IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS)
e-ISSN: 2319-2380, p-ISSN: 2319-2372. Volume 2, Issue 6 (Mar. - Apr. 2013), PP 77-86
www.iosrjournals.org

Co-integration and Market Integration: An Application to Raphia Palm Wine Markets in Niger Delta Area of Nigeria

Adakaren Blessing[1], Chukwuemeke John Arene[2], Sonny Angus Nnaemeka Dixie Chidebelu[3]

Agricultural Economics Division, Nigerian Institute for Oil Palm Research (NIFOR), Benin City, Edo State, Nigeria[1].
Department of Agricultural Economics, University of Nigeria, Nsukka, Nigeria[2].
Department of Agricultural Economics, University of Nigeria, Nsukka, Nigeria[3].

Abstract: *The study was designed to examine market integration with the help of co-integration test on the price of Raphia palm wine (RPW) in the Niger Delta Area of Nigeria using evidences from Bayelsa, Delta and Rivers States of Nigeria. Issues considered included; the determination of the existence and level of RPW inter-market price dependences; description of short-run interactions through cross-market lagged price changes; evaluation of long-run responses to contemporaneous price changes in the RPW market; and speed of price adjustments to long-run equilibrium. Multi-stage random sampling was used to select the markets used for the study. Primary data was used for the study while data analysis was achieved using co-integration test by Johansen and Jeselius (1990) applied to four daily market prices of two (rural and urban) Raphia palm wine markets in each of the selected States. Results obtained from the study revealed that price signals and information were transmitted smoothly, but slowly across the markets. The short-run estimates indicated that the rural markets adjusted to price changes in the urban markets within each State, while at the State level, it was observed that Delta and Rivers States did all the price adjustment. The long-run responses to exogenous price changes showed that a one percent increase in the urban prices of RPW within the States resulted in a corresponding decrease in the rural price of RPW by 2.5%, 1.05% and 1.27% for Bayelsa, Delta and Rivers States respectively. While at State level, a 1% increase in price of RPW in Bayelsa State would cause a decrease in price of RPW in Delta and Rivers States' prices by 1.37% and 6.8% respectively. The speed of price adjustment between the short-run and long-run RPW prices measured by ECM within the States were -0.14423 and 0.09206 for urban and rural price in Bayelsa State; -0.2811 and 0.3259 for urban and rural price in Delta State; and 0.3674 and 0.7609 for urban and rural price in Rivers State respectively. On State level, however, Bayelsa State had an adjustment speed of -0.154, Delta had a speed of 0.235, while Rivers State had a speed of 0.0189 respectively. These results have important policy implications. Since Raphia palm wine markets are spatially integrated, the government may think of reducing or even withdrawing its efforts to influence the price in the market.*

***Key Words**: Market Integration, Co-integration, Rural Raphia palm wine market, Urban Raphia palm wine market, Price signal and information*

I. Introduction

Spatial market integration refers to the degree of co-movement of prices in spatially separated markets and the transmission of prices across the markets (Minot & Goletti, 2001; Intodia, 2005; Reddy, 2006). Simply, spatial market integration refers to the extent to which price change in one market is associated with price changes in other markets (Gabre-Madhin, 2001). According to Okoh & Egbon (2005), market integration is the phenomenon behind the synchronous movement of prices of commodities or group of commodities over time in spatially differentiated markets. In their view point, the ability of a market system whether domestic or foreign, to efficiently perform its developmental function depends on the ease with which price changes and responses are transmitted spatially and temporally. Thus, the synchronous movement over time among prices in different markets becomes an important indicator of market efficiency. Two markets are said to be spatially integrated if when trade takes place between them, price in the importing market equals price in the exporting market plus the transportation and other transfer costs involved in moving products between them (Chirwa, 2000). This definition implies that, first, there is trade between markets, and second, the price differentials between them cannot exceed the marketing costs necessary to move the product from one market to another. If P^i_t denotes the price of food in the importing market and K^{ij}_t denotes the transfer costs in the same period, then, whenever

$P^i_j + K = P^i_t$ (1) trade occurs, But if,

$P^i_j + K > P^i_j$ (2) then, there is no incentive to trade

The above two equations (1) and (2) are spatial arbitrage conditions and are both consistent with food market integration. When transfer costs equal the inter- market price differential, and if there are no barriers to trade between markets, trade will cause prices in the two markets to move on one to one basis and the spatial arbitrage conditions are binding.

On the other hand, two markets are said to be segmented if price in one market does not affect price in the other. Co-integration of markets is thus the opposite of market segmentation. In reality, however, prices of similar products within markets move from time to time, and their margins are subject to various shocks that may drive them apart or pull them together (Goletti & Babu, 1994). Granger (1969) observed that if two markets were co-integrated, some sort of causality runs from one market to another. If the causation were unidirectional, then, past price of one market could be used to forecast the price of the other market. Ravallion (1986) argued that when there was one central market influencing price transmission, prices in other markets were dependent on their own past values and on current and past values of the central market price. Perfect market price integration occurred when the price in one market was a translation of the price in the other; implying that price changes were the same or equal. The transfer cost between the two markets was the translation factor. However, perfect integration is rarely a common scene. Most times, intermediate degrees of integration occur. This underscores the measurement of speed or magnitude of price transmission. A short-run or long-run adjustment can be distinguished and dynamic multipliers/error correction computed for determination of magnitude of price adjustment and speed of adjustment. Thus, the degree of price transmission can provide at least a broad assessment of the extent to which markets are functioning in a predictable way, and price signals are passing through consistently between markets (Conforti, 2004).

Market integration can be seen in three dimensions, namely, spatial market integration (location), vertical market integration (product form), and temporal market integration (time). The first case reflects the effect of a price change in one market location on the price of the same commodity in another market location. If there is no linkage between two market prices, then markets are said to be separated. Vertical market integration reflects the passage of a price change across steps in the marketing chain. A price relationship between raw and processed products is a good example of this vertical integration. In this case, the movement of a product is combined with some form of processing such as in the case of freshly tapped RPW as a raw product and bottled or distilled gin as a processed product. Another example of this vertical integration is a movement of a product from one level to another level without changing its form. For example, a movement of RPW from wholesale to retail is a good example of this kind of integration. Lastly, temporal market integration reflects the effects of a present price change on future prices.

The concept of market integration has retained an increased importance over recent years, particularly in developing countries where it has potential application to policy questions regarding government intervention in markets (Alexander & Wyeth, 1994). Unless agricultural product markets are spatially integrated, producers and consumers will not realize the gains from trade liberalization. If markets are not integrated, the correct price signals will not be transmitted through the marketing channels, the farmers will not be able to specialise according to long-term comparative advantage and the gains from trade will not be realised. An integrated market is synonymous with pricing efficiency, i.e., prices should always reflect all information.

In the context of Nigeria, there are several reasons to analyze the performance of Raphia palm wine (RPW) markets. As a staple, which serves as a major source of energy and an important food crop in Nigeria, RPW provides income to the tappers and marketers, and a source of raw material to dry gin producers besides its other uses (Olomola, 2001; NAD, 2002). It grows naturally in the Niger Delta Area (NDA) of the country over an estimated 504 800 hectares of land (NDDC, 1999; FOS, 2004). Lack of funding, non-uniform units of measurement, poor market information system and price volatility all contribute to poor price competitiveness in the local markets (FAO, 2007; Okoye & Agwu, 2009; Enibe, Chidebelu & Onwubuya, 2009; Ifejirika, Arene & Mkpado, 2013). This has resulted in high cost of distribution, seasonal glut and shortages, rapid and increased fermentation of the RPW which in turn affects the behaviour of the tappers, market intermediaries and consumers. There is therefore a need to estimate the extent of market integration for RPW in Nigeria for the following reasons. First, price is a product of market performance. If a shock occurs in a market, it is expected that price will adjust in other markets to reflect the changing conditions imposed by that shock. The change in price is a signal that then facilitates market adjustment of quantities, etc. For instance, if there is a RPW shortage in the Northern region of Nigeria, well-integrated markets will quickly reflect this shortage through appropriate price relationship, creating signals for the imports of RPW to Northern and other Southern markets. When spatially markets are not integrated, price signals among markets will be transmitted imperfectly and with delays. One of the main consequences of this poor price transmission is high price volatility that weakens the food security of both farmers and consumers. Secondly, in poor countries such as Nigeria, market interventions are constrained by lack of financial resources. Knowing that markets are integrated and will therefore efficiently transmit information and guide trade flows between surplus and deficit areas can make it easier for governments to allow markets to work, while concentrating their scarce resources on investments that will reduce marketing costs or target needy households in a way that does not disrupt markets. Third, as stated by Goletti & Tsigas (1995), knowing the relationship among spatial market prices makes forecasting analysis more attainable. For instance, knowing the direction of price signals between integrated markets enables prediction changes in food security among farmers and consumers in one market as a result of changes in another market. In summary, prices in different markets are important in the decision on where to buy and sell. In other words, "regulates" trade flows. Therefore, the arbitrage activity of traders connects spatially separated markets, and market integration analysis provides a better understanding of the dynamic interaction of prices and the degree by which physically separated markets are connected.

The major objective of the study is to determine the presence and level of integration in Nigerian RPW market system. Specifically, the study focused on the:

- determination of the existence and level of RPW inter-market price dependences;
- description of short-run interactions through cross-market lagged price changes;
- evaluation of long-run responses to contemporaneous price changes in the RPW market; and
- Speed of price adjustments to long-run equilibrium.

II. Methodology

The study area is Niger-Delta Area (NDA) of Nigeria. It is bordered to the South by the Atlantic Ocean and to the East by Cameroon. It occupies a surface area of about 112,110 square kilometres (NDDC, 1999; NPC, 2006). It represents about 12 per-cent of Nigeria's total surface area. The region comprises nine of Nigeria's constituent States (Table 1). The NDA consists of saline mangrove swamps which stretch through the coastal States with 504,800 hectares in the NDA and 95,000 hectares in Cross River State (NDDC, 1999; FOS, 2004). The size of the mangrove forest rank it as the largest in Africa and as the third largest in the world (FOS, 2004; NDHDR, 2006). The large and persistent gap between agricultural activities and livelihood security in the NDA with little or no formal sources of income and employment suggests that livelihood security is dependent on agriculture in rural areas. The economic activities of NDA comprise of land based type on the drier land which includes farming, fishing, collecting and processing palm fruits and wine, as well as hunting and water based type of livelihood systems with a less diversified economy (NDDC, 1999; CASS, 2003; NDHDR, 2006).

Table 1: States Composed of the Niger Delta Area, Land Area and Population

State	Land Area (Square Kilometres)	Population (NPC, 2006)
Abia	4,877	2 833 999
Akwa Ibom	6 806	3 920 208
Bayelsa	6 806	3 920 208
Cross River	21 930	2 888 966
Delta	17 163	4 098 391
Edo	19 698	3 218 332
Imo	5 165	3 934 899
Ondo	15 086	3 441 014
Rivers	10 378	5 185 420
Total	**112 110**	**31 224 587**

Source: National Population Commission (NPC) (2006). Result based on 2005 census

Sampling Procedure

Multistage random sampling technique was used in selecting the localities for the study. In stage 1, Bayelsa, Delta and Rivers States were randomly selected out of the nine States that constitute Niger Delta Area (NDA) of Nigeria. From each State, two markets were randomly selected (one from the rural areas and the other from the urban areas) to give a total of six markets.

Data Collection

Primary data was used for the study as there was no available prices series data on RPW in Nigeria at the Ministries of Agriculture, Federal office of Statistics and Nigerian Export Promotion Council at the time this study was conducted. Periodic RPW prices was collected from each of the markets on a four days market interval for a period of six calendar months starting from August 2012-January, 2013.

Data Analysis

Data collected was analysed using co-integration analysis and Johansen's market integration model.

Model Specification

Time series properties of the data were examined in order to avoid spurious results emanating from the non-stationary of the price data series and to analyse the price transmission of Raphia palm wine market in NDA. Co-integration analysis was carried out in three steps. It began with a unit root test to confirm the stationary status of the variables that entered the model using the Augmented Dicky Fuller (ADF) statistic. The co-integration regression was obtained from the normalized coefficients of the model generated from the co-integration vector. With the existence of co-integration, the Error Correction Methodology (ECM) model to incorporate short run and long run effects of price movement was estimated. Diagnostic tests of the stochastic properties of the models was carried out.

Unit Root Tests

A co-integrating relationship exists between non-stationary series if there is a stationary linear combination between them. Therefore, the need to test the stationarity of the times series first. Augmented Dicky Fuller (ADF) was used to determine whether or not the series were stationary. The testing procedure for the ADF was as follows:

$\Delta X_t = \beta_o + \beta_2 X_{t-1} + \beta_i \sum \Delta X_{t-i} + \sum_i$-------------------------------(36)

where:

X_t represented individual explanatory variables and at time, t;

βo was a constant; and Δ indicates the difference term.

The unit root test was carried out under the null hypothesis $\mu \neq 0$.

$ADF_t = \hat{U}/SE(\hat{U})$ -------(10) ----------------------------(37)

Once a value test statistic was computed, it was compared with the relevant critical value for the DFT. If the statistics was greater (in absolute value) than the critical value at 5% or 1% level of significance, then the null hypothesis of $\mu \neq 0$ was rejected and no unit root was present.

Once this was established, the test for co-integration was carried out. A typical regression model to test for market integration between two markets under the traditional static method is specified as follows:

$Y_{1t} = K + BY_{2t} + e$ -----------------------(38)

where

Y_{1t} = price for a central (urban) market in time t;

Y_{2t} = price series for a peripheral (rural) market in time t;

K = the intercept term;

B = a parameter of the slope; and

e = error term

III. Results

Unit Root Tests

The results presented in Table 2 examined the time series properties of prices of Raphia palm wine (RPW) in both the rural and urban markets of the three states. The variables were examined for stationarity using the Augmented Dicky- Fuller (ADF) unit root test. The result of the ADF unit root test indicated that prices of RPW in the rural and urban locations were non-stationary at their levels, but became stationary at the first order difference. See Table 2 below. The same was applicable to the three States taken as individual markets. Thus, they were integrated at order one I(1), the first determining factor for market integration, which necessitated the estimation of the vector error correction model (VECM).

VECM Result and interpretation for RPW Markets in Bayelsa State

The VECM results showed that a 1% increase in urban price of RPW would in the long run decrease its rural price by 2.51%. The Error Correction coefficient, the speed with which the system will adjust to shocks and restore equilibrium between the short-run and long-run measured by the error correction model (ECM) is -0.14423 for the urban price and 0.09206 for the rural price. The model came out with the expected negative sign and also indicated that the level of market integration or restoring equilibrium back into the system in response to exogenous shock was slow. Further interpretation of the presence of co-integration between the two market prices implied that the two market prices followed the same long-run trend. As a result, the market price in the urban market would not drift above or below the rural market price in the long-run (see Tables 3 and 4).

Pairwise Granger Causality Test

Table 5 below presents the direction of causality between the urban and rural prices of RPW in Bayelsa State. The variables used in these tests were stationary at their levels. The Granger test was conducted with a lag length of 1 and 5% level of significance. The result indicated that rural price of RPW in Bayelsa State did not granger cause the urban price, and urban price of RPW did not also granger cause the rural price of RPW. In other words, an increase in rural price of RPW will not bring about an increase in the urban price of RPW.

Table 2: Unit Root Test

Variable	constant	trend	lag	ADF	95% critical value	ADF	95% critical value	Result
				Level		First difference		
Urbanprice (Bayelsa)	With	-	0	-2.3973	-2.9127	-9.0273	-2.9127	I(1)
Rural price (Bayelsa)	With	-	0	-2.8371	-2.9127	-9.219	-2.9137	I(1)
Urban price (Delta)	without	-	0	0.01149	-1.9463	-6.8599	-1.9464	I(1)
Rural price (Delta)	without	-	0	0.093001	-1.9463	-7.29682	-1.9464	I(1)
Urban price (Rivers)	With	-	0	-2.6186	-2.9127	-6.99506	-1.9137	I(1)
Rural price (Rivers)	without	-	2	0.66289	-1.9465	-4.861674	-1.9467	I(1)
Bayelsa p	With	-	0	-2.2348	-2.9127	-9.0295	-1.9137	I(1)
Delta-p	without	-	0	0.201662	-1.9463	-6.82047	-1.9464	I(1)
Rivers-p	With		0	-2.4824	-2.9127	-7.32706	-1.9137	I(1)

Source: Field Data, 2013

VECM result

Table 3: Long-Run Estimates of Urban & Rural Markets of Raphia Palm Wine in Bayelsa State.

Regressors	Long-run estimates	Standard error	T-value
Urban price	1.000		
Rural price	-2.510744	0.7359187	-3.41
Constant	327.5998		

Source: Computed from field data, 2013

Table 4: Short-Run Estimates of Urban & Rural Markets of Raphia Palm Wine in Bayelsa State

Error Correction	D(Urban-price)	D(Rural-price)
CointEq1 cf.	- 0.1442302	0.0920602
t-val	- 1.50	1.91
D(Urbanprice(-1))cf.	-0.1502458	-0.0571942
t-val	-1.03	-0.78
D(Ruralpric(-1)) cf.	-0.0991374	-0.0862584
t-val	-0.33	-0.58
Constant	4.644204	7.27605
R-sq=	0.08720.1132	

Source: Computed from field data, 2013

Table 5: Pairwise Granger Causality Tests for Change in RPW Prices in Bayelsa State

Null Hypothesis	Observation	F-Statistics	Probability
Rural Price of Raphia palm wine in Bayelsa does not Granger Cause Urban price.	57	0.91225	0.34377
Urban Price of Raphia Palm	57	0.75389	0.38909

	wine did not Granger Cause Rural price in Bayelsa State.

Source: Computed from field data, 2013

Co-integration test for palm-wine in Urban and Rural markets in Delta State

The co-integrating test and VECM were done with a lag length of 1 for urban and rural prices. The trace statistics showed a 1 co-integrating equation at 5% significant level.

VECM Result and interpretation

The result of the rural price indicates that a 1 per cent increase in urban price of RPW in the long run would decrease rural price by 1.05 per cent. The Error Correction coefficient (the speed with which the system would adjust to shocks and restore equilibrium between the short-run and long-run measured by the ECM is -0.2811 for the urban price and 0.3259 for the rural price. The model came out with the expected negative sign and also indicated that the level of market integration or restoring equilibrium back into the system in response to exogenous shock was slow. Further interpretation of the presence of co-integration between the two market prices implied that the two prices followed the same long-run trend. As a result, the market price of RPW in the urban market might not drift above or below the rural market price in the long-run (see Tables 6 and 7).

Pairwise Granger Causality Test for Change in RPW Price in Delta State

Table 8 below presented the direction of causality between urban prices and rural price of RPW in Delta state. The variables used in the tests were stationary at the first order and well integrating. The Granger test was conducted with a lag length of 1 and 5 per cent level of significance. The result indicated that there was no interdependent and bi-directional causality between urban and rural prices of Raphia palm wine in Delta State, but unidirectional. An increase in rural price of RPW in Delta State would not bring about an increase in the urban price of RPW, but not with the urban price. An increase in the urban price of RPW in Delta State would cause that of the rural price to increase. See Table 8 below.

Table 6: Long-Run Estimates of Urban & Rural Markets of Raphia Palm Wine in Delta State

Regressors	Long-run estimates	Standard error	T-value
Urbanprice	1.000		
Ruralprice	-1.04809	0.0946929	-11.07
Constant	-8.916785		

Source: Computed from field data, 2013

Table 7:Short-Run Estimates of Urban & Rural Markets of Raphia Palm Wine in Delta State

Error Correction		D(Urbanprice)	D(Ruralprice)
CointEq1	cf.	-0.2811116	0.3259027
	t-value	-1.83	2.56
D(Urbanprice(-1))	cf.	0.1657558	-0.1798327
	t-value	0.95	-1.25
D(Ruralprice(-1))	cf.	0.0680086	0.1544752
	t-value	0.35	0.97
Constant		5.07397	4.376618

R-sq= 0.09400.1186

Source: Computed from field data, 2013

Table 8: Pairwise Granger Causality Tests for Change in RPW Price in Delta State

Null Hypothesis	Observation	F-Statistics	Probability
D(Rural Price of Raphia palm-wine in Delta State) does not Granger Cause D(Urban price)	57	0.55959	0.45767
D(Urban Price of Raphia palm-wine in Delta State) Granger Cause D(Rural price)	57	5.28334	0.02543

Source: Computed from field data, 2013.

Co-integration test for palm-wine in Urban and Rural markets in Rivers State

The adjustment coefficient on CointEq1 for the urban price of RPW was positive and small at 36.74% a day. The adjustment coefficient on rural price of RPW was positive and large at 76.1% a day and significant. The adjustment was being done by both the urban and rural price in the short run, however the rural price adjusted faster than the urban price in the short run.

VECM Result and interpretation

The result of the rural prices in the long-run indicated that a 1% increase in urban price of RPW in Rivers State in the long-run would decrease its rural prices by 1.274 per cent (Table 9). In the short-run, the Error Correction coefficient was 0.3674 for the urban prices and 0.7609 for the rural prices (Table 10). The model came out with an unexpected positive sign for the urban market equilibrium adjustment coefficient and also indicated that the speed of restoring equilibrium back into the system in response to exogenous shock was fast. That of the rural market price adjustment was fast, positive and significant, indicating that the rural price did all the adjustment.

Pairwise Granger Causality Test for Change in RPW Price in Rivers State

Table 11 below presents the direction of causality between urban prices and rural prices of Raphia palm-wine in Rivers State. The variables used in these tests were stationary and well integrating. The Granger test was conducted with a lag length of 1 and 5 per cent level of significance. The result showed that there existed an interdependent and bi-directional causality between urban price and the rural price of Raphia palm-wine in Rivers State. An increase in rural price of Raphia palm-wine in Rivers State will bring about an increase in the urban price, and an increase in the urban price will also lead to an increase in rural price of palm-wine in Rivers State in the short-run. See Table 11 below.

Table 9: Long-Run Estimates

Regressors	**Long-run estimates**	**Standard error**	**T-value**
Urbanprice	1.000		
Ruralprice	-1.273884	0.1267271	-10.05
Constant	143.9671		

Table 10: Short-Run Estimates

Error Correction		**D(Urbanprice)**	**D(Ruralprice)**
CointEq1	cf.	0.3674534	0.7609123
	t-val	1.62	3.95
D(Urbanprice(-1))	cf.	-0.0589755	-0.296799
	t-val	-0.24	-0.14
D(Ruralprice(-1))	cf.	-0.0789217	-0.0073312
	t-val	-0.37	-0.04
Constant		0.1097628	0.0530057

R-sq= 0.1077 0.3958

Source: Computed from field data, 2013

Table 11: Pairwise Granger Causality Tests

Null Hypothesis	Observation	F-Statistics	Probability
D(Rural Price of palm-wine in Rivers State) Granger Cause D(Urban price)	57	7.53724	0.00819
D(Urban Price of palm-wine in Rivers State) Granger Cause D(Rural price)	57	25.4379	0.0000055

Source: Computed from field data, 2013

LONG-RUN AND SHORT-RUN ESTIMATES OF THE ENTIRE RAPHIA PALM WINE MARKET PRICES IN BAYELSA, DELTA AND RIVERS STATES

Lag order selection

Before the co-integration test and the VECM were conducted, the lag order selection was first tested. However, the lag order selection showed a maximum lag length of 1, but co-integration was found at the lag order of 2. Thus, the co-integration test and the VECM were done with a lag length of 2 for the analysis here.

Cointegration test for Raphia palm-wine in Bayelsa, Delta and Rivers States

Here the trace statistics test indicated that there was 1 co-integrating equation(s) at 5% significance level. Note, the existence of at least one co-integration equation was a major determinant of market integration in the three states. The short-run (Table 12) estimates showed the level of market integration among the three States taken as individual markets. The results showed that the adjustment coefficient on CointEq1 for Bayelsa price was negative as it should be, insignificant and very small at 15.3% a day, the adjustment coefficient in Delta and Rivers States were positive, as they should be, small at 23.5% and 1.89% respectively a day. Delta State was significant while Rivers State was insignificant. It was observed that Delta State had the fastest level of adjustment.

Table 12: LONG-RUN ESTIMATES

Regressors	**Long-run estimates**	**Standard error**	**T-value**
Bayelsa	1.000		
Delta	-1.373969	.2750104	-5.00
Rivers	6.837472	2.445485	2.80
Constant	-7123.608		

Source: Computed from Field data, 2013.

Table 13: SHORT-RUN ESTIMATES

Error Correction	**D(Bayelsa)**	**D(Delta)**	**D(Rivers)**
CointEq1 cf.	-0.1536925	0.2353759	0.0189307
t-val	-1.73	4.18	1.50
D(Bayelsa(-1)) cf.	-0.2192898	-0.1072611	1.461074
t-val	-1.41	-0.49	1.08
D(Bayelsa(-2)) cf.	-0.0843494	-0.248541	-0.9042135
t-val	-0.54	-0.12	-0.67
D(Delta(-1)) cf.	-0.350064	0.1960264	-1.28967
t-val	-0.35	1.41	-1.50
D(Delta(-2)) cf.	-0.0131654	0.0682827	-2.177266
t-val	-0.13	0.51	-2.54

D(Rivers(-1)) cf.	0.0200888	0.0112754	-0.2414668
t-val	0.91	0.36	-1.26
D(Rivers(-2)) cf.	0.0079872	-0.0127732	-0.4627227
t-val	0.36	-0.43	-2.42
Constant	15.92303	10.30372	1.162244

R-sq = 0.20600 0.3051 0.1831

Source: Computed from field data, 2013

VECM Result and interpretation

The results of the long-run estimates showed that a 1% increase in Bayelsa State's price of RPW in the long run will decrease Delta State's price by 1.37% and increase Rivers State's price by 6.8%. The Error Correction coefficient, the speed with which the system will adjust to shocks and restore equilibrium between the short-run and long-run measured by the ECM was -0.154 for Bayelsa State price, 0.235 for Delta State price and 0.0189 for Rivers State price. The coefficient came out with the expected negative sign and also indicated that the level of market integration or restoring equilibrium back into the system in response to exogenous shock was slow. Furthermore, the presence of co-integration between the three market prices implied that the prices followed the same long-run trend. As a result, the market price in Bayelsa, Delta and Rivers states markets would not drift above or below each other in the long-run.

Pair wise Granger Causality Test

Table 14 below presents the direction of causality between urban prices of RPW and rural prices of RPW in the three states. The variables used in these tests were stationary at their levels. The Granger test was conducted with a lag length of 2 and 5 per cent level of significance. The result indicated that rural price of RPW in Delta State do not granger causes Bayelsa State's price, while Bayelsa State's price do not granger cause Delta State's price. This is applicable for all the states; none causes the other to change. An increase in any of the state's prices of Raphia palm-wine will not bring about a corresponding increase on the other states price. This is shown in table 14 below.

Table 14 Pairwise Granger Causality Tests

Null Hypothesis:	Obs	F-Statistic	Probability
DELTA did not Granger Cause BAYELSA	57	0.44585	0.64275
BAYELSA did not Granger Cause DELTA		2.32072	0.10849
RIVERS did not Granger Cause BAYELSA	57	1.20556	0.30792
BAYELSA did not Granger Cause RIVERS		1.53171	0.22594
RIVERS did not Granger Cause DELTA	57	2.12483	0.12991
DELTA did not Granger Cause RIVERS		0.02420	0.97610

Source: Computed from field data, 2013

IV. Conclusion and Recommendation

There was an existence of inter-dependence in prices of RPW within and between the States both at the short-run and long-run. In the short-run, the rural prices did all the price adjustments in Bayelsa and Delta States; while in Rivers State, RPW price adjustment was done by both the urban and rural markets, although, the rural prices adjusted faster than the urban price. The long-run responses to exogenous price changes in RPW market showed that an increase in the price of RPW in the urban market caused a decrease in the rural market prices; implying that the urban and rural prices in the three States followed the same long-run trend. The speed with which the system adjusted to shocks and restored equilibrium between the short-run and long-run RPW prices was -0.14423 and 0.09206 for urban and rural prices in Bayelsa State; -0.2811 and 0.3259 for urban and rural prices in Delta State; and 0.3674 and 0.7609 for urban and rural prices in Rivers State respectively.

References

[1]. Alexander, C., & Wyeth, J. (1994). Co integration and Market Integration: An Application to the Indonesian Rice Market. J. Devt. Studies, Vol.30 (2) Pp303-328

[2]. Chirwa, E.W. (2000). Food Marketing Reforms and Integration of Maize and Rice Markets In Malawi. Working Paper, School of Economics, University of East Anglia.

[3]. Conforti, P. (2004). Price Transmission in Selected Agricultural Markets. FAO. Commodity and Trade Policy Research. Working Paper No. 7 Accessed via http://www.

[4]. Enibe, D. O., Chidebelu, S. A. N. D., Onwubuya, E. A., Agbo, C., & Mbah, a. A. (2008).

[5]. Policy Issues in the Structure, Conduct and Performances of Banana Market in Anambra State. Journal of Agricultural Extension 12(2).

[6]. FAO (2007). The Major Significance of 'Minor' Forest Products: The Local Use and Value of Non-Timber Forest Products to Local People.
[7]. Federal Office of Statistics (FOS) (2004). Socio-economic Profile of Nigeria Gabre-Madhin, E.Z. (2001). The Role of Intermediaries in Enhancing Market Efficiency.
[8]. In the Ethiopian Grain Market. Journal of Developing Economics 25,202 Elsevier Science Publishers
[9]. Granger, W.J. (1969). Investigating casual Relations by Econometric Models and Cross- Spectral Methods. Econometric 16,121-130
[10]. Goletti, F., & Babu, S. (1994). Market Liberalization and Integration of Maize Markets in Malawi, Agric. Econ. 11,311-324
[11]. Golleti, F., & Tsigas, C. (1995). Analysing Market Integration. In: Gregory, J.S (ed) Prices, Product and People 1995. Published in Cooperation with the International Potato Centre
[12]. Ifejirika, C.A., Arene, C.J. & Mkpado, M. (2013). Price Transmission and Integration of Rural and Urban Rice Markets in Nigeria. Journal of Agriculture and Sustainability. Vol.2(1)Pp 66-85
[13]. Intodia, V. (2005). Co-integration and Market Integration. An Analysis of Tea Markets in India. India Journal of Economics. Pp97-105
[14]. Minot, N., & Goletti, F. (2001). Rice Market Liberation and Poverty in Vietnam Research Report of International Food Policy Research Institute. Washington D.C.
[15]. National agricultural Digest (NAD) (2002). Strengthening the Peasant Farming Economy 1(1) Pp17-20
[16]. Niger Delta Development commission (NDDC) (1999). A Brief History
[17]. Niger Delta Human Development Report (NDHDR) (2006): Poor Human Development in Niger Delta—the State of Niger-Delta Environment.
[18]. National Population Commission NPC (2006). Provisional Result based on 2005 Census.
[19]. Okoh, R.N., & Egbon, P.O. (2005). The Integration of Nigeria's Rural and Urban Foodstuffs Markets. AERC Research Paper 151
[20]. Olomola, A. S. (2001). Financing Oil Palm Production through Contract Farming. NISER Monograph Series No.6
[21]. Ravallion, M. (1986). Testing Market Integration. Am. J. Agric. Econ.68(2),102-109