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DRIVERS OF RICE PRICE VARIATION IN NIGERIA: A TWO-STAGE ITERATIVE RIDGE REGRESSION APPROACH

Opeyemi E. Ayinde[1], Victor I. Aina[1*], Kayode Ayinde[2] and Adewale F. Lukman[2]

[1]Department of Agricultural Economics and Farm Management, University of Ilorin, P.M.B.1515, Ilorin, Kwara State, Nigeria
[2]Department of Statistics, Ladoke Akintola University of Technology, P.M.B. 4000 Ogbomoso, Oyo State, Nigeria

Abstract: Most studies on local rice in Nigeria were centred on increasing production, consumption or competitiveness with very few of them addressing the determinants of the price of rice in an economy. Filling this gap requires a study on the various factors that influence the price of rice. Food price instability is a frequent forerunner of macroeconomic shocks and political turmoil that can discourage long-run investment and curtail growth. In this study, secondary data were employed. The study used descriptive statistics tools to analyse the pattern of price variation over the period of 42 years in the study area. Similarly, various factors affecting price variation of rice were examined. The following recommendations were made: appropriate tax collection measures on producers should be implemented so as to curtail farmers from exploiting the masses by making excessive gains. Since the decrease in export results in an increase in price, the government should keep a balance between import and export to maintain the price of rice at a reasonable level. The price of rice can be reduced by the government when they implement measures to control the inflation rate in the economy. The government should put measures to regulate the quantity of land used by rice producers as well as to control the price of rice, since they both have a positive relationship.

Key words: price variation, rice, ridge regression and Nigeria.

Introduction

Time series data on prices are usually observed to have seasonality or cyclical fluctuations which may be attributed to fluctuations in supply that may be caused by economic trends, weather, planting and harvesting seasons. Because of supply fluctuations, traders practice speculative storage, which has impact on price levels

*Corresponding author: e-mail: ainaifedotun@gmail.com

especially during the lean period of supply (Eleanore, 2013). The price difference across time will depend only on storage costs and the opportunity cost of capital, in which case prices may stabilize over seasons. However, speculative storage may also result in soaring prices in the long run. In the latter case, storage would not adequately stabilize price volatility (Tadese and Guttormsen, 2011).

Nigeria covers an area of 924,000 square kilometers, bordered by the Gulf of Guinea, Cameroon, Niger, Benin, and Chad. The status of rice in the average Nigerian diet has been transformed from being a luxury food item to that of a staple which is gradually taking part of the share formerly accounted for cassava and yam (Akande et al., 2003; Odushina, 2008). According to Akanji (1995) and Akpokodge et al. (2001), a combination of factors has triggered the structural increase in rice consumption. These include: rapid urbanization and ease of preparation that fit easily to the lifestyle of urban workers. It is expected that the demand for rice will continue to increase (Akande et al., 2003; FAO, 2005).

Nigeria's annual rice demand is estimated at 5 million tonnes out of which only about 2.2 million tonnes are produced locally. The annual rice supply gap of about 2.8 million tonnes (or 56% of demand) is bridged by importation (Mafimisebi et al., 2014). According to Shively (1996), increased price variability can have detrimental impacts on both consumers and producers of agricultural commodities, thus leading to a change in the production levels of the commodity involved. Variability is one of the major attributes that explain the characteristics of most price data. This attribute has important implications for policy and the welfare of food consumers and the nation's economy (Mafimisebi et al., 2014). The variation in prices of agricultural commodities in Nigeria has been attributed to a number of factors including variances in the 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. This study looks at the factors that contribute to change in the price of rice over time.

The general objective of the study is to analyze the determinants of rice price variation in Nigeria. The specific objectives are to:

- Describe the pattern of rice price variation in Nigeria,
- Determine the factors responsible for rice price variation in Nigeria.

The most common feature observed in agricultural prices is clearly marked by seasonal pattern of change. Price fluctuation can be caused by the divergence between planned output and realized output. There is also the seasonality in production and marketing which also causes price fluctuation. This is so because most products are characterized by some seasonality behaviour in their production and marketing pattern. According to Olukosi et al. (2007), there are two types of price variation, the seasonal price variation and the cyclical price variation. The seasonal price variations are regular patterns of price fluctuation that occur within a

year. The cyclical price variation is a pattern that repeats itself regularly with the passage of time.

In the past few years, many studies have been carried out to investigate the causes of and solutions to soaring food prices (Abbot et al., 2009; Gilbert, 2010). They have examined and identified a set of drivers of food price upsurges including biofuel demand, speculation in commodity future markets, countries' aggressive stockpiling policies, trade restrictions, exchange rate and economic growth. In a developing economy like Nigeria, where export price fluctuates as a result of currency devaluation which is expected to be an incentive for export growth, the primary concern is the nature and magnitude of risk introduced by the price and exchange rate movements in agricultural exports. Many researchers who conducted researches on the effects of price and exchange rate movements on agricultural tradable products had inconclusive results, leaving a gap in this area. For instance, Kargbo (2006) found that prices, real exchange rates, domestic production capacity, and real incomes have significant impacts on the agricultural export. Studies by DeGrauwe (1988) show that exchange rate variability causes fluctuations in export revenue. While there is a certain consensus regarding the effects of weather, biofuel production and export restrictions on food prices, the problem is far from settled. In spite of the government effort to improve export, the agricultural sector is yet to respond to such policy signals. Instead, the performance of the agricultural exports remains dismal and discouraging. Of the massive documents on the effects of exchange rate volatility on macroeconomic variables, only very few have attempted to identify the role of third world countries' exchange rate volatility on domestic macroeconomic variables (Clark, 2004). Most empirical studies focus primarily on granger causality tests to explain the role of speculation in price volatility (Irwin et al., 2009; Gilbert, 2010). Some researchers identified an explosive increase in prices during the 2007–2008 spikes (Gilbert, 2009; Philips et al., 2011). Pindyck and Rotemberg (1990) analyzed the co-movement of seven unrelated commodities. They used various macro-economic variables such as interest, inflation, and exchange rates but also supply and demand conditions to explain the co-movement. However, they found that after controlling for these factors, the prices still moved together, a phenomenon Pindyck and Rotemberg dubbed as *excess co-movement* and which they attributed to herd behavior on commodity (futures) markets.

Most empirical studies focus primarily on granger causality tests to explain the role of speculation in price volatility (Irwin et al., 2009; Gilbert, 2010). The adopted methodology in this study will shed light on the trend in price change over the years and also identify the effects of different factors on rice price variation. Akpan and Udoh (2009) used the ordinary least squares method to estimate grain relative price variability and inflation rate movement in different agricultural policy regimes in Nigeria. The major findings were that inflation had a positive significant

impact (at the 5% significance level) on relative price variability of grains in Nigeria. Ettah et al. (2009) used ordinary least squares method to estimate effects of price and exchange rate fluctuations on agricultural exports in Nigeria. The major findings were that exchange rate fluctuations and agricultural credits positively affected cocoa exports in Nigeria.

This study goes a little further to analyze various factors that determine variation in the prices of rice. Since spikes and volatility are the major indicators of food crises, it uses the ordinary least squares method in its estimation.

Material and Methods

Scope of study

This study employed time series data of a period of 42 years, obtained from various sources spanning from 1970 to 2011. They are various AGROSTAT bulletins which include editions of National Bureau of Statistics review of external trade, National Bureau of Statistics summary and annual abstract of statistics, Central Bank of Nigeria's economic and financial review and an online database maintained by Food and Agricultural Organization (FAO).

Analytical technique

Descriptive statistics

The descriptive and inferential statistical technique such as graph is used to show the pattern of price variation of rice. The percentage is used to get the price levels in order to represent them on a graph.

Unit root test

The Augumented Dickey-Fuller (ADF) (Dickey and Fuller, 1979) was used for this test. It is used to test for stationarity or non-stationarity. A stationary series is one with a mean value which will not vary within the sampling period. A non-stationary series will exhibit a time varying mean (Juselius, 2006). Ordinary least squares can be used in time series analysis so far the variables are stationary (Gujarati, 2003).

Ordinary least squares

The ordinary least squares (OLS) method is one of the most important ways for estimating the parameters of general linear models, because of its simplicity and rationality, the results are obtained when specific assumptions are achieved. But if these assumptions are violated, this (OLS) method does not assure the

desirable results. The influence of the autocorrelated errors is one of these problems, which statistically leads to insignificant results and the two-stage least squares method is used to deal with it. Multicollinearity is another interesting problem; this occurs when the explanatory variables are correlated with each other, and the ridge regression method is used to deal with it. (Hussein et al. 2012)

$$\mathrm{Pric_t} = \beta_0 + \beta_1 \mathrm{prod_t} + \beta_2 \mathrm{imprt_t} + \beta_3 \mathrm{Exprt_t} + \beta_4 \mathrm{Area_t} + \beta_5 \mathrm{ExchRa_t} + \beta_6 \mathrm{InflaRate_t} + \epsilon_t,\ t=1, 2,\ldots,42 \quad (1)$$

where

$\mathrm{Pric_t}$ = price of rice in year t,

$\mathrm{prod_t}$ = production of rice in year t,

$\mathrm{imprt_t}$ = import in year t,

$\mathrm{Exprt_t}$ = export in year t,

$\mathrm{Area_t}$ = area of land in year t,

$\mathrm{ExchRa_t}$ = exchange rate in year t,

$\mathrm{InflaRate_t}$ = inflation rate in year t,

ϵ_t = error term associated with time t,

β_0 is the intercept,

$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6$ are the regression coefficients.

Series of prices were all deflated by using Consumer Price Index (CPI). The real prices obtained were then used for the analyses.

$$\text{Real price} = \frac{\text{nominal price}}{\text{CPI}} \times 100 \quad (2)$$

Two-stage iterative ridge regression

Two-stage least square and ridge regression are combined sequentially to form two-stage iterative ridge regression. This method is adopted to deal with the problem of autocorrelated error and multicollinearity. This concept was adopted from the work of Hussein (2012). The following steps were taken to:

- Obtain the regression model of the variable using OLS;
- Use the ρ obtained from the OLS to transform the model;
- Apply the OLS estimator to estimate the transformed data sets and carry out a diagnostic test to check if the problem of autocorrelation has been handled;
- If not handled, use the ρ obtained from the first transformed model to transform the model again until the ρ converges to zero;
- Apply the OLS estimator to estimate the second transformed data sets and carry out a diagnostic test to check if the problem of autocorrelation has been handled;

- If the problem of autocorrelation has been solved, then apply ridge regression to the transformed data. The concept of ridge regression was introduced by Hoerl and Kennard (1970). Ridge regression is a method of biased linear estimation which has been shown to be more effective than the OLS estimator when data exhibit multicollinearity. It reduces multicollinearity by adding a ridge parameter, K, to the main diagonal elements of X'X, the correlation matrix.

Results and Discussion

Descriptive statistics

Table 2 shows descriptive statistics where mean production, minimum production and maximum production were analysed for the data series of rice. It shows that rice has an all-time maximum production of 4,567,320 tonnes and an all-time minimum production of 218,000 over the considered time period. The all-time maximum price is 196,202.30, while the maximum area of land used in production is 27,250,000 ha.

Table 1. Unit root table.

Explanatory variable	Dependent variable	Estimation method
Stationary	Stationary	OLS
Non-stationary	Non-stationary	Co-integration
Stationary	Non-stationary	Logically inconsistent
Non-stationary	Stationary	Logically inconsistent

Source: Gujarati (2003).

Table 2. Summary statistics for dependent and explanatory variables.

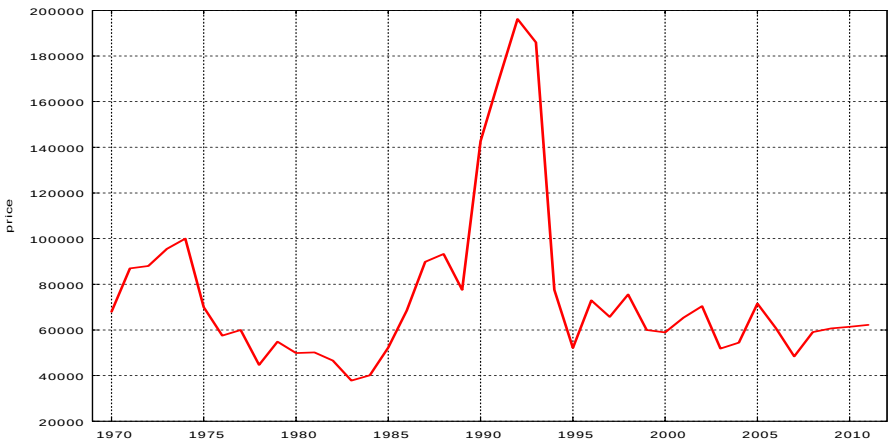
	N	Minimum	Maximum	Mean	Std. deviation
Price	42	37,814.33	196,202.30	75,118.74	35,703.36
Production	42	218,000	4,567,320	2,240,105	1,314,271.66
Import val	42	255	2,187,419	629,012.10	545,605.17
Export val	42	0	9,244	441.83	4,902.08
Area	42	172,000	27,250,000	1,341,244	850,265.25
Exch rate	42	0.5	154.74	43.84	56.74
Infl rate	42	3.5	72.8	19.53	16.53

Source: Data analysis, 2014

Pattern of rice price

It can be seen from Figure 1 that from 1970 the price of rice increased at an increasing rate until 1971 from which point it was relatively stable until 1972.

There was a significant increase from 1972 to 1974, the price of rice fell drastically all through the years to 1984 when it began to rise again at a high speed until 1988. There was a fall in price between 1988 and 1989. The price of rice increased at an alarming rate from 1989 to the highest point ever in 1993. The price of rice reached its highest point in 1993. Then there has been occasional rise and fall over the other years.



Pattern of rice price:
Figure 1. Source: Data analysis, 2014.

Augmented Dickey-Fuller (adf) test

The efficacy of a times series regression model in establishing the relationship among variables is conditional on the assumption that the variables must be stationary. Therefore, before fitting a regression model, the variables must be stationary. In the case of non-stationary time series, it implies that the variable may be co-integrated. Dickey-Fuller test is on the list of the available statistics for testing unit root (Gujarati, 2003).

Pre-analysis information

- The data obtained from export value were turned to dummy variables because of the outlier possibilities in the data, to avoid a spurious result.
- Yield quantity of rice was omitted from the analysis to reduce the existence of multicollinearity between the variables.
- All data except that of export (which is a dummy variable) were logged to reduce the possibilities of having a spurious result.

An econometric model for this study is specified as follows:

$$\text{LogPric}_t = \beta_0 + \beta_1 \text{Logprod}_t + \beta_2 \text{Logimprt}_t + \beta_3 Exprt_t + \beta_4 LogArea_t + \beta_5 LogExchRa_t + \beta_6 LogInflaRate_t + \epsilon_t, t=1,2,\ldots,42 \quad (3)$$

where

$LogPric_t$ = logarithm of price of rice in year t,
$Logprod_t$ = logarithm of production of rice in year t,
$Logimprt_t$ = logarithm of import in year t,
Exprt_t = export in year t,
$LogArea_t$ = logarithm of area of land in year t,
$LogExchRa_t$ = logarithm of exchange rate in year t,
$LogInflaRate_t$ = logarithm of inflation rate in year t,
ϵ_t = error term associated with time t,
β_0 is the intercept,
$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6$ are the regression coefficients.

Unit root test

Table 3 shows the results of the unit root test for stationarity in all variables using the augmented Dickey-Fuller (ADF) test. All the variables are stationary at different lag lengths either at 5% or 10% level of significance.

Table 3. Augmented Dickey-Fuller test of unit root.

Variables	Statistics	P-value	Implication	Lag length	Order of integration
Logpric_t	-2.8081	0.0571	Stationary	6	Stationary at level
Logprod_t	-5.3215	0.0000	Stationary	6	Stationary at level
LogArea_t	-3.7131	0.0039	Stationary	6	Stationary at level
Logimprt_t	-4.4147	0.0001	Stationary	1	Stationary at level
Export_t			Stationary	0	Stationary at level
LogInflRate_t	-3.6982	0.0078	Stationary	0	Stationary at level
LOgExchRa_t	-3.2042	0.0835	Stationary	17	Stationary at level

Source: Data analysis, 2014.

Ordinary least squares, two-stage iterative ridge regression analyses

In an attempt to study the factors affecting price variation, the linear regression model (10) of original variables in their natural logarithms gives the results in Table 6. From Table 4, it can be seen that estimation based on the OLS estimator produces residuals that are normally distributed using Jarque-bera test. Also, the condition of constant variance is satisfied using a white test. Furthermore, the results reveal the existence of both multicollinearity (VIF>10) and autocorrelation (DW value = 0.9261 and DW P-value = 0.000) simultaneously. The

problem of multicollinearity might be the reason for the wrong sign in the area, import and export. In this study, both problems were handled sequentially.

Table 4. Ordinary least squares analysis output.

Variable	Coefficient	Std. error	t-statistics	P-value	VIF
Constant	10.9579	2.2304	4.9130	0.0000***	
Logprod	0.9878	0.3559	2.7760	0.0088***	41.2310
Logarea	-0.9010	0.4470	-2.0160	0.0516*	66.4320
Logimport	-0.1513	0.0339	-4.4630	0.0000***	2.3250
Logifrate	O.0571	0.0714	0.8003	0.4289	1.1750
Logexrate	0.1168	0.0756	1.5440	0.1316	12.7340
Export	-0.1679	0.1482	-1.1320	0.2651	2.1030
R-squared	0.4371	DW P-value	0.0000	White test p-value	0.4386
Jarque-bera test	0.0946	F(6, 35)	4.5292	RHO	0.5320
Adjusted R^2	0.3406	$\hat{\sigma}^2$	0.0938		

Table 5. Two-stage least squares analysis output.

Variable	Coefficient	Std. error	t-statistics	P-value	Vif
Constant	0.2645	0.5157	0.5130	0.6112	
Logprod1	0.6355	0.3972	1.6000	0.1185	35.3500
Logarea1	0.2670	0.3980	0.6708	0.5067	35.8130
Logimort1	-0.1288	0.0582	-2.2140	0.0334**	1.5620
Logifrate1	-0.0568	0.0807	-0.7044	0.4858	1.1360
Logexrate1	-0.2111	0.0621	-3.4010	0.0017***	1.8570
Export1	-0.0284	0.1144	-0.2485	0.8052	1.5250
R-squared	0.8219	DW P-value	0.0290	White test p-value	0.1333
Jarque-bera test	0.4721	F(6, 35)	26.9236	RHO	0.2060
Adjusted R^2	0.7914				
$\widehat{\sigma}^2$	0.1012				

In Table 5, the original data from Table 4 were transformed using $\hat{\rho}$=0.5320 (from Table 4) to correct the problem of autocorrelation by applying two-stage least squares and the variables were changed

- LOGPROD was transformed to LOGPROD1,
- LOGAREA was transformed to LOGAREA1,
- LOGIMPORT was transformed to LOGIMPORT1,
- LOGIFRATE was transformed to LOGIFRATE1,
- LOGEXRATE was transformed to LOGEXRATE1 and
- EXPORT was transformed to EXPORT1.

New data were obtained after the transformation. The problem of autocorrelation still persisted in the transformed analysis (Table 7), for instance (DW value = 1.5509 and DW P-value = 0.0290).

Table 6. Two-stage least squares analysis output (second iteration).

Variable	Coefficient	Std. error	t-statistics	P-value	VIF
Constant	-0.4157	0.9473	-0.4388	0.6635	
Logprod2	0.1717	0.3250	0.5267	0.6004	23.1770
Logarea2	0.7588	0.2760	2.7500	0.0094***	23.9990
Logimport2	0.0408	0.0614	-0.6653	0.5102	1.6600
Logifrate2	-0.0801	0.0853	-0.9762	0.3356	1.1780
Logexrate2	-0.2813	0.08525	-3.3000	0.0022***	2.2270
Export2	-0.0294	0.1228	-0.2391	0.8124	1.7220
R-squared	0.8707	DW P-value	0.1576	White test p-value	0.2731
Jarque-bera test	0.6663	F(6, 35)	39.2800	RHO	0.0906
Adjusted R^2	0.8485				
$\hat{\sigma}^2$	0.1034				

The previously transformed data (in Table 5) were then transformed again using $\hat{\rho} = 0.2060$ (from Table 5) to re-correct the problem of autocorrelation by applying two-stage iterative least squares and the variables were changed; LOGPROD1 was transformed to LOGPROD2, LOGAREA1 was transformed to LOGAREA2, LOGIMPORT1 was transformed to LOGIMPORT2, LOGIFRATE1 was transformed to LOGIFRATE2, LOGEXRATE1 was transformed to LOGEXRATE2 and EXPORT1 was transformed to EXPORT2. In Table 6, a whole set of data showed an improvement in the R-squared (0.8707). After the transformation, summary statistics of the analysis indicated that the problem of autocorrelation has been handled since DW value = 1.7939 and DW P-value = 0.1576, but there still exists the problem of multicollinearity since VIF>10. With the presence of multicollinearity in a dataset, the signs of parameters can be found to be different from expectations.

Table 7. Two-stage ridge regression based on OLS.

Variables	Coefficient	Standard error	VIF
Logprod2	0.3239	0.0462	0.1416
Logarea2	0.3049	0.0382	0.1388
Logimport2	0.0199	0.0452	0.2724
Logifrate2	0.0383	0.0738	0.2887
Logexrate2	-0.1420	0.0536	0.2661
Export2	-0.0353	0.0892	0.2746
R-squared	0.5725	$\hat{\sigma}^2$	0.5846

In Table 7, the problem of multicollinearity is corrected using ridge regression, because a bias estimator was used to solve the problem of multicolinearity. We can only talk of the positive and negative effects of the variables on price and not the significance of the variables.

Change in production results in a directional change in the price of rice. This is believed to be true because Nigerian agricultural production has been on the sleep for a while now. In Nigeria, there is need for an increase in the importation of some essential raw materials and equipment in order to boost production. Thus, necessitating an increasing variation in the price of rice, and also a change in the area used for planting rice will result in a directional change in the price of rice. Government interventions that stop or allow importation of rice will lead to price variation in any of two directions, whether positive of negative and this is in line with the work of Lui (2001). An increase in the inflation rate in the country results in a very high price in the purchase of rice and reduces people's access to rice which is a major staple food in the country and this is not contrary to theoretical expectations. Export and exchange rates have a negative effect on the price of rice in Nigeria.

Conclusion

From the results of the empirical analysis, the price responds negatively to export and exchange rates. A positive effect is realized when the inflation rate and import rate are reduced, thus, the price of rice will be reduced. Increasing the amount of land used in the production of rice increases the price of rice.

Based on the results from this study, the following recommendations are necessary: since an increase in the price brings about an increase in production, which is in line with the theory of supply; government should implement policies that will subsidize the price of rice to consumers and increase the level of food security in the country. Appropriate tax collection measures on producers should be implemented so as to curtail farmers from exploiting the masses by making excessive gains. Since a decrease in export gives an increase in price, government should keep a balance between import and export to maintain the price of rice at a reasonable level. The price of rice can be reduced by the government when they implement measures to control the inflation rate in the economy. The government should put measures to regulate the quantity of land used by rice producers so as to control the price of rice, since they both have a positive relationship.

References

Abbot, P.C., Hurt, C., Tyner, W.E. (2009): What drives food prices? Farm Foundation. Issue Report. pp. 17.

Akande, S.O., Akpokodge, G. (2003): Rice prices and market integration in selected areas in Nigeria. A Study Report, WARDA-NISER Collaborative Study.

Akanji, B.O. (1995): Hedonic-Price analysis of the demand for grain crops in Nigeria: The case of rice and cowpea. Nigeria. A Ph.D thesis submitted to University of Ibadan, Ibadan, Nigeria.

Akpan, S.B., Udoh, E.J. (2009): Estimating grain relative price variability and inflation rate movement in different agricultural policy regimes in Nigeria. Humanity and science Journal. 8(2)147-151.

Akpokodge, G., Lancon, F., Erenstein, O. (2001): Nigeria's rice economy: State of the art. A paper presented at the WARDA-NISER Nigerian rice economy workshop, Ibadan, pp 4-9.

Clark, P. (2004): Exchange rate volatility and trade flow - some news evidence. International Monetary Fund Staff Papers 25.

Dickey, D.A., Fuller, W.A. (1979): Distribution of the estimators for autoregressive time series with unit roots. Journal of the American Statistical Association.74:427-431.

DeGrauwe, P. (1988): Exchange rate variability and slowdown in growth of international trade. International Monetary Fund Staff Papers. 35:63-84.

Eleanore, V. Ramos (2013): A time series analysis of intertemporal price transmission in the Philippine rice market. Proceeding of the12th National Convention on statistics, Makati City, Philippines.

Ettah, B.E., Akpan, O.D., Etim, R.S. (2009): Effects of price and exchange rate fluctuations on Agricultural exports in Nigeria" International Journal of Economic development research and investment 2(1):1-10.

Food and Agricultural Organization (FAO), 2000: Agriculture towards 2015/30 Technical Interim Report. April, 2000 Rome.

Food and Agricultural Organization (FAO), 2001: FAO Rice Conference 2001. Accessed Online at www.fao.org On 30th October, 2013.

Food and Agricultural Organization (FAO), 2005: FAO Rice Conference. Accessed Online at www.fao.org.

Gilbert, C.L. (2009): Speculative influences on commodity futures prices 2006-2008. In United Nations Conference on Table and Development. pp. 13

Gilbert, C.L. (2010): How to understand high food prices. Journal of Agricultural Economics 61:398-425.

Gujarati, D. N. (2003): Basic Econometrics.4th edition. New Delhi: Tata McGraw-Hill.

Hoerl, A.E., Kennard, R.W. (1970): Ridge regression: biased estimation for non-orthogonalproblems. Technometrics; 12(55): 531-540.

Hussein Y. A. E. and Abdalla A. A. (2012): "Generalized two Stages Ridge regression estimator: GTR for Multicollinearity and Autocorrelated Errors. http:ww.researchgate.net/ publication/283205493_Generalized_Two_Stages_Ridge_regression_Estimator_GTR_for_Multicollinearity_and_Autocorrelated_Errors.

Irwin, S.H., Sanders, D.R., Merrin, R.P. (2009): Devil or Angel? The role of speculation in the recent commodity boom (and bust). Journal of Agricultural and Applied Economics, 41:393-402.

Juselius, K. (2006): The Co-integrated VAR model: methodology and applications, Oxford University Press.

Kargbo, M. (2006): Exchange rate volatility and agricultural trade under policy reforms in South Africa. A. Research Paper to African Economic Research Consortium. Journal of Monetary and Economic Integration. 9(2):42-43.

Lui, X. Chengang, W., Wei, Y., (2001): Causal links between foreign direct investment and trade in China, China Economic Review" 12:190-192.
Mafimisebi, T.E., Agunbiade, B.O., Mafimisebi, O.E. (2014): Price variability, co-integration and exogeniety in the market for locally produced Rice: A case study of southwest zone of Nigeria. Journal of Rice Research. 2:1. http://dx.doi.org/10.4172/jrr.10000118.
Odusina, O.A. (2008): Urban Rice Demand Analysis: A Case Study of Ijebu-Ode Township. Middle-East Journal of Scientific Research 3:62-66.
Olukosi, J.O., Isitor, S.U., Moses, O.O. (2007): Introduction to agricultural marketing and prices principle and applications. Agitab Publication, Zaria, pp 107-115.
Phillips, C.B., Shu-Ping, Shi Jun yu (2011): Testing for multiple bubbles. Cowles Foundation Discussion Paper No. 1843. Yale Univeersity.
Pindyck, R.S., Rotemberg, J.J. (1990): The excess co-movement of commodity prices. Economic Journal 100:1173-1189.
Shively, G. E. (1996): Food Price variability and Economic Reform: An ARCH Approach for Ghana. American Journal of Agricultural Economics, 78(1)126-136.
Tadese and Guttormsen (2011): Drivers and triggers of international food spikes and volatility. Food Policy 47:117-128.

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POKRETAČI VARIJACIJE CENE PIRINČA U NIGERIJI: DVOETAPNI ITERATIVNI PRISTUP RIDGE REGRESIJA

Opeyemi E. Ayinde[1], Victor I. Aina[1*], Kayode Ayinde[2] i Adewale F. Lukman[2]

[1]Odsek za agroekonomiju i farm menadžment,
Univerzitet u Ilorinu, P.M.B.1515, Ilorin, država Kvara, Nigerija
[2]Odsek za statistiku, Univerzitet tehnologije Ladoke Akintola,
P.M.B. 4000 Ogbomoso, dražava Ojo, Nigerija

R e z i m e

Većina istraživanja o lokalnom pirinču u Nigeriji su usmerena na povećanje proizvodnje, potrošnju i konkurentnost sa veoma malo onih koja se bave determinantama cene pirinča u privredi. Premošćavanje ovog jaza zahteva istraživanje o različitim faktorima koji utiču na cenu pirinča. Nestabilnost cene hrane je čest prethodnik makroekonomskih šokova i političkih nemira, koji mogu obeshrabriti dugoročna ulaganja i smanjiti rast. U ovoj studiji su korišćeni sekundarni podaci. Za potrebe ovog istraživanja korišćeni su alati deskriptivne statistike, kako bi se analizirao obrazac varijacije cena tokom perioda od 42 godine u ispitivanoj oblasti. Takođe, ispitani su različiti faktori koji utiču na varijaciju cene pirinča. Došlo se do sledećih preporuka: treba da budu primenjene odgovarajuće mere naplate poreza proizvođačima, kako bi ograničile poljoprivrednike da iskorišćavaju mase za postizanje prevelikih dobitaka. Pošto smanjenje izvoza rezultira povećenjem cena, vlada treba da zadrži ravnotežu između uvoza i izvoza kako bi se cena pirinča održala na razumnom nivou. Vlada može smanjiti cenu pirinča, kada se primene mere za kontrolu stope inflacije u privredi. Vlada treba da uspostavi mere za regulisanje količina zemljišta, koju koriste proizvođači pirinča kao i za kontrolisanje cena pirinča, pošto obe imaju pozitivnu vezu.

Ključne reči: varijacija cene, pirinač, ridge regresija, Nigerija.

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[*]Autor za kontakt: e-mail: ainaifedotun@gmail.com