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SPATIAL INTEGRATION OF MAIZE MARKETING IN NIGERIA

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Abstract: *This study investigates market integration for local maize market in Oyo State, South Western part of Nigeria. Monthly retail prices per kilogram of milled local maize between January 1998 and December 2007 was sourced from the Agricultural Development Programme of the State. Descriptive statistics which included mean, coefficient of variation and graphical analysis, correlation analysis, co- integration analysis and the Granger causality test were carried out. The descriptive analysis showed that urban market recorded the highest average monthly prices of local maize in Oyo State than their rural counterparts. Graphical trend of the variables showed that price series of local maize is more stationary in the rural areas than the urban areas. Correlation analysis of the variables showed that there is co-movement of prices within state. The co-integration results also showed that there is a long run relationship between the paired markets (that is rural and urban markets) of the state studied. It is recommended that Government should invest hugely on research involving pricing policy and marketing which will help in understanding price behaviour both in the short and long-run respectively which will enhance agricultural development and food security.*

Keywords *–co-integration, granger causality test, integration, spatial, trend analysis.*

I. Introduction

Maize is one of the staples widely grown in Nigeria. However, its production is more in the Northern part of the country than in the South, which is largely forest in nature with heavy rainfall. The maize grown in the southern part of the country is rain fed while that grown in the Northern part of the country is an admixture of rainfed and irrigation. Because of the scanty rainfall in the Northern part of the country, maize growers support their production with fertilizer and water from irrigation. Maize as a cereal crop is high yielding, easy to process and readily digested. It is a versatile crop that grows across a range of agro ecological zones. That might explain why almost all farmers in Nigeria grow maize. Maize is one of the most important cereals in the world followed by rice, wheat and millet. Maize has its significance as a source of large number of industrial products besides its uses as human food and animal feed. Over 50% of the population in the Sub-Saharan Africa has maize as a staple food. It is an important source of carbohydrate, protein, iron, vitamin and minerals. Africans consume maize as a starchy base in a wide variety of porridges, pastes, grits and beer. Green maize (fresh on the cob) is eaten parched, baked, roasted or boiled and plays an important role in serving as a stable menu for the downtrodden masses.

There are principally two types of maize that are produced in Nigeria-yellow and white maize. The two varieties of maize are grown in all parts of the country in almost equal proportions. Grain of these varieties of maize contains between 5-6 grains.

Nigeria produces annually over 6million tonnes out of 624 million tonnes of maize produced worldwide. The world major producer of maize is USA followed by China and Brazil. The world trade in maize in year 2002-2003 was estimated at75.85 MT.

The major exporters of maize are USA, China, Argentina, Brazil, Hungary and South Africa. The major importers of the same product during the same period were Japan, South Korea, Mexico, Egypt and Taiwan. Nigeria does not participate much in the world trade in maize due to its high domestic demand pressure on the maize for industrial uses, animal feeds and consumption. Maize is used as food in form of porridges of different types, boiled or roasted, corn flakes and popped grains. More than 60% of the Nigeria's production of maize is consumed by the industrial sector for production of flour, beer, malt drink, corn flakes, starch, syrup, dextrose and animal feeds. Maize plant can be used as dry fodders and green fodders [1]

Nigerian maize is traded both locally and internationally with a considerable percentage filtering into Niger, Chad, Mali, Benin Republic and some other countries in the West African Sub-region. Locally, white and yellow maize are sold almost in all markets in Nigeria with the commanding markets for the commodity being Dawanau market in Kano, Dandume and Jibia market in Katshina, Giwa Market in Kaduna, Shinkafi and Talata Mafara in Zamfara, Bodija in Ibadan, Osi market in Onitsha and Mile12 market in Lagos. A market system in which there is synchronous movement of prices in different markets over time is said to be integrated[2]. Market integration is a concept with application in spatial, temporal and product from market inter-relatedness. Without

market integration, price signals will not be transmitted from food deficit to food surplus areas, agricultural producers will fail to specialize according to comparative advantage and the gains from trade will not be realized[3].Market integration analysis attempts to make statements on the functioning of markets, it tries to find information on the speed with which arbitrage takes place between markets, it also gives indication on commodity price interrelatedness[4].Market integration is often used as proxy for the "efficiency" with which a market system operates and the level of competitiveness in the market[5]. It is thus believed that the perfectly competitive market condition is the ideal market structure for market integration as this will force prices to adjust instantaneously to any new price of information so that all available information is reflected in prices.

A. Statement of research problem.

Past policies have arrived at increasing agricultural productivity through increased investment in agronomic and production systems research. Efforts have also been made to restructure the agricultural sector, by removing every element of control in the supply and pricing of agricultural produce through the abolition of marketing boards, and reducing level of subsidies on agricultural inputs. This latter policy has contributed enormously to the erratic price variations in agricultural produce observed in recent years. Not much emphasis has been placed on the study, evaluation and development of marketing system. Policy formulation has failed to take cognizance of the fact that production and marketing constitute a continuum and the absence of development in one retards progress in the other. [6]

Previous studies in the marketing and pricing of staple food stuffs in different parts of Nigeria have concluded that the marketing and price information transmission mechanism are inefficient although there are many buyers and sellers in the market[7],[5],[8].The paucity of physical infrastructure such as storage facilities, transportation systems, access roads, communication channels and inadequacy of economic data for planning and research are some of the factors identified as source of inefficiency. Others include, a high number of intermediaries in the marketing chain, high and erratic prices which will further depress the level of agricultural production. Thus, Oligopolistic competition is present in food stuff marketing in Nigeria.

B. Justification of the study

The integration of food grain market is central to the direction and success of agricultural policies in the West African Semi-Arid Tropics (WASAT).A well-integrated market system is essential to household food security in both food deficit rural areas and those witnessing a rise in the relative importance of non-food cash cropping. It is also key to the sustained success of extensions of new food production technologies, which might otherwise flood stagnant local markets with unstable surpluses. It can also be shown that the degree of food grain market integration determines whether equity oriented production policies in less favoured food-producing areas should be oriented toward food or some alternative activity[9] If price transmission does not occur, the localized scarcities and abundances may result in excessive strain on the population[10]. Market integration analysis attempts to make statements on the functioning of markets, it tries to find information on the speed with which arbitrage takes place between markets, it also gives indication on commodity price interrelatedness[4].

Market integration is often used as proxy for the efficiency with which a market operates[8] and the level of competitiveness in the market[5] .It is thus believed that the perfectly competitive market condition is the ideal market structure for market integration as this will force prices to adjust instantaneously to any new piece of information so that all available information is reflected in prices. In view of the importance of maize which is believed will help increased production. Since an inefficient marketing can cause decline in production, because it would lead to high price spread between the farm gate and the retail end. It could fail to transmit the correct price signals to the farmers.

C. Objectives of the study

The general objective of the study is to examine how integrated the local maize market in urban and rural market of Oyo State of Nigeria is.

The specific objectives are:

1 To present the trend analysis of the market studied.
2 To compare the market integration between urban and rural markets in the state.
3 To make policy recommendations.

II. Literature review

Studies on marketing of staple food stuffs in various regions of Nigeria abound, while those on maize are few. Of recent, the use of time series econometric techniques has improved the understanding of the performance of food markets and impact of reforms using price data.

[5] studied food market integration in Northern Nigeria using correlation analysis, compares market performance of staple (garri, rice, yams, and maize) and supplementary (cowpea, sorghum, millet) food. The study finds that out of 3,527 coefficients of pairs of markets for seven food crops only,19 have a correlation

above 0.9 and more than 2000 coefficients are less than 0 .50.The correlations among garri prices are the highest and described as a fairly well-integrated system with more than one third having correlation above 0.80. This is followed by cowpea with 11.8 percent of the coefficient above 0.80, 1.0 percent for millet prices, 0.7 percent for maize prices, 0.6 percent for sorghum prices, 0.3 percent for rice prices and none for yam prices.

[11] studied the extent of market integration of maize to understand how liberalisation affects markets in Malaysia. The study concentrated on movement of prices and price adjustment process over time using correlation and co-integrated analysis. The study concluded that market liberalization enhances the degree of market integration.

In addition, almost all the markets studied exhibit a long run stable relationship shown by the existence of a stationary linear combination of price series and the number of markets that are co-integrated increased after liberalization. Also, the study finds that three major cities, Lilongwe, Zomba, and Blantyre are pivoted in the transmission of price signals to other markets.

[12] applied the concept of co-integration in the study of market integration in seven spatial markets in Indonesia. The result of the study indicates high co-integration of markets, but only 17 relationships out of 56 are strongly exogenous. They conclude that supply sources are more important than demand sources in the driving process.

[13] applied co-integration techniques in the study of market integration in ten spatial markets in Ethiopia. The study applied the analysis of shocks such as war and market liberalization. The results showed that liberalization reduces the margins between some of the main producing areas and the main consuming area. In addition, more markets become integrated with Addis-Ababa in the period after the policy change. On the whole, liberalization has important effects on the long-run and short-run integration of food markets.

[14] investigated the structural determinants of market integration using 64 rice markets in Bangladesh. Correlation and co- integration analyses were used to obtain measures of market integration on which were in turn regressed on structural characteristics such as marketing infrastructure, vitality of policy and production levels. The study concluded that the degree of market integration in Bangladesh is moderate as segmented markets and only 10 percent of a network of 2016 market links. In addition, the determinants of market integration were sensitive to the measures of market integration but results suggested that market integration is negatively affected by distance and the number of strikes and possibly affected by the number of production shocks.

[15] worked on pricing dynamics and market integration of cassava roots and products in Edo and Delta states using correlation and Ravallion-type model. Out of 56 market pairs of garri, 40 had correlation coefficients of above 0.80 for cassava roots,16 market pairs had coefficients above 0.80.The result of the Ravallion-type model revealed that changes in cassava and garri prices in each of the markets studied could be explained by changes in their own historical prices as well as contemporaneous and historical price variation in other markets. Another important finding was that cassava root prices in spatial markets were more integrated than garri prices in the short-run. She also reported a generally low level of price association between cassava roots and garri prices and absence of instantaneous price adjustments between markets.

[16] in a co- integration study of cocoa supply in Nigeria found that weather effect is stationary while producer price and hectrage planted on cocoa have a long run equilibrium relationship with its determinants. The result suggested that cocoa export supply responds to relationship with its determinants. Their findings unequivocally support the deregulation of cocoa pricing as done under the structural adjustment programme of the late 1980s.The study recommended that government should intensify positive price policy measures that will greatly enhance cocoa production and hence its export supply to the world market. This is due to the fact that Nigeria's supply is not significant enough to decisively upset world market.

[17] worked on structure and performance of cotton marketing in Northern Nigeria. Using Ravallion models, he found only 10 pairs of cotton markets to be integrated out of 56 pairs. Thus the degree of integration of cotton markets is very low in Northern Nigeria.

He also found that parity prices were either above or below producer prices thus giving risk to either positive or negative price spread. For the three marketing years studies 1996/97, 1997/98 and 1998/99, the highest marketing margin of ₦18,000 was recorded in 1998/99 and this is equivalent to 32.7 percent of the producer price. This marketing margin was seen as high in his opinion. He concluded that the structure of cotton markets is not free of defects, the conduct is not flawless and expectedly the performance of the markets exhibits pricing inefficiency and high degree of segmentation or independence.

[18] used co-integration and Granger-Causality to determine whether or not there is a long-run relationship between the domestic price and foreign markets. The results of 1970-1998 period covered by the study the world price of cocoa powder and cocoa butter.

Granger causes the price level of their respective domestic prices and causes them to change at 1% and 5% levels of significance respectively. No causalities were found from world price to producer price of cocoa bean. The results of the exogeneity test for all the market pairs revealed that all the relationship were exogenous.

The measure of contemporaneous price effect was unity and this indicates that the transmission of new information about price changes is within one year.

In a study by [19], it was found that despite the low status of garri, its price seasonally remains high for 8months and low for 4months of the year.

Evidence from the spatial price movements indicate existence of a high degree of integration amongst markets for garri in different geographical areas.

III. Methodology.

A. The study area.

The area of study is Oyo State. Oyo State is bordered by Benin Republic in the West, in the North and East by Kwara and Osun States respectively and by Ogun State in the South.

The state as it is presently constituted came into being in August 31, 1991 when the State creation excised the present Osun State from the old Oyo State. It covers a land area of 27,000sq km and made up of 33 local governments in four Agricultural Zones of Ibadan/Ibarapa, Oyo, Ogbomosho and Oyo Central, Oyo South and Oyo North Senatorial districts.

Oyo state is located between $7^0 3^1$ and $9^0 12^1$ North of the equator and longitudes $2^0 47^1$ and $4^0 23^1$ East of the Meridian. This location confers on the state the equatorial climatic conditions. There are two district seasons namely wet and dry seasons.

B. Method of data collection.

Time series data (monthly prices) of retail prices of local maize in the state between 1998-2007 inclusive (ten years) was sourced from each state's agricultural development programme (ADP).

Interview was conducted with relevant bodies such as Oyo State Ministry of Agriculture, Agricultural Development (OYSADEP), Project Coordinating Unit (PCU) and sellers and buyers of local maize in the state.

C. Method of data analysis.

Market integration refers to co-movement of prices and more generally in smooth transmission of price signals and information across spatially separated markets.

Time series analysis of price data is conducted (from the secondary source).

Correlation coefficient of prices and co- integration analysis will be used to measure the market integration in this study. Granger causality test will be used to measure the market integration in this study. Granger causality test will be used to evaluate which is the leading market in each of the market in the state. ARCH – model will also be used if appropriate.

C.1 *Correlation analysis*

One simple way to study market integration is to consider the correlation of price series for different markets.Correlation(**ρ**) is a measure of the extent to which variables ' move together' and it is defined as.

$$\boldsymbol{\rho}_{ij}=\frac{\sum_{i=1}^{n}(P_{it}-P)(P_{jt}-P_i}{\sum_{t=1}^{n}(Pit-Pi)^2\sum_{t=1}^{n}\sqrt{(Pit-P\text{i})^2}}$$ Where

Pit=denotes the prices for local maize urban market (i measured at time t)

Pjt=denotes the prices for local maize in rural (j measured at time t).

P_{it} and P_{jt} denotes the means of each prices series.

n=number of observation.

If two prices co-vary perfectly in the same direction, it will equal one and the price series will move in parallel. Testing for market integration then reduces to assessing whether or not the sample correlation (ρ) is significantly different from one.

C.2 Co-integration analysis.

Co-integration analysis is concerned with the existence of a stable relation among prices in different localities. When a long-run linear relation exists among different series, these are said to be co integrated.

The presence of co- integration between two series is indicative of interdependence; its absence indicates market segmentation. In particular, a segmented link is one where there is no integration, whereas an integrated link is one where we have co integration.

Basically, the idea of co -integration rests on the thesis that even though two time series may not themselves be stationary, a linear combination of the two non-stationary time series are said to be co integrated.

Usually, for co- integration, the two time series have to be of the same 'order' i.e. they should be stationary after the same number of differencing. If a time series is said to be at its level i.e. without differencing such time series is said to be integrated of order zero I(0).If a non-stationary time series becomes stationary after first differencing, it is said to be integrated of order one I(1) etc.

In co integration analysis, the concern is usually with a co integration of order I(1) between a pair of nominal price series. This type of co integration requires that two price series P^i_t and P^j_t are each non-stationary in levels but stationary in first differences. It is accordingly necessary to test each of the univariate series for stationary individually and then, if they are both shown to be 1(I), proceed to test for co-integration.

The most commonly used method is to run an OLS regression of one I(1) price series on another 1(1) price series and a time trend[20].

$P_{it}=\alpha+\beta P_{jt}+Y_t+E_i$

Where Pit and P_{jt}=Price series of a commodity.

α= Constant

β and Y=Parameter estimators.

E_i=error term.

The above equation is known as 'Co integration regression'. The next step is to test the residual E_t from the co integration regression for stationary using the DE or ADF test on the β of the equation below.

$\Delta E_t=\beta_{Et-1}+\sum Y_j \Delta E_{t-j}+\lambda_1$

Where E_t=Error term of co integrating regression.

Y= Parameter estimator of lagged error term.

The constant and time trend are now committed from the test because the residuals from the co integration will have zero mean and be detrended.

The null hypothesis β=0 will be tested (Note that this is a test of the non-stationary of the residuals rather than the original time series).

If the 't-statistics' on the β coefficient is less(i.e. more negative) than the relevant critical value, the null hypothesis may be rejected and the two series are said to be co integrated of order1(1).

A stationary residuals implies that the two variables are co integrated (Thomas, 1997).

When two series are stationary of the same order and co integrated, one can proceed to investigate causality. This is because at least, one Granger-Causal relationship must exist in a group of co integrated series .

The causality test is represented as follows.

$\Delta P_{jt}=\beta_o+\beta_1 P_{i(t-1)}+\beta_2 J_{(t-1)}+\sum_{k-1}^{m} \delta k\, \Delta Pi(t-k)+\sum_{h=1}^{n} \alpha h \Delta Pj(t-h)+\lambda_t$

Where m and *n* are the numbers of lags determined by a suitable information criterion.

C.*3 Arch models*

ARCH stands for Auto regressive conditional Heteroskedasticity. It is a technique used in finance to model asset price votality over time. It is observed in much time series data in asset prices and these are periods when variance is high and periods where variance is low. The ARCH econometric model for this(introduced by[20] is that the variance of the series itself is an AR (Autoregressive) time series, often a linear one.

Formally,[20] states that an ARCH model is a discrete time stochastic process {et} of the form.

$E_t=Z_tS_t$

Where the Z_t's are id overtime,$E(Z_t)=0$,$Var(Z_t)=1$ and S_t is positive and time varying. Usually S_t is further modelled to be an autoregressive process.

ARCH models are usually estimated by maximum likelihood techniques.

IV Data analysis and interpretation

A. Trend analysis

Trend analysis was carried out by the use of descriptive statistics which include mean, coefficient of variation and graphical analysis.

Urban markets in Oyo State recorded the highest average monthly price for local maize than their rural markets (see table 4.1).The reason for this may be because consumption is higher in the urban areas than the rural areas of the state.

Table 4.1: Summaries of Monthly Local Maize Prices from 1998-2007.

YEAR	URBAN PRICES(N/kg)	RURAL PRICES(N/kg)
1998	22.01	20.78
1999	30.50	30.58
2000	19.78	17.36
2001	33.06	31.37
2002	35.57	34.84
2003	27.56	25.89
2004	35.77	33.77
2005	59.69	52.22
2006	40.52	34.41
2007	35.48	30.31
Average	28.32	25.96

Source: Computed Price Series Data 2008.

The trend in market prices of maize in the various markets is represented graphically in figures 4.1.

Figure 4.1: The Graphically Trend of Oyo State's Urban and Rural Market Price series of Local Maize (1998-2007).

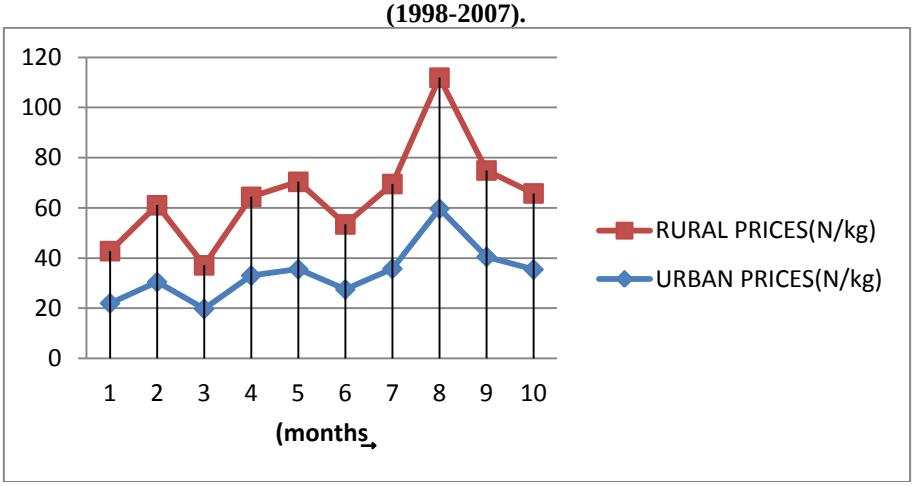

Figure 4.1 contains the graphical representation of urban and rural market's of maize price series of Oyo State respectively. The figure revealed that monthly price of maize increased at an increasing rate between 1998-1999,but there was a sharp decrease in 2000,it later increased between 2001-2002 and decreased in 2003.2004-2005 experienced an increase in the price of maize at about N33.77-N60.00/kg, while there was a fall in 2006 and 2007.The decrease in 2000,2003,2006 and 2007 may be as a result of surplus of harvest in those years while the rise in prices were as a result of shortage in supply of the commodity in such periods.

B. Correlation analysis

The correlation analysis carried out showed that the paired markets were correlated (that is there is co-movement of prices between the paired market).

Table 4.2: Summaries of the Correlation Results.

Market Pairs	Pearson Correlation Coefficient	Spearman's Rho Correlation Coefficient
OYR-OYU	0.966	0.914

Source: Computed from the correlation analysis result,2008.

From table 4.2, it could be seen that a correlation coefficient of 0.966 was obtained with Pearson Correlation which was significant at the 0.01 level (2-tailed).Since the coefficient is closer to unity and since correlation coefficients directly measure how closely prices of a commodity (maize) move together in spatially dispersed market, the market for maize is said to be integrated and efficient in urban and rural market respectively. This is also supported by Spearman's rho coefficient which happens to be a non-parametric statistical method which gave a correlation coefficient of 0.914 which was significant at 0.01 level (2-tailed).This result also shows that the two markets move together. However, the overall result showed that there is a co-movement of maize price in the maize market in Western Nigeria since all the paired markets have correlation of above 0.60.The result of the growth rate as shown in Table 4.3 shows that it is Exponential.

C. Co-integration analysis.

C.1 Unit root test.

Unit root tests were carried out to examine the stationarity of the variables in the model to be estimated. A series is said to be stationary if the means and variances remain constant over time. It is denotedI(0), denoting 'Integrated of order zero'. A series is non-stationary if the means and variances vary over time and the variances are infinite. In general, a variable is said to be integrated of order *d* , written I (d),if it must be differenced "d" times to be made stationary.

This study employs the Augmented Dickey Fuller (ADF) unit root to test for stationarity. This involves running a regression;

$\Delta Z=\alpha Z_{tj}\text{-}1+\sum_{t-1}^{p} \alpha i\, \Delta Z\text{tj} - 1 + ei.$

t-test is performed to find out whether α is significantly different from zero. The price series is adjudged to be stationary if the absolute value of the ADF test statistic is greater than the absolute value of the critical value, significant at *p (0.01,0.05 and 0.*10*). F*rom our result shown in Table 4.4, since the value of the ADF test statistic is greater than the absolute value of the critical value at p(0.05 and 0.10) for the rural market we concluded that there is stationarity at 5% and 10% while there is none at 1% at level I(0). We then proceed to first differencing i.e.I(1). However, at first differencing I(ϕ), all the rural market price series were stationary at all levels of significant i.e. 1%, 5%, and 10% respectively(See table 4.5).

Table 4.4: Results of the Stationarity Tests for the level of the Variables.

Variable(Market price series)	ADF Test Statistics at level I(0)
OYR-OYU	-3.140103

1% test critical value for the ADF statistics=-3.486551.
5% test critical value for the ADF statistics=-2.886074.
10% test critical value for the ADF statistics=-2.579931.
*Indicates that Null hypothesis is rejected at 95% and 90% level of significance.
$H_{0=}$Price series are not stationary.
H_1=Price series are stationary.
The conclusion is that there is stationarity at 95% and 90% respectively.
Source: Computed from Dickey Fuller regression result.

Table 4.5: Results of the Stationarity Tests for the First Difference of the Variables.

First differencing of the market price series	ADF Test Statistics at first difference of the price series level I(1)
OYR-OYU	-8.557351
1%	-3.486551
5%	-2.886074
10%	-2.579931

The result shows that there is stationarity at all levels.
*Significant at all levels (1%, 5%, and 10%).
Source: Computer Output 2008.
In the urban market as shown in Table 4.6 at Integration of order 0 i.e. I(0), only at 10% is the market stationary that is absolute value of ADF statistics is greater than absolute critical value.

However at first difference I(1), the urban market for maize was stationary at all levels of significance 1%,5% and 10% respectively.

Having observed that the urban and rural markets for maize are stationary at the first difference, we then proceed to test for the market integration using co integration analysis and Granger causality test.

D. Co-integration tests.

The co-integration tests carried out was based on Eigen value and Trace statistic. The result from Table 4.8 showed that there was co-integration of the order (1,1) since the absolute ADF test statistic was greater than the absolute value of the critical values at 1%,5% and 10% level respectively. Also the Durbin-Watson statistics shows that there is positive first-order autocorrelation since the value of the coefficient lies between zero and 2(i.e. $0 \leq 0.792795 \leq 2$.

The result also shows that the R-squared was high with the value of 0.932214.This implies that 93% of the variation in the rural market prices of maize in the rural areas are accounted by the urban maize prices.
The Unrestricted Co integration Rank Test result as shown in Table 4.9 shows that max-eigen value test indicates no integration at both 5% and 1% levels.

E. Granger causality test.

This test was carried out to identify which markets occupy position of price leadership and to measure the speed of price adjustment. The variables were lagged by 2 months. Results from Table 5.0 showed that when lagged by two month,bi-directional causality exists between rural and urban markets of Oyo State. This shows that any of the markets could take the lead in each market. This result also showed that there is perfect relationship between rural and markets for maize.

V Summaries and conclusion

This chapter presents the summary and conclusion of the findings from the study upon which recommendation is made for policy and further study on similar topic.

A. Summary

The study was carried out to investigate how integrated the local maize market in south western part of Nigeria choosing Oyo State as the study area.
Monthly retail price per kilogram of milled local maize between January 1998 and December 2007 was sourced from the Agricultural Development Programme of the State.
Trend analysis was carried out by the use of descriptive statistics which include mean, coefficient of variation and graphical analysis. Employing the correlation analysis, co-integration analysis and the Granger causality test, market integration test based on econometric model was carried out. The descriptive analysis showed that urban market recorded highest average monthly prices of local maize in Oyo State than their rural counterparts.

Graphical trend of the variables showed that price series of local maize is more stationary in the rural areas than the urban areas.

The unit root tests proved that Oyo State′s price series are stationary at first difference at all levels-1%,5% and 10% for both markets.

Correlation analysis of the variables showed that there is co-movement of prices within state. The co-integration results also showed that there is long run relationship between the paired markets (that is rural and urban markets) of the state. When lagged by 2months, the Granger causality tests revealed that bi-directional causality exists between the paired markets of the state.

This also confirmed that there is perfect movement of prices between paired market of the state.

B. Conclusion

Results of the findings showed that Oyo States rural and urban markets are integrated of order I(≈I(1).It implies that there is co-movement of prices between urban and rural markets of the state studied.

C. Recommendation

1. Government should invest hugely on research involving pricing policy and marketing which will help in understanding price behaviour both in the short and long-run respectively which will enhance agricultural development and food security.
2. Government should help in the development and maintenance of infrastructures such as good roads, storage facilities, processing facilities etc which will reduce market inefficiencies.
3. There is the need to intensify efforts on the area of data collection, information dissemination through mass media agents such as television and radio stations, newspapers and magazines to broadcast or publish price information about maize and other major staple food stuffs in different market locations at regular intervals.
4. Policy makers need to develop new schemes that would make credit available to traders particularly those in the rural areas to enhance their ability to supply more maize and hence increase in the level of competition which will reduce perfect collusion or price co-operation.

References.

[1] Abuja Securities and Commodity Exchange Plc(2006) Market-price- www.abujacomex.com2006.
[2] ,C.B.(1996): Market Analysis Methods: Are Our Enriched Toolkits Well-Suited to Enlivened Markets? American Journal of Agricultural Economics.78(3),825-829.
[3] Baulch,B.(1997): Testing Food Market Integration Revisted.Journal of Development Studies,33(4):512-534.
[4] Dahlgran,K.A.,and Blank,S.C.(1992).Evaluating the integration of Continuous Discontinous Market.In American Journal of Agricultural Economics.74(2);469-479.
[5] Jones,W.W.(1969).Marketing of Staple Food Crops in Tropical Africa.Overall Analysis and Report.Standford,California,Pp.60-100.
[6] Olayemi, J. K(1972). Rice Marketing and Prices: A case Study of Kwara State. Nigeria Bulletin of Rural Economics and Society Vol.8 No.2 pp211-220.
[7] Anthonio,Q.B.O;(1968).The Marketing of Staple Food Stuffs in Nigeria: A Study in Printing Efficiency.Ph.D Dissertation,University of London.Pp.98-167.
[8] Dittoh.S.(1994).Market Integration:The Case of Dry Season Vegetables in Nigeria,Issues in African Rural Development.2:89-101.
[9] Delgado S. (1995).A Variance components approach to food grain market integration in Northern Nigeria. American Journal of Agricultural Economics 68:970-979.
[10] Ravallion M;(1986).Testing Market Integration, American Journal of Agricultural Economics 68:102-109.
[11] Golleti,F.and Babu,S.(1994): Market Liberalisation and Integration of Maize Markets in Malawi.Journal of Agricultural Economics,11:311-324.
[12] Alexander.C.and Wyeth,J.(1994): Cointegration and Market Integration: An Application to the Indonesian Rice Market.Journal of Farm Economics,Vol.49,No.3 pp721.
[13] Decron,S.(1995): On Market Integration and Liberalisation:Method and Application to Ethiopia: Journal of Development Studies,32(1):112-143.
[14] Gollete,F,Ahmed,R. and Farid,N.(1995).Structural Determinant of Maize Integration: The case of Rice Market in Bangladesh.Developing Economics,23(2),185-202.
[15] Okoh, R. N. (1999), An analysis of Oligopolistic Pricing and Market Integration of cassava Roots and Products in Delta and Edo State of Nigeria .Unpublished Ph.D. Thesis Department of Agricultural Economics, University of Ibadan.
[16] Tijani.A.A;J.O.Ajetomobi and O.Ajobo(1999): A Cointegration Analysis of Nigeria Cocoa Export Supply.Journal of Rural Economics Development.Vol.13 No1.45-53.
[17] Onu,J.I.(2000): An analysis of the structure and performance of cotton marketing in Northern N igeria.An Unpublished Ph.d Thesis Department of Agricultural Economics,University of Ibadan.
[18] Salami,O.A.(2000): Economic Analysis of cocoa bean and cocoa products Marketing under the regulated and free market regimes in Nigeria. A Ph.d Dissertation,Department of Agricultural Economics,University of Ibadan.
[19] Oludimu,O.(1982).The Marketing of Processed Cassava in Nigeria: An Insight.Nigerian Journal of Development Studies 2(1);93-102.
[20] Engle,R.F. and Granger C.W.J.(1987): Cointegration and Error Correction, Representation,Estimation and Testing.Econometrica.55:251-276.

	1998		1999		2000		2001		2002		2003		2004
Mnth	Urb	Rur	Urb	Rur	Urb	Rur	Urb	Rur	Urb	Rur	Urb	Rur	Urb
JAN	20.35	19.39	26.22	22.25	17.65	15.40	23.39	21.06	30.06	31.82	29.69	27.86	26.10
FEB	18.61	17.68	30.14	26.17	18.12	15.68	26.11	27.99	28.47	33.41	29.71	27.76	29.49
MAR	20.96	20.00	27.34	23.37	18.59	16.15	32.21	33.85	34.06	35.00	29.09	27.02	31.90
APR	19.22	18.26	31.96	27.99	19.06	16.62	34.69	28.84	39.65	36.52	30.93	28.46	35.76
MAY	21.57	20.61	34.84	30.87	19.48	17.04	42.65	36.60	39.86	38.07	30.50	29.78	42.99
JUN	26.92	26.01	29.37	33.34	19.90	17.46	44.68	39.80	45.53	43.66	35.68	32.07	41.90
JUL	29.18	27.68	29.14	33.11	20.37	17.93	40.27	38.53	43.66	45.25	29.06	28.21	44.02
AUG	19.04	17.54	30.30	34.27	20.84	18.40	30.75	28.68	38.07	39.66	26.78	24.51	39.86
SEPT	16.69	15.19	30.12	34.09	18.51	16.07	30.40	27.28	32.48	34.07	21.32	22.30	31.74
OCT	21.64	20.14	34.70	30.73	19.91	17.47	29.32	30.06	30.07	28.48	21.48	20.42	34.80
NOV	23.85	22.35	29.00	32.97	22.34	19.90	30.21	31.30	31.66	26.89	22.71	20.01	35.35
DEC	26.06	24.56	32.97	37.85	22.64	20.20	32.10	32.52	33.25	25.3	23.77	22.34	35.39

2004		2005		2006		2007
Rur	Urb	Rur	Urb	Rur	Urb	Rur
26.0	40.26	38.04	45.65	39.35	32.37	27.68
28.32	45.41	43.20	45.90	37.97	32.21	27.68
28.80	50.48	48.59	45.12	40.32	31.48	27.72
35.25	71.29	60.15	44.39	40.35	34.37	30.56
41.43	79.99	71.90	46.02	41.97	37.88	34.88
41.44	74.75	68.26	49.64	42.75	43.19	37.19
41.60	76.70	62.69	43.86	36.68	33.33	31.11
38.43	70.54	60.65	38.09	31.26	34.01	26.91
29.25	59.19	48.98	34.37	27.75	34.01	26.91
29.40	52.94	44.55	31.95	25.73	38.57	31.00
30.55	50.11	42.82	30.03	23.54	37.22	31.00
34.95	44.70	36.82	31.23	25.36	37.22	31.09

Method: Least Squares.
Date: 07/21/08 Time: 15:36.
Sample: 1998: 01 2007:12.
Included observations: 120.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
TREND C	0.004771 3.096631	0.000748 0.052144	6.378079 59.38623	0.0000 0.0000
R-squared	0.256365	Mean dependent var		3.385249
Adjusted R-squared	0.250063	S. D. dependent var.		0.327742
S.E.of regression	0.283821	Akaike info criterion		0.335579
Sum squared resid	9.505406	Schwarz criterion		0.382037
Log likelihood	-18.13476	F-statistic		40.67989
Durbin-Watson stat	0.266484	Prob(F-statistic)		0.000000

Dependent Variable: LOG (URBAN).
Method: Least Squares.
Date: 07/21/08 Time: 15:37.
Sample: 1998:01 2007:12.
Included observations: 120.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
TREND C	0.005856 3.115952	0.000687 0.047887	8.525482 65.06902	0.0000 0.0000
R-squared	0.381175	Mean dependent var		3.470247
Adjusted R-squared	0.375930	S.D. depentent var		0.329944
S.E.of regression	0.260650	Akaike info criterion		0.165247
Sum squared resid	8.016709	Schwarz criterion		0.211705
Log likelihood	-7.914799	F-statistic		72.68385
Durbin-Watson stat	0.253405	Prob(F-statistic)		0.000000

Stationarity TABLE 4.4.
Null Hypothesis: RURAL has a unit root.
Exogenous: Constant.
Lag Lenght:1(Automatic based on SIC,MAXLAG=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.140103	0.0263.
Test critical values:	1% level 5% level 10% level	-3.486551 -2.886074 -2.579931	
MacKinnon(1996) one-sided p-values.			

TABLE 4.5.
Null Hypothesis: D(RURAL) has a unit root.
Exogenous: Constant.
Lag Lenght: 0(Automatic based on SIC, MAXLAG=12).

Augmented Dickey-Fuller test statistic		t-Statistic -8.557351	*Prob. 0.0000
Test critical values:	1% level 5% level 10% level	-3.486551 -2.886074 -2,579931	
*MacKinnon(1996) 0ne-sided p-values.			

Table 4.6.
Null Hypothesis: URBAN has a unit root.
Exogenous: Constant.
Lag Length: 1(Automatic based on SIC, MAXLAG=12).

Augmented Dickey-Fuller test statistic	t-Statistic -8.652448	Prob* 0.0000
Test critical values: 1% level 5% level 10% level	-3.486551. -2.886074. -2.579931.	
MacKinnon (1996) one-sided p-values.		

Stationary at 1st difference.
Co-integration test TABLE 4.8.
Dependent Variable: RURAL.
Method: Least Squares.
Date:07/21/08 Time: 15:41.
Sample: 1998:01 2007:12.
Included observations: 120.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
URBAN C	0.842632 2.510594	0.020917 0.755453	40.28368 3.323295	0.0000 0.0012
R-squared	0.932214	Mean dependent var.		31.15792
Adjusted R-squared	0.931640	S. D. dependent var.		10.68100
S.E.of regression	2.792635	Akaike info criterion.		4.908374
Sum squared resid.	920.2593	Schwarz criterion.		4.954832
Log likelihood.	-292.5024	F-statistic		1622.775
Durbin-Watson stat	0.792795	Prob (F-statistic)		0.000000

Null Hypothesis: RESIDUAL has a unit root.
Exogenous: Constant.
Lag Lenght: 0(Automatic based on SIC, MAXLAG=12)

	t-Statistic	Prob*
Augmented Dickey-Fuller test statistic	-5.334914	0.0000
Test critical values: 1% level 5% level 10% level	 -3.486064 -2.885863 -2.579818	

MacKinnon (1996) one-sided p-values.
Date: 07/21/08 Time: 15:40.
Sample (adjusted): 1998:06 2007:12
Included observations: 115 after adjusting endpoints.
Trend assumption: Linear deterministic trend.
Series: RURAL URBAN.
Lags interval (in first differences):1 to 4.
Unrestricted Co-integration Rank Test TABLE 4.9.

Hypothesized No. of CE(s)	Eigenvalue	Trace statistic	5 Percent Critical Value	1 Percent Critical Value.
None*	0.110415	18.57290	15.41	20.04
At most 1*	0.043528	5.117903	3.76	6.65

*(**) denotes rejection of the hypothesis at the 5%(1%) level.
Trace test indicates 2 co-integration equation(s) at the 5% level.
Trace test indicates no integration at the 1% level.

Hypothesized No. Of CE(s)	Eigenvalue	Max-Eigen Statistic	5 Percent Critical Value	1 Percent Critical Value
None at most 1*	0.110415 0.043525	13.45500 5.117903	14.07 3.76	18.63 6.65

*(**) denotes rejection of the hypothesis at the 5%(1%) level
Max-eigenvalue test indicates no integration at both 5% and 1% levels.
Granger causalty TABLE 5.0
Pairwise Granger Causality Tests.
Date:07/21/08 Time: 15:44
Sample: 1998:01 2007:12
Lags:2

Null Hypothesis	Obs	F-statistic	Probability
URBAN does not Granger Cause RURAL	118	4.54002	0.01269
RURAL does not Granger cause URBAN		0.42157	0.65704

TABLE 4.2 Correlations

		Urban	Rural
Urban	Pearson Corr.	1	.966(**)
	Sig.(2-tailed)		.000
	N	120	120
Rural	Pearson Corr.	.966(**)	1
	Sig.(2-tailed)	.000	
	N	120	120

**Correlation is significant at the 0.01 level(2-tailed).

Correlations			Urban	Rural
Spearman's Rho	Urban	Correlation coeff.	1.000	.914(**)
		Sig.(2-tailed)		.000
		N	120	120
	Rural	Correlation Coeff	.914(**)	1.000
		Sig.(2-tailed)	.000	
		N	120	120
**Correlation is significant at the 0.01 level(2-tailed)				

