2t} = f(LnP_{1t})$	Variable	$LnP_{3t} = f(LnP_{4t})$
Constant	0.0464 (0.479)	**Constant**	0.1599 (1.695)*	**Constant**	0.5757 (2.895)***
LnP_{2t}	0.9885 (45.49)***	LnP_{1t}	0.9650 (45.49)***	LnP_{4t}	0.8460 (18.07)***
F-cal	2069***	**F-cal**	2069***	**F-cal**	326.48***
R²	0.954	**R²**	0.954	**R²**	0.766
DW- test	1.716	**DW- test**	1.760	**DW- test**	1.634
ADF test for errors from above equations					
ECM$_t$	-8.932***	**ECM$_t$**	-8993***		

Note: the equation for the ADF test include constant and trend. Critical value at 1% = -4.05, Values in bracket represent t-values. The asterisk *** represents 1% significance level. Variables are as defined in equation 3

The third equation in Table 7 test for the theory of one price in Fufu market in the study area. The result for Fufu market indicates that, the price transmission between the rural and urban markets might not exhibit perfect symmetric relationship. Since the long run market integration coefficient is not unity (i.e. 0.8460), we suggested that, there is evidence of weak long run price integration or price transmission mechanism between rural and urban market price of Fufu in Akwa Ibom State. The Johansen co-integration test result for equations 9 and it reversed equation revealed that, the trace and maximum eigenvalue were significant at first rank level. The result as presented in Table 8 shows that, the calculated trace test and maximum eigenvalue test statistics are greater than the critical values at 1% probability level. These further confirm the presence of at least one co-integration relationship between the specified price variables in the two equations.

Table 8. Results of Johansen Cointegration Test (unrestricted constant)
for equations $LnP_{1t} = f(LnP_{2t})$ and $LnP_{2t} = f(LnP_{1t})$

Rank	EigenValue	Trace test	p-value	Lmax. test	p-value
0	0.45416	66.830	[0.0000]	61.148	[0.0000]
1	0.05479	5.691	[0.0170]	5.691	[0.0170]

Note: Unrestricted constant; Log-likelihood = 448.259 (including constant term: 161.633)

3.6 Error Correction Models for Rural and Urban Prices of Garri in Akwa Ibom State

The presence of co-integration among specified variables in equation 9 demanded the specification of the Error Correction Model. Table 9 contains estimates of ECM generated for equation 11; while Table 10 contains estimates of ECM generated for the reverse of equation 11. The essence was to determine the speed of adjustment of rural and urban price of Garri to exogenous shock in the marketing system in the state. For equation 11, the coefficient of the error correction terms is negative (i.e. -0.663) and statistically significant at 1% probability level.

Table 9. ECM estimates for $LnP_{1t} = f(LnP_{2t})$

Variable	Coefficient	Standard Error	t- value
Constant	0.00127	0.00679	0.186
ΔLnP_{1t-1}	-0.15281	0.09797	-1.569
$\Delta Ln\ LnP_{2t}$	0.89342	0.03859	23.10***
$\Delta Ln\ LnP_{2t-1}$	0.15042	0.09587	1.569
ECM$_{t-1}$	-0.66292	0.12620	-5.253***

R^2 = 0.861; F-cal. = 147.3*; DW = 1.905; Normality test = 42.238***; RESET test = 0.076(0.784)**

Note: Values in bracket represent t-values. The asterisks * and *** represent 10% and 1% significance levels respectively. Variables are as defined in equation 3

The result validates the existence of the long-run equilibrium relationship between the rural and urban market price of Garri in Akwa Ibom State. The result further implies that, the rural price of Garri is sensitive to departure from its equilibrium states or levels in the previous periods. The slope coefficient of the error correction term (-0.663) represents the speed of adjustment and also is consistent with the hypothesis of convergence towards the long-run equilibrium once the rural price of Garri equation is shocked. The diagnostic test for the ECM model for equation 10 revealed R^2

value of 0.861 which means that the specified explanatory variables explained about 86.10% of the adjusted total variations in the rural price of Garri in Akwa Ibom state, Nigeria. The F-statistic of 147.3 is significant at 1% probability level, indicating that the R^2 is significant and this implies that the equation has goodness of fit.

Table 10. ECM estimates for $LnP_{2t} = f(LnP_{1t})$

Variable	Coefficient	Standard Error	t- value
Constant	0.00105	0.00695	0.151
ΔLnP_{2t-1}	-0.18308	0.09872	-1.854*
$\Delta Ln\ LnP_{1t}$	0.94206	0.04046	23.29***
$\Delta Ln\ LnP_{1t-1}$	0.16272	0.09961	1.634
ECM_{t-1}	-0.69454	0.13300	-5.220***

R^2 = 0.869; F-cal. = 157.9*; DW = 1.95 Normality test = 29.233***; RESET test = 0.0231 (0.879)**

Note: Values in bracket represent t-values. The asterisks * and *** represent 10% and 1% significance levels respectively. Variables are as defined in equation 3.

For the urban price equation for Garri, the slope coefficient of the error correction term is (-0.6945) and is statistically significant at 1% probability level. The coefficients of the error correction term show the speed of convergence to the long run equilibrium as a result of shock in the urban price of Garri in the state. This indicates that, any disequilibrium in the long run price of Garri in the urban market would be corrected in the short run. The significant nature of the ECM implies that, the urban price of Garri will always react to bring stability in the rural price whenever there is significant variation in the rural price of Garri. About 66.29% of the rural price adjustment takes place within every month due to exogenous shock in the marketing system in Akwa Ibom State. Similarly, about 69.45% of the urban price adjustment takes place within every month due to exogenous shock in the marketing system in Akwa Ibom State. The result suggests that the urban price of Garri is strongly exogenous to rural price of Garri in Akwa Ibom State. By implication, movement in the rural price of Garri is significantly detected by urban price variation. The diagnostic tests for the ECM model for urban price of Garri revealed R^2 value of 0.869; this means that the explanatory variables contained in the equation explain about 86.90% of the total variations in the urban price of Garri in Akwa Ibom state, Nigeria. The F-statistic of 157.9 is significant at 1% probability level, indicating that, the equation has goodness of fit.

The empirical results revealed that, the long run model for rural and urban price of Garri in Akwa Ibom State converges to the postulate of the law of one price. The market integration coefficient for each of the equation is approximately unity. This confirms the existence of the long run market integration between prices in rural and urban areas for Garri market in Akwa Ibom State. The constant terms in the two long run equations give the picture of the transfer cost or the extent of price differential between the rural and urban market due to arbitrage activities. The result further revealed insignificant influence of the transfer cost in the marketing process of Garri in Akwa Ibom State. This perhaps suggests high efficiency in information transmission between rural and urban markets for Garri and improvement in the marketing infrastructures in the state.

For the short run model, the result revealed that, the behavior of rural and urban price of Garri also tended to the postulate of the law of one price. The coefficient of urban price was significant and also approaching unity for urban and rural price Garri. These results imply that, in the short run, there is high degree of market integration between rural and urban prices of Garri in the State. Also,

the degree of adjustment of the rural and urban prices of Garri to previous equilibrium once there is exogenous shock is 66.30% and 69.45% respectively. This means that, it will take about 6 weeks and 5 weeks 5 days for the rural and urban price of Garri respectively to adjust fully to equilibrium position in the long run. The result shows that, the urban price of Garri appears to respond faster relative to rural price once there is an exogenous disturbance in the marketing process. Similar findindg have been reported by several researchers on different food stuffs in Nigeria. They include Okoh and Egbon (2005), Akintunde *et al*. (2012), and Akpan *et al*. (2014).

3.7 Market Connection Index (MCI) for Garri in Akwa Ibom State, Southern Nigeria

The index of market connection (IMC) was estimated for Garri market only since there was evidence of co integration between the rural and urban price of Fofo in the State. The estimates of IMC regression is shown in Tables 11. The estimated IMC was 0.517 or 51.70%.

Table 11. MCI for $LnP_{1t} = f(LnP_{2t})$

Variable	Coefficient	Standard Error	t- value
Constant	-0.23879	2.18200	-0.109
P_{1t-1}	0.34162	0.09255	3.691***
$(P_{2t} - P_{2t-1})$	0.88088	0.04566	19.292***
P_{2t-1}	0.66122	0.09443	7.002***
R^2 = 0.922; F-cal. = 382.5*; DW = 1.970**			

Note: Values in bracket represent t-values. The asterisk *** represent 1% significance level. Variables are as defined in equation 3.

The IMC for Garri market was less than unity. This implies that, there is high short run market integration between the price of Garri in rural and urban markets in the state. This however confirms the ECM results discussed previously and further substantiates the presence of perfect price transmission mechanism in the short run between price of Garri in rural and urban markets in Akwa Ibom State. This corroborates the findings of few researches in Nigeria. For instance Adeoye *et al*. (2011), Akintunde *et al*. (2012), and Akpan *et al*. (2014) have reported similar results for different stuffs in Western and Southern region of the country.

4.0 Summary and Recommendations

The study used statistical and econometric techniques to analyze the price transmission between the rural and urban prices of Garri and Fofo (Cassava derivatives) in Akwa Ibom State, Southern Nigeria. Results revealed that, prices of Garri and Fufu in the rural and urban markets have positive relationships with time and exponential growth rates that is less than unity. The graphical analysis showed that, the rural and urban prices of Garri co-moved together with minimal deviation within the period under consideration. However, there were noticeably deviations in trends of rural and urban prices of fufu in the study area. The result suggested the prevalence of efficient price transmission between the rural and urban market for Garri and perhaps less efficient for Fufu in Akwa Ibom State. Also, the Pearson correlation coefficient matrix revealed that, the rural price of Garri and Fufu have linear symmetric relationships with their corresponding urban prices in the study area. The relationship was stronger in Garri than in Fufu. The result connotes the existence of symmetric market information flow between the rural and urban markets for Garri and Fufu in the

state. The Granger causality test revealed bi-directional relationship between the rural and urban price of Garri and Fufu in Akwa Ibom State, Nigeria. This also suggested that, the price transmission mechanism between the rural and urban markets for Garri and Fufu is efficient; and has high tendency for market integration. The results of the co-integration test revealed the presence of co-integration between the rural and urban prices of Garri. The co-integration between the rural and urban prices of Fufu was not tested for, since both prices were stationary at their respective levels. The coefficients of the price variable in the co-integration equations for Garri market converges to unity which connotes the presence of market integration in the long run and one price theory. Contrary, the coefficient of market integration for Fufu was far from unity; which suggests weak market integration and significant arbitrage activities. The result of the short run model or ECM confirms the existence of short run market integration between rural and urban prices of Garri in the study area. The result further revealed that, the urban price of Garri adjusted faster than the rural price once there is exogenous shock in the marketing process in Akwa Ibom State. The estimation of index of market connection (IMC) supported the high short run market integration between prices in rural and urban markets for Garri.

Based on the finding, it is recommended that, the Akwa Ibom State government should continue to improvise marketing infrastructures as this will improve the symmetric nature of information among markets in the state. The presence of excessive externality costs such as the transportation costs, security levies and market charges could distort the free flow of Garri and Fufu in rural and urban markets and bring about significant price differential between the two markets in the state; thus government should endeavor to dismount all sources of such costs in the state. The Akwa Ibom State government should established market information centers and awareness programmes on mass media (such as radio, television and newspaper), to facilitate efficient communication among markets in the state.

Acknowledgements

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