Rural Economics and Development

Price Transmission and Market Integration of Fish in Oyo State

Adenegan, Kemisola O. and Anifat O. Bolarinwa
[1]*Department of Agricultural Economics, University of Ibadan, Nigeria.*

Abstract

This study examined degree of market integration and price transmission between four categories (local fresh, local dried, imported iced and imported dried) of fish market in the rural and urban area of Oyo State. Secondary data were sourced on the monthly retail prices of fishes for sixty months from the Oyo State Agricultural Development Project (OYSADEP). Data were analysed using the Augmented Dickey Fuller (ADF) test, Granger-causality test and Index of Market Concentration. The result revealed that while the other three market pairs were well integrated, the rural and urban local fresh fish market were not well integrated as the pair accept the null hypothesis of no integration, prices of the local and urban fresh fish market were not tied together in the long run. Thirty-one market links rejected the null hypothesis of no granger causality; seventeen market links exhibit a uni-directional granger causality while fourteen market links exhibit a bi-directional granger causality. The urban fresh fish market occupies the leadership position in the price formation and transmission in the markets investigated. The Index of market connection (IMC) indicates that the markets exhibit low short run market integration. It is therefore recommended that there is need for a policy to ensure efficient marketing of fresh fish in the urban and rural area of the State.

Keywords: *price transmission, market integration, granger causality, Index of market connection.*

**Correspondence E-mail:bumkem@yahoo.com; anifatbolarinwa@yahoo.co.uk*

Introduction

Market integration is a central issue in many contemporary debates concerning market liberalization. It is perceived as a precondition for effective market reform in developing countries: “Without spatial integration of markets, price signals will not be transmitted from urban food deficit to rural food surplus areas, prices will be more volatile, agricultural producers will fail to specialize according to long term comparative advantage and gains from trade will not be realized" (Baulch, 1997a).

UNIVERSITY OF IBADAN LIBRARY

The general consensus among economists and policymakers is that market liberalization enhances economic growth whereas intervention policies inhibit it (FAO, 1987; Onafowora and Owoye, 1998). Unless agricultural markets are integrated, producers and consumers will not realize the gains from liberalization. The correct price signals will not be transmitted through the marketing channels, as a result of which farmers will not be able to specialize according to long-term competitive advantages. Furthermore, the potential gains from trade will not be realized in full (Ravallion, 1986).

The farmers have realised the importance of adopting new techniques of production and therefore making efforts for more income and higher standards of living. The cropping pattern is no longer dictated by what they need for their own personal consumption but what is responsive to the market in terms of prices received by the farmers. While the trade is much organised the farmers are not conversant with the complexities of the marketing system which is becoming more and more complicated. The cultivator is handicapped by several disabilities as a seller. He sells his produce at an unfavourable place, time and price. An efficient marketing system stimulates production. Producers are likely to produce more if they are able to sell at reasonable prices. Similarly, an efficient marketing system stimulates consumption as consumers are ready to buy more, if they are able to purchase their requirements in the right form, place, time and at a minimum satisfaction (Adekanye, 1988). According to Onyuma *et al.*, (2006), majority of agricultural markets in African countries are inefficient and poorly integrated and agricultural marketing efficiency in Nigeria is dismally low.

Agricultural prices greatly influence the pace and direction of agricultural development. Prices serve as market signals of the relative scarcity or abundance of a given product; prices also serve as incentive to direct the allocation of economic resources and to a large extent they determine the structure and rate of economic growth. The liberalization of agricultural markets implies accepting potentially substantial variation in prices across time, space and product form. This price variation is necessary if agricultural markets are to perform its marketing functions (Tschirley, 1995). Information on agricultural commodity price in both developed and developing countries like Nigeria is important to both producers and consumers. Prices vary almost throughout the year and understanding the trend of such variations is therefore essential for good planning by the producers, consumers and policy makers.

Given its relatively cheaper cost, fish has become the major source of nutrition for the people of Nigeria, most of whom are not economically well off. The American Heart Association recommends eating fish at least two times per week as part of a healthy diet. Fish is packed with proteins vitamins and nutrients that can lower blood pressure and help reduce the risk of a heart attack or stroke. In Nigeria, the total domestic fish production is far less than the total domestic demand. According to Zango-Daura (2000), the country requires 750,000 tonnes of fish while domestic production amounted to 350,0000 tonnes. Fish importation makes up the balance of 400,000 tonnes. Importation is thus often used to bridge the fish supply demand gap (Rahji *et al.*, 2001). Nigerian's importation of fish is worth about N12 billion annually (zango-Daura, 2000).Since the time the Government of Nigeria made a tariff reduction on all fishery products in 2001 from 25% to 5%, Nigeria has become a major destination for imported seafood. According to Zango-Daura (2000), Nigeria requires 1.5m

UNIVERSITY OF IBADAN LIBRARY

tonnes of fish annually. This is what is needed to meet FAO's recommended minimum fish consumption rate of 12.5 kilogramme per head yearly to satisfy basic protein needs. Considering all the usefulness, nutrients and financial gains from fishes, the question then remains as whether the fish market in Nigeria is well integrated?

However, little is known about the price transmission effects of fishes between different markets in the deregulated environment in Nigeria as a whole and in Oyo state in particular. This study therefore investigates the nature and extent of market integration of four categories of fishes markets; the imported iced, imported dried, local fresh and the local dried fishes in the rural and urban markets in Oyo state and to determine the causal relationship between the markets. Our assumption is base on the fact that there is no causal relationship between rural and urban prices of the different categories of fishes. The rest of the sections are divided thus: section two has to do with the theoretical frame work, section three the methodology, section four the results and discussion while section five details the conclusion and recommendation.

2. Literature review

Majority of studies have used the econometric techniques of time series to test the Integration of the markets. The development of these techniques includes the cointegration and the correction of errors models, which has now become the standard tools to analyze the spatial relations of the markets, thus replacing the old empirical tools, such as the regression and correlation coefficient.

Although the test for integration of the markets and the transmission of the prices has a relatively long history which starts with Harriss (1979, Blauch (1997), and Barrett and Li (2002) criticized the analysis as being not very reliable. Fackler and Goodwin (2002) and Barrett and Li (2002), further described linear tests for the integration of the markets and the transmission of the prices as being rough and inadequate.

Notwithstanding the views of these authors, Rapsomanikis et al (2003) opine that the models of the time series require less data compared to other econometric models. It is therefore important to note that the time series models for the market integration analysis provide excellent results concerning the question of the integration of the markets and the transmission of the prices, if a methodological framework of suitable test is used and results correctly interpreted.

Two common forms of analysis of the relationships between prices are market integration and analysis of marketing margins. Studies (Fackler & Goodwin, 2002; Wohlgenant, 2001) on market integration attempt to investigate the extent of a market by analyzing the development of prices over time for potentially competing products. The interest for marketing margins or supply chains is how supply and demand shocks at one level of the supply chain are transmitted to the other levels within the chain. However, a feature that has not received much attention is that if different markets are integrated at the same or different level of supply chains, the supply chain for the product being examined can also be linked. Moreover if there is market integration at one level and a high degree of price transmission in the different supply chains, markets can also appear as integrated at different levels in the chain

UNIVERSITY OF IBADAN LIBRARY

despite competition at all levels of the market. Goodwin *et al.* (1990) explained that when investigating relationships between prices in market integration analysis, it is well known that there is in general a simultaneity problem as economic theory does not always give final answers to which variable is exogenous. This same problem is, in general present in the analysis of supply chains.

Nkendah and Nzouessin (2006) in their efforts to analyze the spatial integration of plantain markets in Cameroon and to evaluate the extent of the transmission of the prices from the urban markets towards the peripheral markets located in the rural zones, found the existence of price transmission from Douala or Yaounde towards the markets of production (peripheral), while the variations of the plantain price in Douala and Yaounde was transmitted to the peripheral markets with certain delay. However, the markets react to the changes of the urban prices at different degree. The integration of the short run was said to be weak while certain markets were more integrated than others. Ohen *et al.*, (2007), in a study to explore price integration between producer prices, export and retail price of live catfish in Nigeria concluded that producer and export prices were co-integrated, suggesting that market prices moved synchronously in the long-term as part of a single market. This implied that shocks or measures at any one point within the supply chain were to a large extent transmitted effectively within the chain. Adenegan and Adeoye (2011) on the other hand studied the level of market integration in tomato markets in rural and urban markets in Oyo State, Nigeria using the Augmented Dickey Fuller (ADF) and Indices of Market Concentration (IMC)to analysis the data and measure the degree of Market Integration respectively. The results revealed that prices of tomato were stationary at their level, while none of the market links exhibited bi-directional granger causality or simultaneous feedback relationship. However, the IMC indicated that the markets exhibit low short run market integration. Adenegan *et al.*, (2012), further examined the integration of tomato markets in selected producing and consuming states in Nigeria. The study, which covered three states each in the southern and northern part of Nigeria respectively, showed that prices of tomato were stationary at the first difference level while none of the markets exhibited bi-directional granger causality or simultaneous feedback relationship. It also indicated that Ekiti and Katsina States occupy the leadership position in tomato price formation and transmission. Hence it was suggested that efficient flow of information, good access road and infrastructural development among states were needed to improve market performance. Nkang *et al.*, (2007), also examined price transmission and integration of cocoa and palm oil markets in Cross River State, Nigeria using standard econometric techniques. Results indicated that cocoa markets are fully integrated in the long run with the law of one price holding in the market. The study therefore concluded that producers of cocoa palm oil benefited from spatial arbitrage as suggested by the perfect integration of the market.

3. **Methodology**

Data for the study were obtained from secondary sources. The data were sourced from the Oyo State Agricultural development project (OYSADEP). Monthly prices of imported fresh fish, imported dried fish, local fresh and local dried fishes in both the rural and urban markets across the state were collected from January 2005 to December 2010.

UNIVERSITY OF IBADAN LIBRARY

The study made use of a combination of analytical tools namely:- cointegration analysis, Augmented Dickey-Fuller (ADF) test, Granger-causality procedures and Ravallion- IMCmodel. A brief description of these models is hereby presented.

3.1. *Test for stationarity*

The first step in carrying out a time series analysis is to check for stationarity of the variables (price series in this case). A series is said to be stationary if the means and variances remain constant over time. It is referred to as I(0), denoting integrated of order zero. Non-stationary stochastic series have varying mean or time varying variance. The price series in this study were therefore tested for stationarity. The purpose was to overcome the problems of spurious regression. A stationary series tends to constantly return to its mean value and fluctuations around this mean value have broad amplitudes, hence, the effect of shocks is only transient. The other attributes of stationary and non-stationary data and their implications in econometric modelling are discussed by Gujarati (1995) and Juselius (2006).

A variable that is non-stationary is said to be integrated of order *d*, written *I(d)*, if it must be differenced *d* times to be made stationary. In the same way, a variable that has to be differenced once to become stationary is said to be *I(1)* i.e., integrated of order 1. The ADFtest model was adopted in this study to test for stationarity. This involves running a regression of the form:

$$\Delta P_{it} = \beta_1 + \beta_{2t} + \delta P_{it-1} + \alpha_1 \sum_{t=1}^{m} \beta_i \Delta P_{it-1} + \ell_{it} \qquad (1)$$

Where:
Δ = first difference operator
P_{it} = fish price series being investigated for stationarity
t = time or trend variable
β = the relationship between the price.

The null hypothesis that $\delta = 0$ implies existence of a unit root in P_{it} or that the time series is non-stationary. The critical values, which have been tabulated, by Dickey and Fuller (1979), Engle and Yoo (1987) and Mackinnon (1990) are always negative and are called ADF statistics rather than t-statistics. If the value of the ADF statistics is less than (i.e more negative than) the critical values, it is concluded that P_{it} is stationary i.e. $P_{it} \sim I(0)$.

When a series is found to be non-stationary, it is first-differenced (i.e. the series $\Delta P_{it} = P_{it} - P_{it-1}$to make it stationary, then ADF test is repeated on the first-differenced series. If the null hypothesis of the ADF test can be rejected for the first-differenced series, it is concluded that $P_{it} \sim I(1)$. The price series for all the markets included in this study were investigated for their order of integration.

3.2. *Co-integration test*

Two or more variables are said to be co-integrated if each is individually non-stationary (i.e. has one or more unit roots) but there exists a linear combination of the variables that is stationary. Other attributes of co-integration are as shown in Engle and Yoo (1987) and Silvapulle and Jarasuriya (1994). After the stationarity test, the study proceeds by testing for co-integration between market price series that exhibited stationarity of same order.

The maximum likelihood procedure for co-integration propounded by Johansen (1988), Johansen and Juselius (1990, 1992) and Juselius (2006) was utilized. This is because the two-step Engle and Granger procedure suffers from the simultaneity

UNIVERSITY OF IBADAN LIBRARY

problem and the results are sensitive to the choice of dependent variables (Baulch, 1995). Adopting a one-step vector auto-regression method avoids the simultaneity problem and allows hypothesis testing on the co-integration vector, r. The maximum likelihood procedure relies on the relationship between the rank of a matrix and its characteristic roots. The Johansen's maximal Eigen value and trace tests detect the number of co-integrating vectors that exist between two or more time series that are econometrically integrated. The two variable systems were modelled as a vector auto-regression (VAR) as follows:

$$\Delta X_t = \mu_t + \sum_{t=1}^{k} r_i \Delta X_{t-1} + \pi X_{t-k} + \varepsilon_t \qquad (2)$$

Where:

X_t= N x 1 vector containing the series of interest

(Fish spatial price series)

г and л are matrices of parameters

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

ε_t = vector of errors assumed to be white noise.

μ_t = stochastic error term

3.3. *Test for causality*

When two series are stationary of the same order and co-integrated, one can proceed to investigatefor causality. This is because at least, one Granger-causal relationship exists in a group of co-integratedseries (Alexander and Wyeth 1994; Chirwa 2001 and Nelson 2006). The causality test isrepresented by the error correction equation given as:

$$\Delta P_{it} = \beta_0 + \beta_1 P_{i(t-1)} + \beta_{2j(t-1)} + \sum_{k=1}^{m} \delta_k \Delta P_{i(t-1)} + \sum_{h=1}^{n} \alpha_h \Delta P_{j(t-h)} + \ell_{it} \qquad (3)$$

where:

m and n are number of lags determined by Akaike In formation Criterion.

Rejection of the null hypothesis (by a suitable F-test) that $\alpha_h = 0$ for h = 1, 2.....n and = 0 indicates that prices in market j Granger-cause prices in market i. If prices in i also Granger-cause prices in j, then prices are determined by a Simultaneousfeedback Mechanism (SFM). This is the phenomenon of bi-directional causality. If the Granger-causality runs one-way, it is called unidirectional Granger causality and the market, which Granger causes the other, is tagged the exogenous market.

3.4. *Index of market concentration (IMC)*

The index of market concentration was used to measure price relationship between integrated markets. Following Oladapo and Momoh, (2007) approach, the actual rural price is given by equation (4) as:

$$P_t = \beta_0 + \beta_1 P_{t-1} + \beta_2 (R_t - R_{t-1}) + \beta_3 R_{t-1} + \varepsilon_t \qquad (4)$$

Where:

R_t= urban price (in Naira)

P_t= rural price (in Naira)

R_{t-1} = lagged price for urban market (in Naira)

R_t - R_{t-1} = difference between urban price and its lag (in Naira)

ε_t = error term

UNIVERSITY OF IBADAN LIBRARY

β_o = constant term

β_1= coefficient of rural lagged price

β_2= coefficient of $R_t - R_{t-1}$

β_3 = coefficient of urban lagged price

From the estimation of equation (4) above, the Index of Market Concentration (IMC) is given by:

$$IMC = \frac{\beta_2}{\beta_3} \text{ where } 0 \leq IMC \leq \infty \qquad (5)$$

If:

IMC < 1 implies high short run market integration

IMC > 1 implies low short run market integration

IMC = ∞ implies no market integration

IMC = 1 high or low short run market integration

4. Results and discussion

4.1. *Stationarity test of fish price series in Oyo State*

The result in Table 1 show the stationarity test for the prices of fishes obtained with the ADF procedure. The results indicate that all the variables were not stationary at their level. The values of the ADF t-statistics were smaller in absolute term than the critical value. This showed that the null hypothesis of non-stationarity could be accepted at the probability of 5% level of significance. Therefore, the null hypotheses of non-stationary were accepted for all the variables at their level. When first-differenced, however, the null hypothesis of non-stationarity was rejected in favour of the alternative as the values of the ADF t-statistics were greater in absolute term than the critical value. The null hypotheses were however rejected at first difference for rural local fresh fish and rural imported ice fish markets. The findings here corroborate earlier findings that food commodity price series are mostly stationary of order 1 i.e. I(1) (Alexander and Wyeth 1994; Ogundare, 1999; Franco, 1999; Okoh and Egbon, 2003; Chirwa 2001; Mafimisebi, 2001 and Oladapo, 2003).

Table 1: Results of unit root test of fish price series in Oyo State

Variable (market price series)	Price level I (0)		First difference I (1)	
	ADF statistics	Remarks	ADF statistics	Remarks
Urban Local Fresh Fish	-2.5731	Non-stationary	-6.9935***	Stationary
Rural Local Dry Fish	-2.2567	Non-stationary	-16.8026***	Stationary
Urban Local Dry Fish	-2.5383	Non-stationary	-8.3196***	Stationary
Rural Imported Dry Fish	-2.0713	Non-stationary	-13.1480***	Stationary
Urban Imported Dry Fish	-3.4594	Non-stationary	-14.7842***	Stationary
Urban Imported Iced Fish	-3.6971	Non-stationary	-8.8395***	Stationary

**** significant at 1%*

UNIVERSITY OF IBADAN LIBRARY

4.2. *Co-integration of fish market pair series in Oyo State*

Table 2 presents the result of the co-integration test involving the use of Johansen Maximum Likelihood test to determine the number of co-integrating relations. The maximum Eigen value shows that out of the four market pairs investigated three of them were co-integrated at 5% level of significance. The null hypothesis of no co-integration was rejected at 5% significance level for rural and urban local dry fish, imported dry fish and imported iced fish while it was accepted for only rural and urban market of local fresh fish. All the marketpairs have their prices tied together in the long run except rural local fresh fish and urban local fresh fish markets. Therefore, there was perfect transmission of information in all the three market pairs. When there is perfect transmission of price information in a network of markets; producers, marketers and consumers will realize the appropriate gains from trade because correct price signals will be transmitted down the marketing chain thus enabling producers to specialize according to comparative advantage.

The urban and rural local fresh fish market accepted the null hypothesis of no co-integration at the 5% level of significance implying that inaccurate price information will be conveyed. Markets that are not integrated will convey inaccurate price information that has the tendency to distort production and marketing decisions and contribute to inefficient product movements (Baulch 1997b).This finding corroborate that of Mafimisebi (2008) where it was stated that only 41% of fresh fish market show prices which differ by an amount exactly equal to the transfer cost of one unit of fish between markets in the long-run.

4.3. *Granger-causality and exogeneity in fish markets in Oyo State*

The result of the pair-wise Granger-causality test in Table 3 show that out of the fifty-six market links tested for Granger-causality, only twenty-five market links accepted their respective null hypothesis of no granger causality. From the result of the analysis; seventeen market links exhibited uni-directional granger causality while the other fourteen market links exhibited bi-directional granger causality or simultaneous feedback relationship.

The results also reveal that urban local fresh fish market occupy the leadership position in the fish price formation and transmission as it exhibit a unidirectional granger causality with the rural imported dry fish market at 1% level of significance, the urban imported dry at 5% and urban imported iced fish at 1% level of significance respectively. It also indicate a bi-directional causality with the rural imported dry fish market and the urban imported dry fish market at 1% and 5% level of significance respectively. On the basis of granger causality results, we conclude that there is no dominant market whose price changes influence all other markets. These results are in line with the nature of markets in developing countries, in that those markets are usually more complex than is portrayed by the ravallion radial configuration of markets. These results are similar to what Mohammadand Wim (2010) found in their evaluation of rice market integration in Bangladesh. The analysis here provides a sufficient ground to permit the conclusion that exogeneity occurs in fish marketing in Oyo State in favour of these markets.

UNIVERSITY OF IBADAN LIBRARY

Table 2: Johansen maximum likelihood tests and parameter estimates for I(1) fish market pairs in Oyo State

Market pairs	Eigen value	Trace statistics	Critical value (5%)	Probability	Hypothesized No. of Co-integrating eqn.
RMPLFF	0.18	15.05	15.49	0.06	None
UMPLFF	0.02	1.61	3.84	0.21	At most 1
RMPLDF	0.24	20.69	15.49	0.01	None
UMPLDF	0.03	2.15	3.84	0.14	At most 1
RMPIDF	0.24	20.89	15.49	0.01	None
UMPIDF	0.02	1.97	3.84	0.16	At most 1
RMPIIF	0.26	25.04	15.49	0.00	None
UMPIIF	0.06	3.92	3.84	0.05	At most 1

Note:*RMPLFF is rural market price of Local Fresh Fish; UMPLFF is urban market price of Local Fresh Fish whileRMPLDF is rural market price of Local Dry Fish and UMPLDF is urban market price of Local Dry Fish. RMPIDF is rural market price of Imported Dry Fish; UMPIDF is urban market price of Imported Dry Fish; while RMPIIF is rural market price of Imported Iced Fish and UMPIIF is urban market price of Imported Iced Fish.*

UNIVERSITY OF IBADAN LIBRARY

Table 3: Result of pairwise granger-causality test for fish markets in Oyo State

Null hypothesis	Observations	F-statistic	Probability
URBAN local fresh fish does not granger cause RURAL local fresh fish	70	3.65	0.03**
RURAL local fresh fish does not granger cause RURAL local dry fish	70	3.31	0.04**
URBAN local dry fish does not granger cause RURAL local fresh fish	70	2.43	0.10*
RURAL imported dry fish does not granger cause RURAL local fresh fish	70	3.35	0.04**
URBAN local fresh fish does not granger cause RURAL local dry fish	70	2.86	0.06*
URBAN local fresh fish does not granger cause URBAN local dry fish	70	4.14	0.02 **
RURAL imported dry fish does not granger cause URBAN local fresh fish	70	2.64	0.08*
URBAN local fresh fish does not granger cause RURAL imported dry fish	70	5.59	0.00***
URBAN imported dry fish does not granger cause URBAN local fresh fish	70	2.82	0.07*
URBAN local fresh fish does not granger cause URBAN imported dry fish	70	4.05	0.02**
URBAN local fresh fish does not granger cause URBAN imported iced	70	5.08	0.01**
RURAL local dry fish does not granger cause URBA N local dry fish	70	2.81	0.07*
RURAL imported dry fish does not granger cause RURAL local dry fish	70	4.75	0.01***
RURAL local dry fish does not granger cause URBAN imported dry fish	70	4.82	0.01***
RURAL local dry fish does not granger cause RURAL imported iced fish	70	4.41	0.02**
URBAN imported iced fish does not granger cause RURAL local dry fish	70	3.73	0.03**
RURAL local dry fish does not granger cause URBAN imported iced fish	70	3.25	0.05*
RURAL imported dry fish does not granger cause URBAN local dry fish	70	2.96	0.06*
URBAN local dry fish does not granger cause RURAL imported dry fish	70	5.18	0.01***
URBAN imported dry fish does not granger cause URBAN local dry fish	70	2.86	0.06*
URBAN local dry fish does not granger cause URBAN imported dry fish	70	2.39	0.10*
URBAN local dry fish does not granger cause RURAL imported iced fish	70	4.98	0.01***
URBAN imported iced fish does not granger cause URBAN local dry fish	70	6.75	0.00***
RURAL imported dry fish does not granger cause URBAN imported dry fish	70	9.62	0.00***
RURAL imported dry fish does not granger cause RURAL imported iced fish	70	4.40	0.02**
URBAN imported iced fish does not granger cause RURAL imported dry fish	70	3.19	0.05*
RURAL imported dry fish does not granger cause URBAN imported iced fish	70	4.40	0.02**
RURAL imported iced fish does not granger cause URBAN imported dry fish	70	4.85	0.01***
URBAN imported dry fish does not granger cause RURAL imported iced fish	70	2.36	0.10*
URBAN imported iced fish does not granger cause URBAN imported dry fish	70	9.20	0.00***
URBAN imported dry fish does not granger cause RURAL imported iced fish	70	5.01	0.01***

**significant at 0.1%, **significant at 0.05%, ***significant at 0.01%*

UNIVERSITY OF IBADAN LIBRARY

4.4. *Indices of market connection for fish markets in Oyo State*

The result of the indices of market connectation (IMC) is presented in Table 4. The results for local fresh fish, local dry fish, imported dry fish and imported iced fish were 1.01, 0.47, 361.22 and 1.37 respectively. The IMC for these market pairs were greater than one thus indicating low short run market integration except local dry fish market that had value less than one which indicates high or short run market integration. The results also show that price changes in the rural market do not cause immediate change in the prices in the urban market.

.

Table 4: Indices of market connection for fish markets in Oyo State

Market pairs	Fish items	R^2	Adjusted R^2	F statistics	DW	IMC classification
Rural and urban	Local fresh fish	0.45	0.42	13.55	2.04	1.01 low short run market integration
Rural and urban	Local dry fish	0.63	0.61	28.05	1.95	0.47 high or short run market integration
Rural and urban	Imported dry fish	0.69	0.67	36.56	2.29	361.22 low short run market integration
Rural and urban	Imported iced fish	0.53	0.50	18.28	1.74	1.37 low short run market integration

5. Conclusion

The study examined the price behaviour in four categories of fishes in the rural and urban market of Oyo State. It was concluded that there is no dominant market whose market price changes influence all other markets. The index of market connection showed low short run market integration in all the market except the local dry fish market, which exhibitedhigh short run market integration. The urban local fresh fish market occupied the leadership position in the study area. The co- integration analysis showed that the markets were well integrated except for the urban and rural local fresh fish markets, implying that consumers were paying more for fresh fish.

It is recommended that there is need for a policy that will improve the efficient marketing of fresh fish at a price that will reflect the transfer cost from the rural surplus to the urban deficit region in Oyo State in order to ensure affordability on the part of the consumer. This will eventually balance the production, marketing and consumption aspect of the fresh fish market within the state while the gains that accrue to the farmer will not be jeopardised.

UNIVERSITY OF IBADAN LIBRARY

References

Adekanye T.O. (1988). Readings in AgriculturalMarketing. Longmans Nigeria Limited, 215 Pp.

Adenegan, K.O and Adeoye, I.B. (2011): Price Analysis of tomatoes in Urban and Rural Markets of Oyo State, Nigeria**.** International Journal Of AgriculturalEconomics & Rural Development. Vol.4 No.2 Pp. 90-96.

Adenegan, K.O., I.B. Adeoye and I. Ibidapo (2012): Spatial Price Analysis of tomatoes in Nigeria. International Journal of Management and Marketing Research (IJMMR) Vol.5 No. 2 Pp. 31-38.

Alexander. C. and Wyeth, J. (1994), Co-integration and Market Integration: An Application to the Indonesian Rice Market, *Journal of Development Studies*, Vol.30, No.4, pp.303-328.

Barrett, C.B. & Li, J.R.(2002): Distinguishing between equilibrium and integration in spatial price analysis. *American Journal of Agricultural Economics*, 84:292-307.

Baulch, B. (1997a). Transfer Costs, Spatial Arbitrage and Testing For Food Market Integration. American Journal of Agricultural Economics, 79(2), 477-487.

Baulch, B. (1997b), Testing Food Market Integration Revisited, *Journal of Development Studies*, 33:477-487.

Baulch, R.J. (1995), Spatial Price Equilibrium and Food Market Integration, A Ph.D Thesis of the Stanford University.

Chirwa, E.W. (2001), Liberalization of Food Marketing and Market Integration in Malawi, Report of AERC Sponsored Research.

Dickey, D.A. and Fuller, W.A. (1979), Distribution of Estimators for Autoregressive Time Series with Unit Root, *Journal of American Statistical Association*, Vol.74, No.366, pp.427-431.

Engle, R.F. and Yoo, B. (1987), Forecasting and Testing in Co-integrated Systems, Journal of Econometrics, Vol.35, No.2, pp.143-159.

Fackler, P.L. and B.K. Goodwin(2002): "Spatial Price Analysis". *In*: Gardner, B. and G. Rausser eds.), *Handbook of Agricultural Economics*, pp: 971–1024. Elsevier Science B.V.

Food and Agriculture Organization (FAO) (1987). Agricultural Price Policies: Issues and Proposals. FAO Economic and Social Development Series No. 40. Rome.

Goodwin, B.K., T.J. Grennes and M.K. Wohlgenant, 1990. Testing the law of one price when trade takes time. *J. Int. Money Finance*, 5: 682–93

Gujarati, D.N. (1995), Basic Econometrics, New York, Mc Graw Hill, 3rd Edition.

Harriss, B. (1979): "There is method in my madness: or it is vice-versa? Measuring agricultural market performance." *Food Research Institute Studies*, 16:97-218.

Johansen, S. (1988), A Statistical Analysis of Co-integration Vectors, *Journal of Economic Dynamics and Control*, Vol.12, No.2-3, pp.231-54.

Johansen, S. and Juselius, K. (1990), Maximum Likelihood and Inference on Co-integration with Applications to the Demand for Money, *Oxford Bulletin of Economics and Statistics*, Vol.52, pp.169-210.

Johansen, S. and Juselius, K. (1992), Testing Structural Hypothesis in a Multivariate Co-integration Analysis of the PPP and UIP for the UK, *Journal of Econometrics*, Vol.53, pp.211-44.

UNIVERSITY OF IBADAN LIBRARY

Juselius, K. (2006), The Co-integrated VAR Model: Methodology and Applications, Oxford University Press (manuscript).

Mackinnon, J. (1990), Critical Values for Co-integration Tests, San Diego University of California (San Diego), Department of Economics Discussion Paper 90-4.

Mafimisebi, T.E. (2001), .*Spatial Price Equilibrium and Fish Market Integration in Nigeria.*, Unpublished Ph.D Thesis, University of Ibadan, Nigeria, p.201.

Mafimisebi, T.E. (2008), Long-run price integration in the Nigerian fresh fish market, Implication for marketing and development. Delhi business review, vol 9 No 1, January – June, 2008.

Mohammad, I.H. and Wim, V. (2010), Evaluation of Rice Market Integration In Bangladesh, The Lahore Journal of Economics. 15:2 (Winter 2010): pp.77-96.

Nelson, M. (2006), Market Integration and Causality in Demand, The Case Study of Farmed Trout in Germany, Paper delivered at the 13th Biennial Conference of International Institute of Fisheries Economics and Trade, Portsmouth, U.K, July 11, Vol.14, p.12.

Nkang, M.N, Ndifon, H.M and Odok, G.N (2007): Price transmission and Integration of cocoa and Palm Oil markets in Cross River State, Nigeria: Implications for Rural Development. Agricultural Journal 2 (4): 457-463, 2007. Medwell Journals, 2007.

Ogundare, G.O. (1999), *The Determinants of the Traditional Export Crops in Nigeria Using Co-integration Approach*, Unpublished M.Sc Thesis, University of Ibadan, p.65.

Ohen, S.B., S.O. Abang and I.C. Idiong (2007): Price Transmission and Market Integration: Vertical and Horizontal Price Linkages for Live Catfish in Nigeria. Journal of Agriculture and Social Sciences Vol.3 No 3 Pp. 79–82.

Okoh, R.N. and Egbon, P.C. (2003), The Integration of Nigeria. Rural and Urban Foodstuff Markets, A Report of AERC Sponsored Research.

Oladapo, O.O. (2003), *Market Integration for Pineapples in Nigeria*, An Unpublished Ph.D Thesis, University of Agriculture, Abeokuta, Nigeria.

Oladapo M.O. and Momoh S. (2007), Food price differences and market integration in Oyo state, Nigeria. International Journal of Agricultural Research. 2(1); 69-74.

Onafowora, O.E., and Owoye, O. (1998). Can Trade Liberalization Stimulate Economic Growth in Africa? World Development, 26(3), 497-506.

Onyuma S.O, Kart E. And Owuor G. (2006). Testing Market Integration for Fresh Pineapple in Kenya. Posteer paper prepared for presentation at the International Association of Agricultural Economist conference, Gold coast, Australia August 12-18.

Rahji, M.A.Y., Popoola L., And Adebisi L.A. (2001). Analysis for The Demend for And Supply of Fish in Nigeria, 1986-1997, Journal of west African Fisheries Vol. 10: 543-550.

Rapsomanikis, G., Hallam, D., & Conforti, P. (2003): Market integration and price transmission in selected food and cash crop markets of developing countries: review and applications. *In* FAO, *Commodity Market Review*, FAO Commodities and Trade Division, Rome.

UNIVERSITY OF IBADAN LIBRARY

Ravallion, M. (1986). Testing Market Integration. American Journal of Agricultural Economics, 68, 102-109.

Robert Nkendah and Chantal Beatrice Nzouessin (2006): Economic Analysis of the Spatial Integration of Plantain Markets in Cameroon. A Research Paper.

Silvapulle, P. and Jayasuriya, S. (1994), Testing for Philippines Rice Market Integration: A Multiple Co-integration Approach, *Journal of Agricultural Economics*, Vol.45, No.3, pp.369-380.

Tschirley, D.L. (1995) "Using Micro Computer Spread sheet for spatial and temporal price analysis: An application to Rice, Maize in Ecuado", In Nuhu, H.S. et al (2009) Food Grain Marketing in Northeast Nigeria: A study of spatial and temporal price efficiency, American- Eurasian journal of sustainable Agriculture 3(3): 473-480.

Wohlgenant, M.K., 2001. *In*: Gardner, B.L. and G.C. Rausser (eds.), *Marketing Margins: Empirical Analysis*. Amsterdam, Holland.

Zango-Daura S. (2000). Fish Import Gulps N12 billion Yearly. New Nigerian News paper, Monday 22nd May, 2000 Pg. 1.

UNIVERSITY OF IBADAN LIBRARY

UNIVERSITY OF IBADAN LIBRARY