BUBBLES IN MAIZE MARKET PRICE IN SOUTH-WEST GEOPOLITICAL ZONE OF NIGERIA

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ABSTRACT: *Prices of grains in Nigeria are usually outrageous at certain periods over the years followed by rapid reversals. This study identifies the factors influencing the (rise and fall) deviation of maize prices from its market fundamental values and tested for the presence of bubbles in eight maize markets in the South-West, Nigeria. Ordinary Least Square and Residual Augmented Dickey Fuller were used to examine the influencing factors and test for the presence of bubbles respectively. Results indicate that Consumer Price Indexes and crude oil price were the major factors influencing maize market prices in the zone, while maize market price bubbles were detected in Lagos Markets, Ogun, Osun and Oyo States Urban Markets.*

Index Terms: Market, Fundamentals, Price, Bubbles and Test

1. INTRODUCTION

The grain sub-sector in Nigeria plays an important role in economic development of the country. It contributes a larger portion of staple food stuff in the country (Akande, 1999). Grains accounted for about 50% of total food supply between 1985 and 1995 (Olayemi, 1999). The commonly grown cereal grains in Nigeria are maize, rice, sorghum, millet and wheat. While some of it is actually consumed as food, most is converted into animal feed, ingredients for processed food or feedstock for ethanol (Mansharamani, 2012). Among these grains, the most available important sources of energy and affordable are maize, rice, millet and sorghum (Maziya-Dixon *et al*, 2004).

One of the determining factors to how much an average poor Nigerian can consume these available energy giving food is price. The nominal price of the individual grains has continuously fluctuated over the past years. Major grain crops in Nigeria have shown broad variations in nominal prices or producer prices over the decades (Akpan and Udoh, 2009). As illustrated by Akpan, the price of rice increased by more than 100% between 1975 -1979 from that obtained between the previous five years averages (1970 -1974), similar trend was obtained for maize, millet and sorghum not until between 1994 -1999 the prices were lowered by less than 40% of their preceding prices as shown in the Table 1.

Table 1: Major Grain Crops and their Mean Prices in Nigeria

	Rice		Maize		Millet		Sorghum		
	Mean price		Mean price		Mean price		Mean price		Inflation
Year	(N)ton.	CV%	(N)ton	CV%	(N)ton	CV%	(N)ton	CV%	Rate(%)Mean
1970-1974	301.4	17.12	157.12	14.79	140.0	39.56	148.4	17.27	10.36
1975-1979	604.0	20.12	375.8	28.57	141.0	19.32	274.6	12.24	19.78
1980-1985	1423.7	38.85	788.0	21.22	622.7	35.36	582.3	32.80	17.80
1986-1993	7483.1	67.97	2938.3	69.39	2759.6	83.97	2689.9	70.61	27.13
1994-1999	39789.8	24.53	20113.8	37.89	19201.0	35.99	18562.0	33.23	30.70
2000-2008	46802.6	38.94	26255.0	26.74	32750.7	50.33	23437.0	45.20	12.79
Agg CV(%)		134.03		138.99		159.13		148.24	

Adopted from Akpan and Udoh (2009); Data Source CBN Annual Report (1987-2008)

Prices of food commodities on world markets, adjusted for inflation, declined substantially from the early 1960s to the early 2000s, when they reached a historic low (FAO, 2011). They increased slowly from 2003 to 2006 and then surged upwards from 2006 to the middle of 2008 before declining in the second half of that year. The sudden increases led to increased concern over the ability of the world food economy to adequately feed billions of people, presently and in the future. Although various observers attach differing degrees of importance to assorted factors, there is a relatively strong consensus that multiple factors had a role in the price increases that began in 2003(FAO, 2011).

Currently, Nigeria is at the level of high food prices following the order of the surge in the international food market. It has been observed that most urban and rural markets have been exhibiting historically high prices since 2007 which worsen in April 2008 and until now the prices are still high above its 2005 level (FEWSNET, 2008). Prices of major cereals in some parts of the country has been found in 2012 to soar above their 2009 price level. For instance in some major markets in the North serving regional traders (Dawanu International Market), the prices of sorghum and millet were 47% and 31% higher than their respective four-year averages respectively. The retail price of a 100 kg bag of maize in Saminaka market, another major northern market, was 56% higher than the four-year average. On the other hand, in the South, the retail price of a 100 kg bag of maize was 34%, 54% and 40% higher in Ibadan, Enugu and Aba respectively (Odozi and Omonona, 2012).

Food price hikes have been linked to supply shortfalls, low stocks, continued increase in food and feed use, and the high growth in demand for biofuels (Minot, 2010). Other causes include government actions and the more integration of the food and energy markets and consequently the link to oil prices. In the light of these, the World Bank (2012) opined that price increase on grains will affect not only bread and processed food, but also animal feed and ultimately the price of meat. While higher prices are generally good news for farmers, the impact on the poor in developing countries who spend a high proportion of their income on food can be devastating. However, higher prices can bring desperately needed income to poor farmers, enabling them to invest, increase their production and thereby become part of the global food security solution (World Bank, 2012).

The episodes of price increases with regard to food availability recorded over the years in the country might be well explained only in non-competitive markets. In most cases, price hike does not follow food shortage or shock in production but due to over optimism arising from price expectations. When agents are limited by the information they have or by their cognitive capacities, they make expectation errors with destabilizing consequences on markets. Therefore, limited logical conditions can thus explain why prices deviate from the fundamental asset values. For instance, if agents anticipate an increase in the grain price while these expectations are not based on changes in the fundamentals, the asset demand and its price will increase moving the grain price away from its intrinsic value. This in Araujo and Simonet (2011) opinion corresponds to self-fulfilling expectation. Self-fulfilling expectations may be related to a default of public information on climatic, agronomic and economic conditions and/or to the agent's decisional limitations that impede them to make rational choices. Based on the agent's expectation and considering an

efficient market in that regard, an upward price movement (bubble) will occur over an extended range that then implodes. The bubble increases at the required rate of return and bursts when agent's expectations will return (Araujo and Simonet, 2011).

Based on the heterogeneous expectations about price and resale of goods at higher prices, bubble is defined as the difference between the market price of an asset and its fundamental valuation or a rapidly rising prices; unrealistic expectations of future price increases and the departure of prices from fundamental valuation (Markus K. 2008). Until now, testing for speculative bubbles has mostly been focused on stock markets, housing, for which only little work has been done with respect to agricultural commodity markets, and the existing evidence is very little.

In this paper, maize is considered as an asset that can be held for a long time. However, the aim of this study is to examine the presence of market prices bubble in South-West Markets, in Nigeria and specifically identifies the major influence of maize market price deviation from its fundamental price and also affirms the presence of bubble in eight selected markets in the study area. This paper is organized into four sections; section one is the introductory part, section two covers the theory behind the methodology used for the study, section three discusses the result and its interpretation and finally the last section gives the conclusion of the study.

II.THEORETICAL AND CONCEPTUAL FRAMEWORK

Prices are the most readily available and reliable information that guide farmers' planting decisions in Nigeria and the world at large. A farmer's decision depends on anticipated profits which in fact depend on anticipated prices of planted crops. Hence, prices are important tool in economic analysis.

Prices are a standard and important component of market and food security analysis because they serve as an indicator of both food availability and food access. Prices are a measure of availability because they tend to rise as the supply of food falls in relation to demand (e.g. poor production, constrained imports of food), and they tend to fall when supply expands in relation to demand (e.g . a bumper harvest). Food prices are also a measure of food access because they affect the household's purchasing power; the ability of a household to acquire goods and services based on the amount of money or other forms of wealth they possess. Prices observed through time are as a result of a complex mixture of changes associated with seasonal, cyclical, trend and irregular factors.(Akintunde et al 2012). The most common regularity observed in agricultural prices is a seasonal pattern of change. Normally, prices of storable commodities are lowest at harvest time, rise as the season progresses, and reach a peak prior to the next harvest (Olukosi and Ositor, 1990).

Most agricultural commodity markets are characterized by a high degree of volatility. Three major market fundamentals explain why that is the case. First, agricultural output varies from period to period because of natural shocks such as weather and pests. Second, demand elasticities are relatively small with respect to price and supply elasticities are also low, at least in the short run. In order to get supply and demand back into balance after a supply shock, prices therefore have to vary rather strongly, especially if stocks are low. Third, because production takes considerable time in agriculture, supply cannot respond much to price changes in the short term, though it can do so much more once the production cycle is completed. The resulting lagged supply response to price changes can cause cyclical adjustments (such as the often referenced hog cycle) that add an extra degree of variability to the markets concerned.

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 and its trend 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. An average household after the price increase spends as high as 75% of their income on food compared with an average of 65% before food crisis (Zoellick, 2008). The volatility in price of agricultural commodities in Nigeria has been attributed to various factors including variances in bargaining power among consumers, cyclical income fluctuations among sellers and consumers, natural shocks such as flood, pests, diseases, and inappropriate response by farmers to price signals (Udoh *et al* 2007, Adebusuyi, 2004). Also short-run fluctuations in agricultural commodity prices occur between production seasons (Cashin and Pattillo, 2000).

Empirical studies analyzing whether agricultural speculators apply feedback trading strategies, shows that If speculators systematically buy (sell) when past returns are positive (negative), this may lead to overshooting (undershooting) agricultural prices. Apart from Irwin and Holt (2004), most studies argue that agricultural speculators systematically follow past price trends, and thus can be characterized as positive feedback traders. This evidence is based on linear Granger-causality tests (Sanders *et al*., 2009) and non-linear smooth transition auto-regressive (STAR) models (Reitz and Westerhoff, 2007; Rothig and Chiarella, 2007). Only Wang (2003), finds evidence that agricultural speculators can be characterized by negative feedback trading which, if profitable, does not destabilize markets.

The role of speculators has also been discussed from an economic viewpoint. A comprehensive overview about the pros and cons is provided by Sanders *et al*. (2010) and Sanders and Irwin (2010). Proponents argue that speculation contributes to price discovery in information efficient markets, provides liquidity to otherwise illiquid markets, and is a necessary counterpart to hedging activities. Also, Milton's classical argument that profitable speculation has a stabilizing effect on prices has been recalled (Gilbert 2009). On the other hand, it has been emphasized that rational as well as irrational speculation can set price trends which may be self-enforced by herd behaviour and result in prices bubbles. Moreover, noise trading has been identified as a source of risk that deters rational market participants from betting against erroneous beliefs (De Long *et al*. 1990).

Given that Prices, in turn, deviate from their fundamental values and do no longer reflect solely demand and costs of production, work has been done to analyse the causal relation between financial investors/speculators and commodity prices and to detect speculative bubbles in commodity prices. Robles *et al*. (2009), conducted Granger causality tests in order to test whether speculative activities in futures markets can help explaining price movements of spot prices for agricultural commodities. They provided evidence that speculation affects prices of wheat, rice, maize, and soybeans. Gilbert (2009), looked for evidence of trend-following behaviour in the commodity price process. Using a positive augmented Dickey-Fuller-Test he finds that index-based investment in commodity futures had an impact on the prices of wheat, corn, and soybeans and that these investments generated a bubble in futures prices.

III. METHODOLOGY

Study Area: The study area is south western Nigeria which consists of Lagos, Ogun, Oyo, Osun, Ondo and Ekiti States. It is also known as the south West geographical zone of Nigeria. The area lies between longitude 20 311 and 60 001 East and Latitude 60 211 and 80 371N (Agboola, 1979) with a total land area of 77,818 km2 and a population of 27, 721, 832 (NPC, 2006). The study area is bounded in the East by Edo and Delta states, in the North by Kwara and Kogi states, in the West by the Republic of Benin and in the south by the Gulf of Guinea. The study area has 85 constituted Forest reserves with a forest area cover of 842,499 hectares. The climate of Southwest Nigeria is tropical in nature and it is characterized by wet and dry seasons. The temperature ranges between 21oCand 34oCwhile the annual rainfall ranges between 1500mm and 3000mm. The wet season is associated with the Southwest monsoon wind from the Atlantic Ocean while the dry season is associated with the northeast trade win from the Sahara desert. The vegetation is Southwest Nigeria is made up of fresh water swamp and mangrove forest at the belt, the low land in forest stretches inland to Ogun and part of Ondo state while secondary forest is towards the northern boundary

where derived and southern Savannah exist (Agboola, 1979). For the purpose of this study, four states were selected from the zone which include Lagos, Ogun, Osun and Oyo States.

Data Collection: Data on the market price of maize used for this study were sourced from the Nigerian Agricultural Development Project (ADPs) of each selected state in the zone, between the years 2001- 2011. Commodity food price index and oil price of the period were sourced from International Monetary Fund website and Energy Information Administration website (EIA) respectively.

Analytical Tools :- The analytical tools used in this study include linear regression and Augmented Dickey Fuller unit root test. The procedures adopted were therefore modelled as stated below;

Bubble model:- In testing the hypothesis that some food crises may be due to rational speculative bubbles, a procedure is built. A simple asset-pricing model used in this study as proposed by Bonjean and Simonet (2011) assume rational expectations.

We consider a simple model for maize price with linear supply and demand. Market equilibrium is given by the set of equation (I) to (III).

Net supply (Q) in period t is positively related to the current price of maize

$$Q_t = a_t + bP_t + \mathcal{E}_t \qquad b > o \qquad \text{(I)}$$

P_t is the maize price level in period t

a_t is an index that depends on current and lagged values of y_t a vector of exogenous supply and demand variables.

Expectation of future rise in price that will compensate for storage cost and losses induces famers and traders to withhold supply. With the assumption of risk neutrality, demand for stocks in period t (S_t) is positively related to the price spread between the future expected price and the current price given by:

$$s_t = c(E_t P_{t+1} - P_t) + d_{t+W_t} \qquad c > o \qquad \text{(II)}$$

d_t is an index that depends on vector of variables reflecting the opportunity cost of holding maize
$E_t P_{t+1}$ is the expected price of maize in period t+1
E_t is the conditional expectations operator
$\mathcal{E}_t$ and w_t are zero-mean , finite variance, serially uncorrelated disturbance terms. They are for unaccounted variables on the demand and supply side.

On the other hand market equilibrium is given by:

$$S_t = Q_t + s_{t+1} \qquad \text{(III)}$$

Where S_{t-1} is initial stock.
The market price at equilibrium becomes

$$E_t P_{t+1} = \lambda P_t + x_i + \mu_i$$

Where; $\lambda = \frac{b+c}{c} > 1$ and $x_t = a_t - d_t$, $\mu_t = \varepsilon_t - w_t + S_{t-1}$ (IV)

x_t is an index that depend on a vector of variables of market fundamentals.
μ_t is an error term .
The forward-looking solution of equation (IV) for p involves two components: F_t the market-fundamentals component and the potential rational bubbles component B_t (Blanchard and Watson, 1982 and Bonjean and Simonet(2011) is given by equation (V):

$$P_t = B_t + F_t \qquad \text{(V)}$$

It is assumed that $E_t(X_{t+j} + \mu_{t+j})$ does not grow at a geometric rate. Therefore $\geq \lambda$, F_t is convergent sum (Bonjean and Simonet2011) given by:

$$F_t = E_t \sum_{i=0}^{\infty} (\lambda^{(i+1)} x_{t+1} + \mu_{t+1\mu}) \qquad \text{(VI)}$$

The market –fundamentals component of the maize price relates to the expected value of the exogenous variables determining supply and demand.

In contrast to the fundamentals component, the bubble part, B_t, is not stationary. B_t is the solution to the homogenous expectationnal difference equation given as:

$E_t B_{t+1} - \lambda B_t = 0$ (VII)

If B_t is less or greater than zero, there exists a rational bubble. The conditional expectations of the bubble are explosive as expressed by equation (VIII):

$E_t B_{t+j} = \lambda^j B_t$ for all $j > 0$ (VIII)

The presence of rational bubble does not violate the non-arbitrage condition. The bubble is expected to grow at the required rate of return and stock holders expect to get the required rate of return on the bubbly asset.

This bubble process satisfies equation (VII) since the expected growth rate of the bubble is always λ.For $B_t <$ c the bubble increases slowly at mean rate λ; if B_t rises above the threshold it expands faster at the mean rate $\lambda\pi^{-1}$ but may collapse with probability1-ð. The bubble grow at a higher rate during expanding phases to compensate the investor for the possibility of collapse. When the bubble collapses, it falls to a means value of δ and the process begins again (Evans 1991; Bonjean and Simonet, 2011). As a consequence periodically collapsing bubbles not only account for occasional asset price crashes but also for rapid run-ups in asset prices before a crash.

Test For periodically Collapsing Bubbles:

Most of empirical test for rational speculative bubbles are indirect tests that exploit the theoretical properties of bubbles. Bubbles are explosive process that should be detected through stationary tests (Diba and Grossman, 1988).

The fundamental component of the maize price and the potential bubbles are estimated The presence and properties of the bubbles are tested using the residual ADF of Taylor and peel, (1998) .

It is assumed that the forecasts of x_t in Eqn (vi) are based on current and past values of x_t i.e exogenous variables that determine supply and demand and all relevant available information about future net supply.

p_t in Eqn (IX) is regressed on supply and demand determinants as well as on information variables and use the residuals as our measure of the bubble: this is represented thus;

$p_t = \infty_i cumulative\ rainfall_t + \infty_2 CPI_t + oil\ price_t + \sum_{s=1}^{12} \emptyset + V_t$ (IX)

Where

P_t : Market price of maize at time

Cumulative rainfall$_t$: measures the cumulative rainfall level during the rainy season (from January to December) in the production area.

Oil price$_t$: variable capturing production and trade costs.

CPI$_t$: Consumer price index in Nigeria

M_s: Monthly dummies that capture seasonal variations

The error term V_t includes all factors not explained by the variable x_t. v_t is assumed to follow a random walk so that $E_t V_{t+1} = V_t$ and to be serially independent.

The fitted value of P_t in (IX) measures the fundamental value of maize (F_t- $\dot{P}_t$).$B_t = P_t\ \dot{P}_t$ is the apparent deviation from fundamentals. Measuring bubbles as the residuals of a price regression on fundamental value generates positive and negative apparent bubbles. In what follows we only consider positive bubbles.

Hence, fundamentals may be misspecified leading to measurement errors in the bubble term. However the tests are invariant to linear transformation of B_t. The deviation between current price and the fundamental component represent the bubble part.

***Testing for unit root in the error process*:**

By adopting the pattern of Campbell and Schiller, (1987), we investigated the stationarity properties of maize prices deviations from fundamentals. Residuals from Eq. (ix) that represent the bubble component of maize prices were used. The Jarque Bera test was carried out to test for normality for all markets at 10% confidence level. Non-normality is consistent with the presence of periodically collapsing bubbles (Payne and Waters 2007). The standard ADF test has been used in most empirical studies but the test is not very informative. Many authors who adopted this model found that it fails to reject stationarity in the presence of PCB

that may be stationary on the whole period but are locally explosive. Due to this flaw, the Residual Augmented Least Squares Dickey-Fuller (RADF) test developed by Taylor and peel (1998) was used to test for the presence of stationarity in the presence of periodically collapsing bubble. The Residual Augmented Dickey Fuller(RADF) test is robust to skewness and kurtosis in the distribution of the residual term and is more powerful in detecting periodically collapsing bubbles. The RADF Test equation is given by:

$\Delta B_t = \theta B_{t-1} + \gamma \hat{w}_t + \epsilon_t$ …….…… (X)

Where: $\hat{w}_t$ = [($\hat{u}_t^3$ -3$\hat{\varphi}^2\hat{u}_t$), ($\hat{u}_t^2$ - $\hat{\varphi}^{2)]}$. The vector, $\hat{w}_t$ corrects the estimate of Θ for skewness and excessive kurtosis of the residuals. $\hat{u}_t$ are the residuals of equation (XI) and $\hat{\varphi}^{2)]}$, the estimated variance; ϵt is the white noise.

Equation (x) is rewritten as

$\Delta B_t = \Theta B_{t-1} + u_t$ (XI)

Where the test statistics is t_A = Ө/√Var(Ө)

Ө is the estimated coefficient in (XI); var (Ө)is the variance-covariance matrix of Ө.

IV. RESULTS

Fundamental components of maize price

From the study, eight major maize markets were surveyed for eleven years (from January 2001 to December, 2011 (see figure1). The markets were the rural and urban markets in four states selected from south-west geopolitical zone of Nigeria. The price of maize in the selected markets were the key variable of interest. Studies have shown that price is made up of fundamental component and certain component which are not explained, known as the residual or bubble component. In order to estimate the fundamental components of maize price in the stipulated markets; these were determined using the monthly consumer price index, oil price and cumulative rainfall. An econometric tool; regression analysis was used to generate the markets price residuals (bubble components) for each market. Figure 2 is a typical illustration of fundamental and bubble components of Lagos Urban Maize market price; the figure shows periods during which the maize price in Lagos Urban Market rose dramatically beyond its fundamental value: between mid-2005 to early 2006, mid 2008 to almost late 2010. A deeper analysis shows that apparent bubbles break out at lean season and end at the arrival of the new harvest. This implies that the price increases exponentially at lean season from May to September after which it crashes to the initial price at the arrival of the new harvest.

The result from the econometric analysis (Table II) indicates an adjusted R^2 in Lagos State Markets, Oyo State Markets and Osun State Rural Market above 50%, showing that more than 50% of the explanatory variables explains the variations in the market price of maize in the surveyed markets. The result further shows factors influencing market price of maize. Result depicts that the consumer price index and oil price were the core factors influencing the price of maize in Lagos state rural and Urban markets. Consumer price indexes positively influence all the market prices in the zone. Cumulative rainfall positively influences Osun State Urban market price. Oil price has negative influence on the prices of Lagos State Market, Osun State Urban Market and Oyo State rural market.

Bubble Characteristics and Tests

The characteristics of the bubble components were accessed based on certain properties (skewness, kurtosis and Jarque Beta test). From Table III, the bubble components of maize prices shows excessive skewness in Lagos Markets and excessive catharsis in all the markets. These characteristics indicate abnormal prices of maize markets in the zone. The Jarque Bera test rejects normality for all markets except Ogun, Osun and Oyo State Rural markets at 10% confidence level. The non-normality test is consistent with the presence of periodically collapsing bubble (Taylor and Beel, 1998, Payne and Waters, 2007). This implies that market price bubbles were present in Lagos Rural and Urban and Ogun, Osun and Oyo States Urban Maize Markets.

On testing for a unit root using Standard Augmented Dickey Fuller Unit Root Test (see Table III), the test accepts the unit root null hypothesis in all cases. This implies that the test rejects stationary in all markets surveyed in the zone. However, the test has been proven to be less informative.

On examining the robustness of the result, Residual Augmented Least Square Dickey Fuller (RADF) test was employed. The RADF t-statistics indicates stationarity in the series and this implies the presence of periodically collapsing bubbles in all the markets. The test is robust to skewness and kurtosis in the distribution of the residual terms. The test shows excess skewness in Lagos maize market prices and excessive kurtosis in all the markets indicating abnormality in the market price of maize. The Jarque Bera test rejects normality for all markets except for Ogun, Osun and Oyo Rural maize markets. From the test result it is concluded that maize market price bubbles were present in Lagos market and all Urban Markets in the zone.

V. CONCLUSION

The econometric results are consistent with the existence of speculative bubbles in urban maize markets in the study. However, the existence of bubbles could indicate a misspecification of market fundamentals. To strengthen this result, further test might need to be conducted such as M-TAR and rolling ADF tests.

The detection of rational bubbles on maize market in South-western Nigeria is very important for policy priority and in improving the quality and availability of information to economic agents, farmers, traders and consumers. It is also important as it gives information for public intervention in markets through security stock and trade policy.

REFERENCES

Agboola S.A. (1979): An Agricultural Atlas of Nigeria, Oxford University Press, Nigeria Pp.248

Akpan, S.B and Udoh, E. J (2009): Estimating Grain Relative Price Variablity and Inflation Rate Movement in Different Agricultural Policy Regimes in Nigeria. *Humanity and Science Journal* Vol.4 No. 2.Pp. 107-1113

Akintunde, O.K.1 , Akinremi, T.B.2 and Nwauwa, L.O.E.1(2012): Food Grain Marketing in Osun State, Nigeria: A Study of Long-Run Price Integration; *Continental Journal of Agricultural Economics* 6 (1): 1 - 9.

Bonjean Catherine A and Simonet Catherine (2011): Testing for rational speculative bubbles on grain markets in Niger: Université d'Auvergne, CERDI. Pp.1-13 www.jma2013.fr/fichiers**2011**/237/**Araujo**%20**Simonet**.pdf

Blanchard, O.J., Watson, M.W., 1982. "Bubbles, rational expectations and financial markets". NBER Working Paper no. 945. National Bureau of Economic Research, Cambridge, Mass.

Campbell, John Y., and Robert J. Shiller. 1987(1987): Cointegration and tests of present value models. *Journal of Political Economy* 95(5): 1062-1088.

Diba B.T. and H. I. Grossman (1988), "Explosive Rational Bubbles in Stock Prices?", *The American Economic Review*, Vol. 78, No. 3, pp. 520-530.

Famine Early Warning Systems Network **(**FEWSNET) (2008): Nigeria Food Security Outlook. March to September; Pp.2-5

John Chiwuzulum Odozi* and Bolarin Titus Omonona (2012); Governance options for price instability: A Review of the food grain commodity in Nigeria. *Journal of Development and Agricultural Economics* Vol. 4(4), Pp. 93-100. Available online at http://www.academicjournals.org/JDAE

Minot N (2010): Transmission of World Food Price Changes to African Markets and its Effect on Household Welfare Paper to be presented at the Comesa policy seminar Food price variability: Causes, Consequence and policy options" on 25-26 January 2010 in Maputo, Mozambique under the Comesa-MSU-IFPRI African Agricultural Markets Project (AAMP). Pp. 53.

Mansharamani Vikram (2012): Food Bubble Is Expanding U.S. Waistlines:

FAO(2011): The state of food insecurity in the world. @ http://www.fao.org/docrep/014/i2330e/i2330e.pdf

Adebusuyi, B. S., (2004). Stabilization of commodity market of interest to Africa: Paper presented at the workshop on constraints to growth in sub-Saharan Africa, held in Pretoria South Africa.

Agricultural Economics, 2008. Special Issue on the World Food Crisis. *Agricultural Economics* 39(S1),Pp. 373-550.

Cashin, P. and Pattillo, C., (2000). 'Terms of trade shocks in Africa: Are they short-lived or long-lived? IMF Working Paper. Washington, DC: IMF. Pp. 2-23

De Long, J B., Shleifer, A., Summers, L. H. and Waldmann, R. J. (1990). Noise Trader Risk in Financial Markets. Journal of Political Economy 98: 703-738

Estrades, C and Terra, M. I(2012): Commodity Prices, Trade, and Poverty in Uruguay. Food Policy 37(1), 58-66.

Evans, G. W. (1991): Pitfalls in testing for explosive bubbles in asset prices. *American Economic Review*, 81, Pp.922– 930.

Gilbert, C. L. (2009): Speculative Influences on Commodity Futures Prices 2006-2008. Working Paper. Department of Economics, University of Trento. @ http://www.unctad.org/en/docs/osgdp20101_en.pdf.

FAO (2008): The State of Food Insecurity in the World 2008. Food and Agriculture Organization (FAO) of the United Nations, Rome, Berifing.

Irwin, S. H and Holt, B. R (2004): The Effect of Large Hedge Funds and CTA Trading on Futures Market Volatility. G. N. Gregoriou et al. (Eds.), Commodity Trading Advisors: Risk, Performance Analysis and Selection. Wiley, New York, Pp.151- 182

Markus K. Brunnermeier(2008): Bubbles. Pp.1-12. http://scholar.princeton.edu/markus/files/bubbles_survey.pdf

Olukosi, J.O. and S.N. Isitor (1990): An Introduction to Agricultural Marketing and Prices, Principles and Application, Living Books Series G.M Publications, Abuja. 15-20.

Payne, J. E., and Waters, G. A. (2005): "REIT Markets: Periodically collapsing negative bubbles?", *Applied Financial Economics Letters*, 1(2), Pp.65–69.

Reitz, S and Westerho F.,(2007): Commodity Price Cycles and Heterogeneous Speculators: A STAR-GARCH Model. Empirical Economics 33(2), Pp.231-244.

Robles, M., Torero, M. and Braun, J. von. (2009): When Speculation Matters. Issue Brief. Washington: IFPRI.

Rothig, A and Chiarella, C (2007): Investigating Nonlinear Speculation in Cattle, Corn, and Hog Futures Markets using Logistic Smooth Transition Regression Models. *Journal of Futures Markets* 27(8), Pp.719-737.

Sanders, D. R., Irwin, S. H., Leuthold, R. M., 2003. The Theory of Contrary Opinion: A Test using Sentiment Indices in Futures Markets. *Journal of Agribusiness* 28 21(1), Pp. 39-64.

Sanders, D. R., Irwin, S. H and Merrin, R. P (2009): Smart Money: The Forecasting Ability of CFTC Large Traders in Agricultural Futures Markets. *Journal of Agricultural and Resource Economics* 34(2), 276-296.

Sanders, D. R. and Irwin, S. H. (2010): A speculative bubble in commodity futures prices? Cross-sectional evidence. Agricultural Economics 41: 25-32.

Sanders, D. R., Irwin, S. H. and Merrin, R. P. (2010): The Adequacy of Speculation in Agricultural Futures Markets: Too Much of a Good Thing? Applied Economic Perspectives and Policy 32: 77-94.

Taylor, M. P., and Peel, D. A. (1998). Periodically collapsing stock price bubbles: A robust test. *Economics Letters*, issue 61, Pp. 221–228.

Tschirley, D.L., (1995). "Using Micro Computer spread sheets for spatial and temporal price analysis: An Application to Rice and Maize in Ecuador", In Gregor J.S.(ed.) Prices, Products and People; Analyzing Agricultural Markets in Developing Countries, Lynne Rienner publishers, Inc. Boulder, Colorado. Pp. 277-299.

Udoh, E. J., and Sunday B. A., (2007): Estimating Exportable Tree Crop Relative Price Variability and Inflation Movement under different Policy Regimes in *Nigeria European Journal of Social Science*. 5(2): 17-26.

USDA,(2008): Food Security Assessment, 2007. United States Department of Agriculture (USDA), Washington, DC.

Wang, C., 2003. The Behavior and Performance of Major Types of Futures Traders. *Journal of Futures Markets* 23(1), 1-31.

Udoh, E. J., and Sunday B. A., (2007). Estimating Exportable Tree Crop Relative Price Variability and Inflation Movement under different Policy Regimes in Nigeria. *European Journal of Social Science*. 5(2): 17-26.

Von Braun, J (2008): Food and Financial Crisis Implications for Agriculture and the Poor. IFPRI, Washington, DC.

Zoellick R. (2008): Food Crisis: How prepared is Nigeria? In Nigeria Sunday This Day Newspaper. April 27. Pp. 25.

APPENDIX

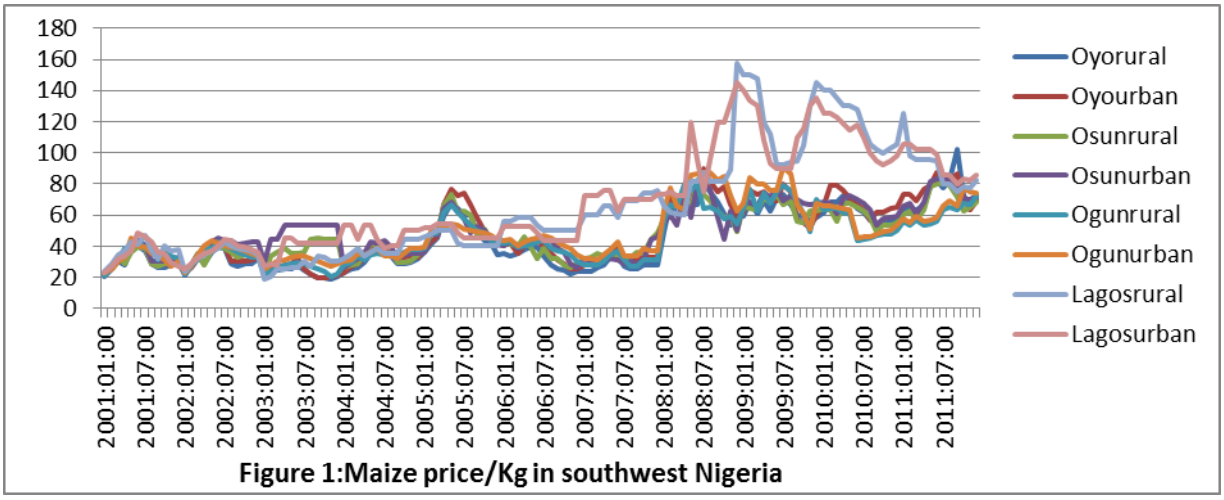

Figure 1:Maize price/Kg in southwest Nigeria

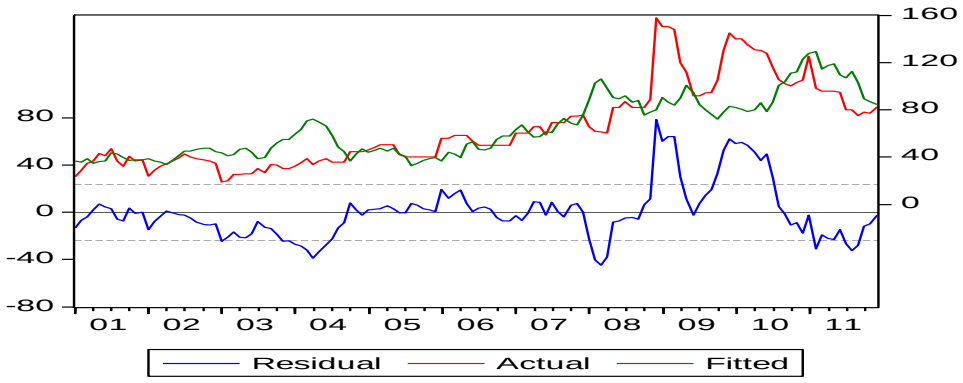

Figure2. Fundamental (fitted) components of the maize price in Lagos Urban Market (₦/kg)

Table II: Estimation of the Fundamental Values: Dependent Variable (Current Maize Price)

	LagosR	LagosU	OgunR	OgunU	OsunR	OsunU	OyoR	OyoU
CPI	1.4815	1.3843	0.2852	0.3481	0.4041	0.4917	0.4954	0.4876
t-stat	7.8637	8.6023	2.9887	3.4536	4.8712	5.3704	4.9623	4.6251
prob.	0.0000	0.0000	0.0034	0.0008	0.0000	0.0000	0.0000	0.0000
Cum. R/F	0.0004	0.0042	-0.0005	0.0025	0.0087	0..0183	0.0038	0.0058
t-stat.	0.0189	0.2356	-0.0354	0.1900	0.8896	1.6872	0.3331	0.4818
prob.	0.9850	0.8141	0.9719	0.8496	0.3753	0.0940	0.7396	0.6308
0ilprice	-0.8281	-0.7354	0.0421	0.0281	-0.0379	-0.1662	-0.0506	-0.0151
t-stat	-4.1857	8.6023	0.4208	0.2664	-0.4348	-1.7283	-0.4829	-0.8918
prob.	0.0001	0.0000	0.6746	0.7904	0.6644	0.0864	0.0000	0.8918
Monthly Variable	yes	yes	yes	yes	yes	yes	yes	yes
R^2	0.5445	0.6072	0.4413	0.4861	0.5818	0.5075	0.5881	0.5869
Adj R2	0.5339	0.5980	0.4282	0.4741	0.5720	0.4959	0.5784	0.5773
Obs.	132	132	132	132	132	132	132	132

SOURCE: Authors' computation, 2013

Table III: Bubbles' Characteristics

	LagosR	LagosU	OgunR	OgunU	OsunR	OsunU	OyoR	OyoU
Obs.	132	132	132	132	132	132	132	132
Skewness	1.1821	1.1771	0.3623	0.6914	0.2172	-0.2448	0.1382	0.4568
Kurtosis	4.7146	4.0270	2.6643	3.2362	2.8292	2.2198	2.8634	3.1374
Jarque Bera	46.9137	36.2827	3.5079	10.8232	1.1986	4.6656	0.5225	4.6950
Prob.	0.0000	0.0000	0.1730	0.0045	0.5492	0.0970	0.7701	0.0956
ADF Test								
P	-0.0036	-0.0017	-0.0004	-0.0002	-0.0017	-0.0021	-0.0007	0.0041

t-stat	-0.3243	-0.1707	-0.0389	-0.0222	-0.1475	-0.1796	-0.0655	-0.3992
RADF Test								
P	-0.0814	-0.1014	-0.1188	-1182	-0.1836	-0.1844	-0.1213	-0.1132
t_A	**-2,3991**	**-2.7105**	**-2.8344**	**-2.8452**	**-3.6540**	**-3.6289**	**-2.9069**	**-2.8171**
T-stat: Kurtosis	4.7147	4.0270	2.6643	3.2362	2.8292	2.2198	2.8634	3.1374
T-stat: skewness	1.1821	1,1771	0.3623	0.6914	0.2172	-0.2448	0.1382	0.4588
Jarque Ber	46. 9137	36.2827	3.5079	10.8232	1.1985	4.6656	0.5225	4.6950
Prob.	0.0000	0.0000	0.1730	0.0045	0.5492	0.0970	0.7701	0.0956

Source: Authours computation, 2013
Note: ADF Test equation includes no intercept and no lagged difference terms of the dependent variable
Critical Value for t_A: 1.6151 @10% level.

TableIV: Unit Root Test Sample Period: January 2001- December, 2011

State	Market	Min.	Max.	Mean	No. of Obs.	ADF p.-value
Lagos	Rural	18.95	158.00	64.82	132	0.5669
	Urban	23.21	145.00	67.51	132	0.6228
Ogun	Rural	20.64	80.24	45.31	132	0.6935
	Urban	23.01	90.88	48.36	132	0.6881
Osun	Rural	20.45	82.21	47.37	132	0.6310
	Urban	23.39	84.44	50.25	132	0. 6197
Oyo	Rural	18.58	102.06	44.43	132	0. 6591
	Urban	19.64	90.20	48.23	132	0.5382

Authors' Computation
ADF test: H0: I(1): Tests administrated on current price values.