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Market Integration of Small-Scale Farms: Exploring the Bambara Groundnut Markets in Nigeria

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Abstract

The extent of uncertainty caused by price inefficiency and instability with reference to Bambara groundnut has made the subsector a dicey one. Markets that are not integrated may convey inaccurate price signals that might distort producers' marketing decisions and contribute to inefficient product movement. The study analyzed the market integration of Bambara groundnut in South-east, Nigeria. The study population comprised all Bambara groundnut marketers in South-east, Nigeria. Out of the five states in South-east, Nigeria, two States will be purposively selected as the study area to establish the movement of prices between the two states to establish a fair comparison of prices between the producing zone and consumption zone. The choice of the two states was based on the predominance of Bambara groundnut marketers. A two-stage sampling technique was adopted in selecting 221 respondents that was interviewed for the study. Data for this study was poised from primary sources using a well-structured questionnaire, oral interviews and direct observations of Bambara groundnut marketers and was analyzed using descriptive and inferential statistics.- The results of the VECM showed that Enugu urban retail prices had a short-run influence of -0.057 although not signicant and a long-run significant influence of -0.2391 on Abia urban retail prices. The results of the VECM estimates for both short-run and long-run relationships indicated that the Enugu rural price of Bambara groundnut had short-run influences of -0.034023 and 0.0032032 with a long-run influence of -0.203230 on Abia rural price. The study recommended that to improve pricing effectiveness and market integration, it is necessary to encourage Bambara groundnut market price information in South-east Nigeria. The flow of information regarding Bambara groundnut prices, demand, and supply will improve both market integration and pricing effacing. The government should create regulations for information services.

Keywords: Market; Integration; Small-scale farms; Exploring; Bambara; Groundnut markets; Nigeria.

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1. Introduction

Market integration refers to a situation in which prices of commodities in spatially separated markets move together and price signals and information are transmitted smoothly across the markets [1]. If markets are interconnected, goods will move from port and border regions into the hinterland and food will migrate from surplus to deficit areas. In order to make food available, traders are encouraged by high prices in deficit areas to transport food from surplus areas to deficit areas [2]. These flows ought to cause prices in deficit areas to drop, increasing household access to food [3].

In order to understand how price movements and information are transmitted across geographically distant markets, the study of market integration is essential [4]. Mari [5], pointed out that many current discussions about market liberalization, price policy, and parastatal reforms in developing countries have the issue of market integration at their core. Without price integration of the market, price signals from food deficit to food surplus areas will not be transferred; prices will be more erratic; agricultural producers will fail to specialize in accordance with long-term comparative advantage; and the benefits of trade will not be realized. The importance of the market mechanism in transmitting prices between surplus and deficit areas, may be compromised by government interference in food pricing and marketing as well as insufficient marketing infrastructure. Agricultural product market integration has frequently been used to assess overall market performance [6]. Competition among arbitragers in integrated markets will ensure that a particular equilibrium is reached where local prices in regional marketplaces vary only by transportation and transaction costs. The effectiveness of arbitrage, price efficiency, and competitiveness can all be inferred from information about market integration [7]. In recent years, market integration

has maintained its increased significance, especially in developing nations where it may have policy implications for issues involving government interference in markets [8]. Market integration is the degree to which price movements in one market are correlated with price changes in other markets. According to Barrett [9], "market integration" is a situation in which (a) prices in several markets move in unison, (b) there is trading between markets, or (c) both. When price changes in one market are reflected in price changes in other markets, it is argued that there is market integration.

Without market integration, farmers won't be able to specialize based on long-term comparative advantage, trade benefits won't be achieved, and correct price signals won't be sent through marketing channels. Pricing efficiency and an integrated market go hand in hand, meaning that prices, should always represent all available market information as defined by Fama [10]. A crucial metric of market performance is market integration. These marketplaces are said to be geographically integrated if price changes in one market fully reflect those changes in the alternate market [11]. Prices are established simultaneously in several places in spatially linked markets, and price changes in one market are communicated to the others [12]. Non-integrated markets may transmit erroneous pricing signals that could affect producers' marketing choices and result in ineffective product movement especially for crops like Bambara groundnut [11].

The Food and Agricultural Organization [13] states that in 2004, Africa spent USD 1 billion on importing of Bambara groundnut. Bambara groundnut oil made up USD 752 million, while Bambara groundnut meal made up US D254 million. There is little empirical data on Bambara groundnut marketing. Thus more research is needed to improve our understanding and, ultimately, the efficiency of Bambara groundnut markets in Nigeria. With weak road infrastructure and varying climatic conditions among Nigeria's agro-ecological zones, each State's ability to produce grains varies. This leads to high transfer costs for food market transactions across the nation. Markets play a significant role in determining food access and availability. If markets are well integrated, it can be expected that market forces are working properly, meaning that price changes in one location are unfailingly related to price changes in other locations and market agents are acting as expected [14]. Agricultural marketing assumes greater significance in the Nigerian economy because surplus production from the farm must be disposed of to earn some income with which farmers can purchase goods and services not produced by them. Therefore, there is a need to examine the market Integration of Bambara groundnut in South east, Nigeria. The important research questions for which answers will be provided for in this study are:

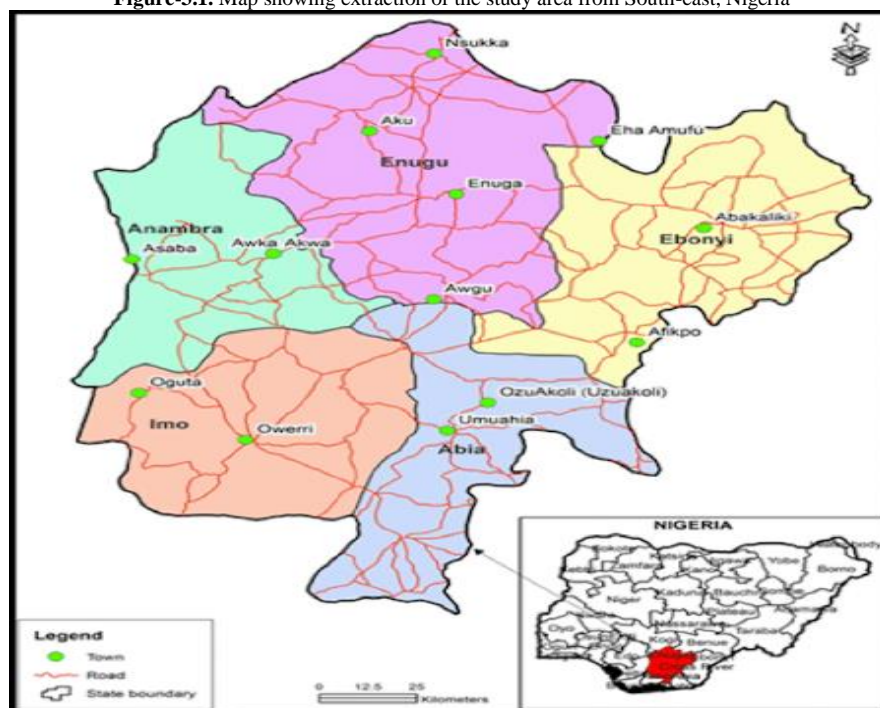i.   Are Bambara groundnuts markets in the study area integrated?

2. Objectives of the Study

This research aims to analyze pricing efficiency and market integration of Bambara groundnut in South-east, Nigeria. Specifically, the study aims to.- assess the market integration of Bambara groundnut in the study areas.

3. Research Methodology

The study was carried out in South-East geographical zone of Nigeria. South-East Nigeria comprises of five states viz: Enugu State, Abia State, Ebonyi State, Imo State and Anambra State. The zone is located within latitudes 4° 30'and 7°00' N and longitudes 5 ° 30', 9° 30' E (Anambra 6°22'0.9"N 6°93'70"E, Enugu 6°53'64"N $7^0 43^1 56$"E, Ebonyi 6°26'49"N 8.01'3.7"E). The zone has a total land mass of 10,952,400 hectares with over 16 million residents' populations [15].

Figure-3.1. Map showing extraction of the study area from South-east, Nigeria

The study population comprised all Bambara groundnut marketers in South-east, Nigeria. Out of the five states in South-east, Nigeria, two States will be purposively selected as the study area to establish the movement of prices between the two states and establish a fair comparison of prices between the producing zone and consumption zone. The choice of the two states was based on the predominance of Bambara groundnut marketers. A two-stage sampling technique was adopted in selecting the respondents. First, our markets from the two States were purposively selected based on the relative prime availability of Bambara groundnut in the identified area. Post recognizance survey, the markets surveyed in Abia State include Ariaria International market, Umuahia Ultra-Modern market, Ngwa road and cemetery road/Eziukwu market. In contrast Orie Orba, Ogbete, Eke Agbani and Awgu were sampled in Enugu State. Successively, from each of the selected Bambara groundnut markets, 30 Bambara groundnut marketers were randomly selected giving a total of 120 marketers of Bambara groundnut from both states of which 112 and 109 Bambara groundnut marketers responses were used for analysis and others were discarded due to either error in filling questionnaires, incomplete information or that they were not returned at all. This gave us a grand total of 221 interviewed respondents for the study.

Data for this study were collected from primary sources. The use of a well-structured questionnaire, oral interviews, and direct observations of Bambara groundnut marketers collected data from primary sources.The questionnaires were administered by the researcher and some trained enumerators. Average monthly time series data were collected on quantity and prices of Bambara groundnut in selected markets of Abia (Ariaria Int. market, Umuahia Ultra-modern market, Ngwa road and Eziukwu market) and Enugu (Orie Orba market, Eke Agbani market, Awgu market) States. The data were used to calculate the spatial price differential between the two States. Data on average monthly (August, 2020 to February, 2022) retail prices and quantity of Bambara groundnut (urban and rural) was collected to analyze price velocity and market integration in the two States. Data was explored using descriptive and inferential statistics such as the unit root test, Augmented Dickey fuller, and Johansen Co-integration test. Four-point likert type scale which is exemplified as:

Very strongly affected (VSA)   =   4 points
Strongly affected (SA)   =   3 points
Partially affected (PA)   =   2 points
Slightly affected (SLA)   =   1 point

Decision rule: if the mean score equals 2.5, then the constraint will be accepted as one that sufficiently affects the marketing system. Also, hypothesis (i) was tested using a t-test of mean difference and ANOVA, while hypothesis (ii) was tested with the law of one market price model.

4. Model Specification

4.1. Co-integration (Objective iii)

The model for evaluating the relationship of prices of a homogenous good between locations as used by Mari [5] is specified as:

$$P1t = \alpha + \beta p^2 t + V_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots1.0$$

"Where P^1t and P^2t represents commodity prices in two alternative regional markets at time t; α and β are parameters, and t n is the error term. If two markets are perfectly spatially integrated, then β = 1. In this case, price changes in one market are fully reflected in an alternative market. When β ≠1 (β <1 or β > I), then degree of integration was evaluated by investigating how far is β from the value of one. For each location, the stationarity of the price series was checked by unit root test using the Augmented Dickey-Fuller test. When there is no trend in stochastic process (Pt)2, the test was carried out by estimating the following equation":

$$Pt = \mu + \phi Pt - 1 + Y1\Delta Pt - k + 1 + \mathcal{E}t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots1.1$$

Where μ and Ø are vectors of constants and trend coefficients respectively, Pt is the price at time t at that location, ΔP represents a change in the price and is equal to (Pt - Pt-1), and e is the error term."

4.2. The Maximum likelihood Method of Co-Integration (Johansen Procedure)

Following Johansen and Juselius [16], the ML method of co-integration may be described as follows: if Pt denotes an (n x l) vector of 1(1) prices, then the k-th order vector autoregressive (VAR) representation of Pt may be written as:

$$Pt = \sum ki = 1 \text{πiPt} - 1 + \mu + \beta t + \mathcal{E}t \ (t = 1,2 \dots \dots T) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots1.2$$

The procedure for testing co-integration is based on the error correction model (ECM) representation of Pt given by

$$\Delta Pt = \sum k - ii = 1\Gamma i\Delta Pt - k + \mu + \beta t + \mathcal{E}t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots1.3$$

Where $\Gamma i - (1 - \text{π}1 - \cdots - \text{π}t); i - 1,2 \dots k - 1; \text{π} = -(1 - \text{π}1 - \cdots - \text{π}k) \dots\dots\dots\dots1.4$

"Each of $\prod 1$ is n x n matrix of parameters; Ɛt is an identically and independently distributed *n* dimensional vector of residuals with zero mean and variance matrix, ΩƐ; μ is a constant term, β is trend coefficient and t is trend. So, it is the $\prod$ matrix that conveys information about the long-run relationship among the variables in Pt. The rank of $\prod$, r, determines the number of co-integrating vectors, and how many linear combinations of Pt are stationary. The matrix α measures the strength of the co-integrating vectors in the ECM, representing the speed of adjustment parameters."

4.3. Law of One Price (LOP) (Objective iii)

"Richardson [17] postulated that the LOP is a test of market integration in period t and involves the regression:

$$\Delta Pjt = \beta1 + \beta2 Pit + \mu t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots1.5$$

"If the joint test β1 = 0 and β2 = I is not rejected, the two prices are not statistically different-; hence, the LOP holds. Before testing for the strong version of the Law of One Price, weaker restrictions will be looked at, akin to the weak market efficiency hypothesis in the financial markets' literature. This is done by formulating a hypothesis of common dynamics. Common dynamics is defined to be the restriction":

$$HO(n): \delta1(s) = \delta2(s) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots1.6$$

If the hypothesis is correct, the inter-market price spread from earlier periods is the only historical data required to forecast market I prices. Finally, it is intriguing to test for the strong form of the Law of One Price given the acceptance of long-run market integration and shared dynamics. The following was the form of the theory:

$$HO(n): y(S) = 1, and\ \delta1(s) = \delta2(s) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots.1.7$$

This includes simultaneously determining if the dynamics of the prices in the two marketplaces are similar and whether there is a single conditional relationship between the two prices. In this instance, a unit change in pricing in market 2 will correspond to a change of one unit in prices in market 1 throughout the immediate future.

5. Results and Discussion

5.1. Result of Market Integration

According to Barrett [18], market integration is when trading between markets, when prices in several markets move together, or when both occur. Since price data is commonly used in studies of market integration, market integration is typically defined as the presence of price changes in one market that are mirrored in price changes in other markets. Depending on the kinds of markets being compared, many types of market integration exist. The link between prices at various points in the supply chain, such as wholesale and retail prices, is referred to as vertical market integration. Integrating prices for the same good in many areas is called spatial market integration.

5.2. Result of Unit Root Tests

The data were checked for series stationarity and the sequence of individual variable integration as a prerequisite for co-integration analysis. All series must be integrated in the same order, often order one, for co-integration analysis to be valid Townsend [4]. The standard E-views econometric software version was used to carry out all estimations. In Enugu and Abia States, the unit root of Bambara groundnut retail prices for urban and rural areas is shown in Table 1. The variables ' non-stationarity was evaluated with the aid of the Augmented Dickey Fuller Unit Root Test. The ADF unit root test result showed that Bambara groundnut retail prices in Enugu and Abia States were non-stationary at their levels in both urban and rural areas. This suggested that the means of these variables were unpredictable, their future values did not converge to their historical values, or they displayed random walk behavior (unit roots). The vector error correction model (VECM) had to be estimated to determine whether there was a long-term link between the variables because, upon further investigation, they remained stationary at the first order differencing and were therefore integrated of order one.

Table-1. Augmented Dickey Fuller (ADF) test of stationarity

Variables	Level				First Difference			
	ADF	5%	10%	DW	ADF	5%	10%	DW
Abia Urban Retail Price	-1.105	-2.91	-2.62	2.01	-6.39***	-2.91	-2.62	2.01
Enugu Urban Retail Price	-1.157	-2.91	-2.62	3.01	-3.09***	-2.91	-2.62	3.09
Abia Rural Retail Price	-0.912	-2.91	-2.62	2.48	-4.51***	-2.91	-2.62	2.46
Enugu Rural Retail Price	-1.201	-2.91	-2.62	1.93	-4.02***	-2.91	-2.62	2.02

*** Significant at 1%, Source: Computed from field data, 2022.

5.3. Johansen Cointegration Tests for Bambara Groundnut Urban Retail Prices in Enugu and Abia States

The following phase in the analysis procedure was to ascertain if co-integration was present or not in the price series after the order of integration had been established. This study used the Johansen technique, which generates long-run estimates and offers likelihood ratio tests for the presence of a number of cointegrating vectors among the series. The recorded rank approach created by Johansen [19] and Johansen and Juselius [16] was used to conduct cointegration tests.

The dynamic Error Correction Model was then utilized to estimate the short-run parameters once cointegration had been established among the variables. In addition to avoiding the spurious regression issue between the variables, it offered information regarding the adjustment rate to long-run equilibrium RF Engle [20]. First, the rank (r) and long-term price relationship in the two States were determined using the Johansen approach. The estimation's number of delays was determined using the Akaike Information Criteria's (AIC) supporting data. However, cointegration indicates that Bambara groundnuts prices in the two States follow the same long-term trends.

5.4. Cointegration Test for Bambara Groundnut Urban Retail Prices in Enugu and Abia States

The retail prices of Bambara groundnut in the cities of Enugu and Abia are presented in Table 2. The linear deterministic trend assumption with intercept and trend on the estimated VAR (Vector Auto Regression) model revealed one cointegrating link between the variables from the likelihood ratio test. As a result, there is a long-term equilibrium link between the urban retail prices of Bambara groundnut in the two States. Furthermore, it meant that although these variables might temporarily vary from their long-run direction, their relationship as a whole had a stable and predictable long-run direction.

The Akaike Information Criteria (AIC), which was lowest at the selected lag order, indicated that the estimated model had a strong fit to the data, which was revealed by further study of the structure and character of the long-run relationship using the Vector Error Correction Model (Table 3 & Equation 1). Additionally, the residuals' auto-correlation test (Table E, Appendix V) revealed that the selected model's residuals were free of auto-correlation issues, indicating that no significant determinants in the system of equations had been overlooked. Equation 4.1 displays the calculated cointegrating equation.

AbiaBG Urban retail price = -2.9012 -0.2391 Enugu BG Urban retail price + Ɛ ....Equ. 1

(-3.04***) (table 4.12)

Table-2. Johansen Cointegration test of long-run relationship between Bambara groundnut urban retail price in Enugu and Abia States

		Critical Value		
Eigen value	Likelihood Ratio	5%	1%	Hypothesized number of CE (s)
0.291	35.20	21.04	27.45	None***
0.064	11.21	16.15	13.26	At most 1

*** denotes rejection of the hypothesis at 1% significance level
L.R. test indicates 1 cointegrating equation at 5% significant level
Source: Computed from field data, 2022.

Table 3 presents the VECM's long- and short-term estimates findings. The findings showed that Enugu urban retail prices significantly impacted Abia urban retail prices over the long term (-0.2391) despite having a short-run non-significant effect of -0.057. This research showed that, whereas a 1 percent increase in Enugu urban retail prices would boost Abia urban retail prices of Bambara groundnut by about 6 percent over the short term, they would have grown by 24 percent over the long term. It is significant to note that although Abia Bambara groundnut dealers purchased Bambara groundnut in Enugu State due to proximity, they also purchased from Northern States. According to merchants in Abia, Bambara groundnut is also frequently purchased from states like Benue, Taraba, Nasarawa, Kaduna, Kogi, and Plateau where they may acquire other food items (including maize, beans, millet, sorghum, and rice) in huge quantities and at competitive prices.

The relatively low amplitude and non-significance of the short-run impacts between the two States could be explained by the marketers' activity in bringing Bambara groundnut from different States. Simister and Chanda [21] studied spatial market integration in three markets in Northern Nigeria and discovered that, despite the relatively sluggish transmission speed, food markets were generally well-integrated. Ani (2004) confirmed the result that urban retail prices of Bambara groundnut in the states of Abia and Enugu were integrated, which was in agreement with the study's findings.

Table 3 describes the error correction coefficient—a measure of how quickly the system recovers from shocks and achieves equilibrium between the short and long run—. The co-integration equation 1 adjustment coefficient for the price in Abia was negative (a prior), significant, but only tiny at 24% a month; the adjustment coefficient for the price in Enugu State was positive, as it should be, but only a little at 21% a month and significant. The adjustment was being made by both the Abia and Enugu urban prices of Bambara groundnut.

Table-3. The Vector Error Correction Model of long and short-run relationship between Bambara groundnut urban retail prices in Enugu and Abia States

Long-run estimates		
Regressors	CointEq1	
Abia Urban Retail Price (AURP)	1.00	
Enugu Urban Retail Price (EURP)	-0.2391 (-3.04***)	
Trend	-0.0043 (-6.19***)	
Constant	-2.9012	
Short-run Estimates		
Error Correction Model	Abia Urban Price model	Enugu Urban Price model
CointEq1	-0.2609(-4.117***)	0.2216 (4.334***)
D(AURP)-1	-0.1136 (-1.61)	-0.026 (-0.160)
D (EURP)-1	-0.057 (-0.60)	0.028 (0.542)
Constant	0.0153 (1.64)	0.0053 (0.731)

Determinant Residual Covariance 3.1E-5   LogLikelihood -217.120
Akaike Information Criteria -2.49201   Schwarz Criteria -3.2910
Figures in parentheses are t-values, ***   Significant at 1%
Source: Computed from Field data, 2022.

Urban prices in Abia, however, adjusted more quickly than those in Enugu. Compared to the 100% threshold of the ideal adjustment, these 26 and 22 percent adjustment speeds were comparatively slow. This showed that price changes were sent with a certain delay to the reference markets. The low pace of adjustment indicates the lack of sufficient arbitration between Abia and Enugu State markets. However, prices in Abia and Enugu State were barely noticeable. This suggested that recent Bambara groundnut price values had little impact on current prices. The existence of cointegration between the retail prices of the two States ran counter to Tostao [22] findings that there was no cointegration between rice prices in the rural and urban markets in Northeastern Nigeria.

Causality tests were required because cointegration by itself cannot be used to conclude the direction of causation between the variables. According to the Granger causality test result (Table 3), there is no relationship between the retail prices of Bambara groundnut in the two States. This indicated that there was no immediate cause-and-effect relationship between retail prices in the two States. This finding suggested that price changes in one market were not short-term dependent on those in the other. In other words, the cointegration test result rejected the null hypothesis that Bambara groundnut prices in the two States were not integrated. Therefore, the result showed that prices of Bambara groundnut in the Abia and Enugu markets had a long-run relationship although not significantly related in the short-run.

Table-4. Wald test of short-run parameters in Error Correction Model of Bambara groundnut urban retail prices in Abia and Enugu States

Hypothesis	Calculated Chi^2 Statistic	Tabulated Chi^2 Statistic (5% level)	Decision
AURP granger cause AURP	1.201	2.106	Reject
AURP granger cause EURP	0.019	2.106	Reject
EURP granger cause AURP	0.590	2.106	Reject
EURP granger cause EURP	0.138	2.106	Reject

AURP – Abia Urban Retail Price
EURP – Enugu Urban Retail Price
Source: Computed from field data, 2022.

5.5. Johansen Cointegration Tests for Bambara Groundnut Rural Retail Prices in Enugu and AbiaStates

Table 5 summarizes the findings of the cointegration test between rural Bambara groundnut retail prices in the states of Enugu and Abia. One cointegrating link between the variables was found based on Akaike Information Criteria, the likelihood ratio test on the estimated VAR (Vector Auto Regression) model, and the assumption of a linear deterministic trend in the data with intercept and trend. Thus, the rural retail prices of Bambara groundnut in the two States had a long-term equilibrium relationship. This further showed that while the short-term behavior of each of these variables might differ from its long-term direction, the long-term behavior of their ties to one another was stable and predictable.Even with stochastic trends, if two variables had a long-term equilibrium relationship, they would move together over time and their difference would remain constant.

The Akaike Information Criteria (AIC), which was lowest at the selected lag order, indicated that the estimated model had a good fit to the data and further investigation of the nature and character of the long-run relationship through the Vector Error Correction Model (Table 6 and equation 2) confirmed this. Additionally, Table F Appendix V's auto-correlation test of residuals revealed that the residuals from the selected model were free of auto-correlation issues, indicating that no significant determinants in the system of equations had been overlooked. This illustrates the cointegrating equation:

AbiaBG rural retail price = -2.230 -0.203 EnuguBG rural retail price + Ɛ .... Equ 2
(-2.102**)

Table-5. Johansen Co-integration test of long-run relationship between Bambara groundnut rural retail prices in Enugu and Abia States

Eigen value	Likelihood Ratio	Critical Value		Hypothesized number of CE (s)
		5%	1%	
0.023901	32.30221	25.11	33.25	None***
0.029041	10.22910	18.35	26.16	At most 1

*** denotes rejection of the hypothesis at 1% significance level
L.R. test indicates 1 cointegrating equation at 5% significant level
Source: Computed from field data, 2022.

Table 6 presents the findings of the VECM estimates for both short-run and long-run relationships. The outcome showed that the Bambara groundnut price in rural Enugu had short-run affects of -0.034023 and 0.0032032 and long-run influences of -0.203230 on the price in rural Abia. According to the findings, a 1 percent increase in Enugu's rural price will boost Abia's rural price by 3 and 0.003 percents in the near term, but by 20 percent in the long term. Low and insufficient arbitrage between the two States may cause Enugu rural prices' non-importance and minimal short-term impact on Abia rural prices of Bambara groundnut. The low arbitrage between the two States may also be explained by the discovery of cheaper pricing in the alternative marketplaces in the nearby Northern States (Benue, Taraba, Nasarawa, Kaduna, Kogi, Plateau), where other food items (such as maize, beans, millet, sorghum, and rice) are purchased at favorable prices. This is true because Abia State wholesalers traveled to other States to acquire Bambara groundnut when the crop price rose in Enugu State. Long-term price increases in Abia State from wholesalers importing Bambara groundnut from other States would be negligible.

Table-6. The Vector Error Correction Model of long and short-run relationship between Bambara groundnut rural retail prices in Enugu and Abia States

Long-run estimates		
Regressors	**CointEq1**	
Abia Rural Retail Price (ARRP)	1.00	
Enugu Rural Retail Price (ERRP)	-0.203230 (-2.10223**)	
Trend	-0.003400(-4.39120***)	
Constant	-2.230012	
Short-run Estimates		
Error Correction Model	**Abia Price model**	**Enugu Price model**
CointEq1	-0.139402(-3.29301***)	0.1200312(2.23904**)
D(ARRP)-1	-0.300322(-2.39901**)	-0.200123 (-0.30234)
D (ARRP)-2	-0.690322(-2.61231**)	0.9402312(1.42302)
D (ERRP)-1	-0.034023(-1.01901)	-0.0203120(-1.13023)
D (ERRP)-2	0.0032032(0.19200)	-0.0293098(-0.43023)
Constant	0.039901 (1.14002)	0.00767212(0.22302)

Determinant Residual Covariance 0.002192   LogLikelihood 289.19201
Akaike Information Criteria -3.12013002Schwarz Criteria -2.1020959
Figure in parentheses are t-values
 *** (**) -significant at 1% (5%),
Source: Computed from field data, 2022

According to the findings, the adjustment coefficient for the Abia rural pricing on cointegration Equation 1 was negative as it should be; it was tiny (14% a month) and significant. Similar to the previous example, the adjustment coefficient for rural prices in Enugu State was positive, as it should be, but it was also extremely tiny (12%) and significant. The Bambara groundnut price adjustment was made in both the rural Abia and Enugu States. However, the price of Bambara groundnut in rural Abia State changed more quickly than in rural Enugu State. In comparison to the 100% threshold of the ideal adjustment, these adjustment speeds of 14 and 12 percent were comparatively slow. This shows that price changes were communicated to the reference markets with a certain delay. The model's results showed that the urban market equilibrium adjustment coefficient had the anticipated negative sign, and they also showed that the rate at which exogenous shocks caused the system to return to equilibrium was slow.The low pace of adjustment indicates the lack of sufficient arbitration between the Abia and Enugu markets.

Lagged prices in Enugu State, however, were not noteworthy. This suggested that current rural price values had no bearing on anticipated future ones. On the other hand, the two most recent figures of the rural price in Abia State were notable. This meant that past prices for Bambara groundnut in Abia State's rural areas impacted current ones. According to Table 7 analysis of Granger causality, rural prices in Enugu State did not granger cause rural prices in Abia State. The outcome showed no short-term causality or interdependence between the rural prices of Bambara groundnut in Abia and Enugu. This implied that various market prices' short-term influences on one another could be neutral, negative, or zero, but, overall, they had no influence. As a result, a rise in the rural retail price of Bambara groundnut in Enugu State would not, in the short term, result in a rise in the price of Bambara groundnut in Abia State, and vice versa-; pricing was thus slowly and ineffectively conveyed between the two places, with an interaction of supply and demand forces controlling the pricing.

However, the absence of granger causality may not necessarily indicate that price signals are not communicated because price signals can be instantly transmitted under some conditions. In the long term, albeit slowly, prices were communicated from one market to another. According to the findings, although prices in Enugu State and prices in Abia State were cointegrated over the long term, it was clear that there was no major impact over pricing in the near term due to low arbitrage. In conclusion, it was determined that the Bambara groundnut markets in Abia and Enugu were not integrated. This suggested that the research area's Bambara groundnut markets were cointegrated.

Table-7. Wald test of Short-run parameters in Error Correction Model of Bambara groundnut rural retail prices in Abia and Enugu States

Hypothesis	Calculated Chi^2 statistics	Tabulated Chi^2 statistics (5% level)	Decision
ARRP granger cause ARRP	11.20	4.891	Accept
ARRP granger cause ERRP	2.01	4.891	Reject
ERRP Granger cause ARRP	0.10	4.891	Reject
ERRP Granger cause ERRP	0.78	4.891	Reject

ARRP – Abia Rural Retail Price, ERRP – Enugu Rural Retail Price
Source: Computed from field data, 2022.

6. Conclusion and Recommendations

According to the findings, Bambara groundnut retail prices in Enugu State's urban and rural areas had the same price velocity pattern. However, as was predicted, the urban prices were higher than the rural prices. The study demonstrated that there were considerable differences in the rate of price change between urban and rural retail

markets in both States. Based on the study findings, the study recommended that to improve pricing effectiveness and market integration, it is necessary to encourage Bambara groundnut market price information in South-east Nigeria. The flow of information regarding Bambara groundnut prices, demand, and supply will improve both market integration and pricing effacing. The government should create regulations for information services.

Contributions to Knowledge

    i.   There were no short-run influences between rural and urban retail prices in Enugu State, except in Abia State, where previous rural retail prices impacted future prices.

    iii.   Long-term co-integration of rural and urban retail prices of Bambara groundnut in the two States was observed, despite the slow adjustment rate.

    ii.   The rate of pricing changes was noticeably slower in Enugu State and much faster in Abia State. Although the rates of rural and urban prices in Abia were similar, the rates of urban and rural prices in Enugu are very different.

Study Limitations

    i.   Insecurity: some of the marketers where unwilling to release their business data, and also bad road network.

    ii.   Limited availability of data: Some of the respondents has no record books, thereby making the data required not readily available and some inaccurate.

Future Prospectives

    The study of market integration and pricing efficiency is particularly crucial. Producers and market intermediaries will benefit from its assistance in locating the causes of inefficiency and suggesting solutions. Additionally, it will assist producers, customers, processors, and marketers in understanding how, where, and when to access their products profitably and effectively. In order to ensure food security, this study will help policymakers develop and carry out policies that will enable efficient distribution and marketing of Bambara groundnut. To prevent too much economic instability, this study will aid policy makers in developing an appropriate supply of agricultural products across the states.

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