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ANALYSIS OF RURAL AND URBAN RICE MARKETS INTEGRATION IN NIGER STATE, NIGERIA: ERROR CORRECTION MODEL APPROACH

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ABSTRACT

This study examined the integration of rural and urban markets in Niger State using the Error correction Modeling. Secondary data of the retail prices of rice were collected for a period of 60 months (2006-2010) and error correction technique was employed in the determination of the degree of market integration between the markets using a four test procedures *viz:* Augumented Dickey Fuller test to detect for the presence of unit root in the series; Johansen co-integration test for the long run equilibrium relationship among the variables; Vector error correction model test (VECM) to capture short-run and long-run changes in the price movements; and Granger casualty test to reflect the direction of influence between prices. The results revealed that unit root in the price series was eliminated after the first differencing and that there was a stable long-run equilibrium relationship among the markets. The vector error correction estimates shows that most of the markets were not well integrated in the short –run, and finally, the causality test revealed that no single market dominated the price formation either in the rural or urban markets in the study area. Therefore, to improve the rate of spatial price adjustment in the study area, policy makers should intensify their efforts on improving the functioning of rice markets through increasing marketers' access to accurate and timely marketing information as well as reduction of the prices of mobile phones to make it more affordable to the marketers so as to improve the degree of integration of the markets in the study area.

Key words: Integration, rice markets, vector error correction

INTRODUCTION

Agriculture is very vital in Nigerian economy and for it to fulfill its role of feeding the teeming populace, marketing, through which the product especially rice, get to the end-users (consumers) must be given priority. This is because a well-functioning market is a precondition for economic development. Hence for markets to carry out these developmental functions effectively, there should be accurate and timely information across spatially separated markets so that shock arising in rural areas where there are always unusual surpluses can be transmitted to urban deficit areas. This is only possible if markets are integrated. Otherwise, there will be distortions in the market and eventual inefficiency in the marketing system.

Market integration as an important aspect of market research provides the basic data for understanding how specific markets work. The usefulness of such information lies in its application to policy formulation and decisions, and, on the extent to which market development may be promoted. Market integration will also help to understand the movement of equilibrium paths of demand and supply for rice in the study area. The degree of proximity of the price movements, the speed and accuracy of diffusion of price information, the efficiency of price transmission or information spread are prerequisites for achieving efficient allocation of resources across space and time (Okon and Egbon, 2005).

Despite the importance price transmission to policy formulation and market development, most research findings in the study area had focused on production, profitability and farm

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level efficiency of rice enterprise. Little research effort had been directed towards rice price transmission between the points of sale (rural markets) and urban markets in the area, hence, it is against this background that this study was set up to analyze the co-movement of rice prices in rural and urban markets as well as the speed and direction of price adjustments of rice in the area.

Conceptual framework

Under competitive conditions, price differences between two regions in the same economic market environment for a homogeneous commodity should approximately equal to the inter-regional transportation costs. Market integration thus involves a test of price efficiency by examining how food markets in different regions respond jointly to supply and demand forces. If price movements in different parts of the country tend to behave similarly, reflecting the cost of transferring the product between two regions, then markets are said to be integrated.

Several studies on market liberalization have tested for food market integration (Ravallion, 1986; Alexander and Wyeth, 1994 and Dercon, 1995). Early empirical studies of market integration used static price correlations to test for spatial market integration in agricultural markets (Jones, 1968; Harriss, 1979 and Blauch, 1997). These involve the estimation of bivariate correlation or regression coefficients between the time series of spot prices for an identical good at different market places. In these analyses, a statistically significant coefficient implies that the two markets are integrated. This kind of modeling of spatial market integration has been criticized for masking other**.** Some other past research work on market integration on various combinations of foodstuffs markets are Akwasi *et al.,* (2011); Amikuzuno (2010); Mohammad and Verbeke, (2010); Okoroafor *et al.,* (2010); Rahji and Adewunmi (2008); Daan, (2008); Mafimisebi, 2008; Tahir and Javed, 2007; Aminu (2006); Huang and Rozelle, (2006); Moser *et al.,* (2005); Akande and Akpokodje (2003); and Takamatsu (2002). These studies suggest that the major sources of poor integration and inefficiency include poor price information transmission channel, too many intermediaries and the high cost of transportation, as well as the sources and validity of price data. The price series used for the various studies were collected weekly or fortnightly by the researchers.

MATERIALS AND METHODS

The area of study was Niger State. It is located between latitudes 8°11'N and 11° 20' N and longitudes 4° 30'E and 7° 20'E. It is bordered on the north-east by Kaduna State and on the south-east by the Federal Capital Territory, Abuja. It is also bordered on the north, west, south-west and south by Zamfara, Kebbi, Kogi and Kwara States, respectively. It shares an international border with the Republic of Benin in the north-west. The State covers an estimated land area of 86,000 square kilometers, representing about 9.3% of the total land area of the country (Alhassan, 2012). According to the 2006 census, the State has a population of 3,950,249 people which is projected to be increasing at an annual population growth rate of 2.38%. The vegetation, soil and weather patterns are favorable for the production of a wide spectrum of food and cash crops of various types. The major crops grown in the State include rice, maize, millet, sorghum, yam, potato, soybean, groundnut, cashew, beniseed and cassava. The amount of rainfall is between 1100mm – 1600mm per annum with average monthly temperature ranges from 23°C to 37°C. The vegetation consists mainly of short grasses, shrubs and scattered trees. Agriculture is the predominant economic activity in the State. The crops mainly grown are maize, yam, cassava, rice and tomatoes among others.

A two-stage sampling technique was used to select the rice marketers in the study area. The first stage involved the random selection of five major rice markets from the State. Then, the rice marketers were categorized into rural buyers, wholesalers and retailers. In the second stage, a random selection of four rural buyers, six wholesalers and ten retailerswas made making a total of one hundred marketers in all.This was due to lack of official census on rice marketers by categories in the study area.

The selected markets were *Bida* New market, *Maitumbi* market, *Dandaudu* market, *Maito* market and *Baddegi* market. Some of the markets are rural while others are urban. The urban markets are New Market and *Maitumbi* markets while rural markets are *Dandaudu, Maito* and *Baddegi* markets. Rural markets are those located within the area of production while urban markets are considered as those located outside the area of production. Prices of rice in rural areas are expected to be lower than in urban areas because of the proximity of the markets to the area of production.

Data for the study were obtained from secondary source. Secondary data on the retail monthly rice prices for 120 months (2006-2010) were obtained from Agricultural Development Programme Offices in the State.

This study was achieved by analyzing the relationship between the rural and urban markets selected for the study (i.e rice supplying market and rice consuming market). For this study, rice supplying market is referred to as market A (Rural markets) while rice consuming market is referred to as market B (Urban markets). Analysis of relationships between prices is a common tool in market integration analysis (Okoh and Egbon, 2005). The market integration model (showing the basic relationship to be investigated) is expressed as follows:

$$\ln P_{Bt} = \alpha + \beta \ln P_{At} + \gamma \ln P_{Bt-1} + \varepsilon_{it} \quad \text{... (1)}$$

Where,

P_{At}= the price of rice in A^{th} market on t^{th} month

P_{Bt-1}= the price of rice in B^{th} market on $t\text{-}1^{th}$ month

α = a constant term (the log of a proportionality coefficient) that captures transportation costs, and quality differences.

β gives the relationship between the prices

γ = the error correction term

Ɛ = white noise term.

Aprori conditions specify that if,

β = 1, the law of one price holds and the relative price is constant. This implies that the two markets are perfectly spatially integrated, that is, a price change in the supplying market is fully reflected in the consuming market.

0<β<1, there is a relationship between the prices, but the relative price is not constant. The degree of integration is evaluated by investigating how far the deviation of β is from unity.

Error Correction Models were used for the test and estimation procedure as suggested by Engle and Granger (1987). There are four steps in the application of the above technique. The first step involved carrying out a unit root test on univariate time series to determine the order of integration through successive differencing. Secondly, Johansen co-integration method was estimated using variables of the same order of integration. The residuals of the co-integration were tested for stationary in the third step. Lastly, the Error Correction Model (ECM) was estimated.

Step 1: Using the Augmented Dickey- Fuller (ADF) test (Dickey and Fuller, 1979) the order of integration of each time series variable was tested to find out if the data were trend stationary or not. The ADF test for this study was formulated by these equations:

$$\Delta P_{Bt} = \beta_0 + \beta_t P_{Bt-i} + \sum c_i \Delta P_{Bt-1} + \varepsilon_t \quad \text{..(2)}$$

$$\Delta P_{At} = \gamma_0 + \gamma_t P_{At-i} + \sum d_i \Delta P_{At-1} + \varepsilon_t \quad \text{...(3)}$$

Where,

Δ = the first difference operator

$\mathcal{E}_t$= the stochastic error term that follows the

classical assumptions.
The other variables in equations (2) and (3) remain as defined in equation (1). The null hypothesis in equations (2) and (3) is that unit root exists, that is, $\beta = \gamma = 1$ against the alternative hypothesis, that $\beta \neq \gamma < 1$

The decision rule here is that if the value of the ADF statistic is less than the critical value at the conventional significance level (usually the five percent significant level) then the series (P_t) is said to be stationary and vice versa. Once the series are found to be non-stationary, then there should exist a linear combination of these variables, which is integrated of order one. The general representation for equations (2) and (3) is:

$$\Delta P_{it} = \beta + \beta_i T + \delta_i P_{t-1} + \sum_{j=1}^{k} b_i \Delta P_{t-1} + \varepsilon_t \quad (4)$$

Where,
Δ = the difference operator
P_{it} = the price of rice in market i, at time, t and T is a time trend (Dickey & Fuller, 1979),
β = drift parameter.
β_i, δ_i and b_i = coefficients
ε_t = white noise error term with zero mean and constant variance
$\Delta P_{t-1} = (P_{t-1} + P_{t-2})$, $\Delta P_{t-2} = (P_{t-2} + P_{t-3})$ etc, that is, using lagged difference terms.
The number of lagged difference term to include is often determined empirically, the idea being to include enough terms so that the error term is serially independent (Gujarati, 1995).

Step 2: The next logical step is to test for cointegration using Johansen co-integration techniques (Trace and Eigenvalue Test).
If two series are individually stationary at same order, the Johansen and Juselius (1990) and Juselius (2006) can be used to estimate the long run co-integrating vector from a Vector Auto regression (VAR) model of the form:

$$\Delta_{pt} = \alpha + \sum_{i=1}^{k-1} \Gamma_i \Delta p_{t-1} + \Pi p_{t-1} + \mu_t \ldots.(5)$$

Where:
p_t is a n x 1 vector containing the rice price series at time (t), Δ is the first difference operator. Γ_i and Π are n x n matrix of parameters on the i^{th} and k^{th} lag of $p_{t,}$

$$\Gamma_i = \left(\sum_{i=1}^{k} A \right) - I_g, \quad \Pi = \left(\sum_{i=1}^{k} A_i \right) - I_g,$$

I_g is the identity matrix of dimension g, α is constant term, μ_t is n x 1 white noise vector. Throughout, p is restricted to be (at most) integrated of order one, denoted 1(1), where 1(j) variable requires j^{th} differencing to make it stationary. Equation (5) tests the co-integrating relationship between stationary series. Johansen and Juselius (1990) and Juselius (2006) derived two maximum likelihood statistics for testing the rank of Π , and for identifying possible co-integration as the following:

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^{m} In(1 - \lambda_i) \quad \ldots\ldots.(6)$$

$$\lambda_{\max}(r, r+1) = -TIn(1 - \lambda_{r+1}) \quad \ldots (7)$$

Where,
r = the co-integration number of pair-wise vector,
$\lambda_i = i^{th}$ eigen value's value of matrix Π .
T = the number of observations.
λ_{trace} is not a dependent test, but a series of tests corresponding to different *r*-value. λ_{max} tests each eigen value separately. The null hypothesis of the two statistical tests is that there is existence of r co-integration relations while the alternative hypothesis is that there is existence of more than r co-integration relations.

Step 3: This involved estimating the error correction model (ECM). ECM captures the short-run disequilibrium situations as well as the long-run equilibrium adjustments between prices. An ECM formulation, which describes both the short-run and the long-run behaviors of prices, is expressed as follows:

$$\Delta P_{Bt} = \gamma_1 + \gamma_2 \Delta P_{At} - \pi \hat{\upsilon}_{Bt-I} + V_{it} \quad \ldots\ldots.(8)$$

In this model,

γ_2= the impact multiplier (the short-run effect) that measures the immediate impact that a change in P_{At} will have on a change in P_{Bt}.

π = the feedback effect or the adjustment effect that shows how much of the disequilibrium is being corrected, that is the extent to which any disequilibrium in the previous period affects any adjustment in the P_{Bt} period.

Of course $\hat{\upsilon}_{t-1} = P_{Bt-1} - \hat{\rho}_1 - \hat{\rho}_2 P_{At-1}$ therefore from this equation we also have ρ_2 being the long-run response.

Step 4: This involved carrying out Granger casualty test. If a pair of series is co-integrated then there must be Granger-causality in at least one direction, which reflects the direction of influence between series (in this case, price).

$$\Delta P_{Bt} = \theta_{11}\Delta P_{Bt-1} + \ldots + \theta_{1n}\Delta P_{Bt-n} + \theta_{21}\Delta P_{At-1} + \ldots + \theta_{2n}\Delta P_{At-n} - \gamma_1(P_{Bt-1} - \alpha P_{At-1} - \delta) + \varepsilon_{1t}$$

.....(9)

$$\Delta P_{Bt} = \theta_{31}\Delta P_{Bt-1} + \ldots + \theta_{3n}\Delta P_{Bt-n} + \theta_{41}\Delta P_{At-1} + \ldots + \theta_{4n}\Delta P_{At-n} - \gamma_2(P_{Bt-1} - \alpha P_{At-1} - \delta) + \varepsilon_{2t}$$

...(10)

The following two assumptions will be tested using the above two models to determine the Granger causality relationship between prices.

$$\theta_{21} = \Lambda = \theta_{2n} = \Lambda = \gamma_1 = 0$$

(No causality from P_{Bt} to P_{At})

$$\theta_{41} = \Lambda = \theta_{4n} = \Lambda = \gamma_2 = 0$$

(No causality from *Pat* to P_{Bt})

The above test (I – IV) procedures offer a framework for the assessment of price transmission and market integration.

RESULTS AND DISCUSSIONS

Augumented Dickey-Fuller unit root test on retail price data series

A series is said to be stationary if the mean and autocovariances of the series do not depend on time, that is, they are time invariant. The first step in testing market integration between the selected markets in the study area using the augmented Dickey-Fuller (ADF) test both at level, and first difference shows that all rice price series in the model were non-stationary at level both at 1% and 5% levels of significance (Table 1). This is because the absolute values of critical statistics were greater than the absolute values of the t-statistics and hence, contains unit root and are non-stationary i.e, I(0). This prompted the test of stationarity of the first difference. After the differencing, the price series attained stationarity because the absolute values of the t-statistics were greater than the critical values

Table 1: Augmented Dickey Fuller unit root tests of price series in the study area

Market price series	Price level 1(0)	First difference 1(1)
Baddegi	-2.4925*	-8.1495**
New market	-1.9693*	-6.9659**
Dandaudu	-1.9182*	-12.6721**
Maitumbi	-2.9082*	-9.4073**
Maito	-1.5337*	-8.3384**

*Non-stationary; **Stationary

Note: Critical values are -3.561 and -3.5482 at the 99%, and -2.9117 and -2.9126 at the 95% confidence levels for price levels and first difference series, respectively.

and hence, all the variables were integrated of order one, I(1). Therefore, the null hypothesis of unit root was accepted at levels but rejected at first difference for all the price series both at 1% and 5% levels of significance. The reason for this process according to Okoroafor *et al.* (2010), is to avoid the consequences of regressing non-stationary time series with the attendant problem of spurious results due to inflation and seasonality. This finding concur with earlier findings and conclusion that food commodity price series are mostly stationary of order one i.e. 1(1) (Agunbiade, 2013 and Okoroafor *et al.*, 2010).

Co-integration test results for the sampled market pairs in Niger State

Table 2 shows the result of the pairwise co-integration test between the sampled markets in Niger State. Eight (8) out of ten (10) market pairs, that is 80% of the pairs, indicated that the calculated λ- trace and eigen value statistics exceeded the critical values of 15.49 and 14.26, respectively, at 0.05 significance level. Therefore, we reject the null hypothesis of no co-integrating vectors and accept the alternate hypothesis of one or more cointegrating vectors which implies that the rice markets were moderately linked together and hence, it can be concluded that there was long-run equilibrium relationship among the pairs during the period. When the λ- trace and λ-max. eigen value tests show a conflicting result, the latter will be given preference over the former and as such, for New Market/ Dandaudu as well as New Market/ Baddegi, we accept the null hypothesis and conclude that there is no long-run linear relationship between them. That is, prices in New Market can drift apart from prices in Dandaudu and Baddegi markets leading to a segmented market and where there is segmentation in the market, the right price signals cannot be transmitted which will invariably cause a distortion in overall marketing decisions and eventual inefficient marketing system. Absence of long-run linear relationship in the markets could also be as a result of inadequacy in transportation (bad road) and telecommunication infrastructure. This agrees with the study of Agunbiade (2013), Sanogo (2008) and Goletti *et al*, (1995) that the degree of market integration is determined by trade action and the operational environment.

Multiple co-integration of rural markets in Niger State

The Johansen multiple co-integration tests were conducted on the price series of rural markets in the study area. These co-

Table 2: Pair-wise co-integration test on rice markets in Niger State

Market Pairs (Pi-Pj)	Trace Test Statistic	Maximal Eigenvalue Test Statistic
New Market/Maitumbi	24.8129**	21.0764**
New Market/Dandaudu	16.5752**	13.2596
New Market/Maito	18.8318**	17.1028**
New Market/Baddegi	17.0903**	12.6874
Maitumbi/Baddegi	30.2858**	26.7172**
Maitumbi/Dandaudu	23.8568**	20.6664**
Maitumbi/Maito	16.4210**	14.8458**
Baddegi/Dandaudu	19.5451**	15.9732**
Baddegi/Maito	19.7423**	17.8889**
Dandaudu/Maito	20.6609**	18.9294**

* *Significant at 0.05 level

integrations involving all variables were carried out for comparison with the result of the pair-wise analysis (only at the bi-variate level). The Johansen's multiple results for Niger State rural markets (That is, Dandudu, Maito and Baddegi markets) rice price series are displayed in Table 3. In the previous analysis, the result of the λ-trace and λ_i-maximum statistics showed that cointegration existed in most of the retail prices of rice in the various market pairs. The test here is to further validate the findings. In essence, the point of interest here was to test the null hypothesis that the various variables were not cointegrated against the alternate hypothesis of one or more co-integrating vectors (i.e r >0). Since the λ-trace statistics exceeded the critical value at 5% level, we rejected the null hypothesis of no cointegrating vectors in favour of alternate hypothesis of one or more co -integrating vectors. In addition, the test of null hypothesis of r = 1 against the alternate hypothesis of r = 2 showed we cannot reject the alternate hypothesis at 0.05 significance level. This implies that there were two co-integrating relationships at the 0.05% level. In other words, this indicated that the rural rice markets in the State were moderately linked together; hence, there was a stable long-run equilibrium relationships among them.

In the eigen value test, the λ_i-max statistic was less than the critical value at 95% significant level for r > 0. Hence, the null hypothesis of r = 0 cannot be rejected. Conversely, the null hypothesis of r = 1 against the alternate of r = 2 revealed that the eigen value statistics exceeded the critical value at the same 5% level. Consequently, the null hypothesis was rejected which confirms the λ-trace test that, rural markets in the State were cointegrated. For both λ-trace and λ-max tests, the null hypothesis of r = 2 cannot be rejected in favour of alternate hypothesis of r = 3 because their statistical values were less than the critical values. Thus, there was absence of three co-integrating vectors during the period. This finding is in line with the work of Mohammad and Verbeke (2010), Mafimisebi(2008) and Jyotish (2006)that one or more cointegrating vectors exist in rice, fish and potato markets, respectively indicating a stable long-run equilibrium relationship in the various markets.

Vector Error Correction estimates for rural markets in the study area

Considering the adjustment coefficients, it was discovered that the adjustment toward the long-run equilibrium in the short-run was fast for some markets and yet slow for others. For instance, in equation 1, the rate at which price changes is transmitted to other markets is 69% for Dandaudu, Maito,16% and Baddegi, 14%. Whilst in equation 2, Dandaudu still took the lead of 60%, followed by Baddegi, 31% and Maito, 28%. The result also shows that all the estimated short-run coefficients are statistically insignificant at the 5% level (with exception of two). The value of the coefficients ranges from 0.004-0.4. The implication here is that the transmission of price changes from one market to another during the same month was weak. Based on the results, it can be concluded that Niger State rural markets were not well integrated in the short run.

Table 3: Multiple Johansen co-integration test for rural markets in Niger State

Null hypothesis	Trace Statistics	95% critical value	Maximum eigen-value	95% critical value
r=0	37.53**	29.79	19.97	21.14
r=1	17.56**	15.49	15.73**	14.26
r=2	1.84	3.84	1.84	3.84

**significant at 0.05 level

Vector Error Correction estimates for urban rice markets in the study area

Vector Error Correction estimates for urban rice markets in Niger State reveal that all the estimated short-run coefficients were statistically significant at the 5% level. Thus, it will not be out of place to conclude that the transmission of price changes from one market to another during the period was strong. Adjustment towards the long-run equilibrium in the short-run also revealed that the price changes in New Market and Maitumbi were transmitted to other markets at a rate of 34% and 64%, respectively, within a month. Based on the results, it can be concluded that urban rice markets in Niger State were moderately integrated in the short run.

In other words, price adjustment across markets did not happen instantaneously. It took some time for the spatial price adjustments to take place. This might be as a result of inadequate communication facilities in the study area. The implication of this is that marketers will be able to adjust faster to changing price situations either in the rural or urban markets thereby reducing the risks and uncertainties embedded in ignorance of the happenings in the target/end markets.

Pair wise Granger-causality test for rice markets

Granger-causality test was used to assess whether price movements (transmission) follow a well-defined pattern by showing the direction of influence between the prices of rice in both the rural and urban markets in the study area. The direction of arrows represents the transmission of prices.

The result of pairwise Granger-causality test for Niger State rice markets is as shown in Table 4. The null hypothesis of no causality-was rejected for 11 market pairs out of the 16 market pairs tested. Five market links of the 11 market pairs exhibited a uni-directional (one-way) causality while the remaining six-showed a bi-directional (two-way) Granger causality. For the first and fourth market pairs, Dandaudu as well as Maito prices showed a strong one-way causation with Baddegi prices (1% level). This suggests that Dandaudu and Maito market prices drive Baddegi market prices. Meanwhile, there is a bi-directional causality between Baddegi and Maitumbi; New market and Maitumbi as well as Maito and Maitumbi. From the foregoing, it can be said that Maito prices exhibited a uni-directional relationship with Baddegi, New market and Dandaudu prices, and bi-

Table 4: Pairwise Granger-causality test on rice markets

Null hypothesis	F-Statistics	Probability
Dandaudu→Baddegi	7.1002***	0.0019
Maitumbi→Baddegi	3.5798**	0.0348
Baddegi→Maitumbi	5.0566***	0.0098
Maito→Baddegi	5.1549***	0.0090
Maitumbi→New market	2.7118**	0.0756
New market→Maitumbi	5.8317***	0.0051
Maito→New market	4.4352**	0.0166
Dandaudu→Maitumbi	3.6714**	0.0321
Maito→Dandaudu	7.1802***	0.0017
Maito→Maitumbi	6.3026***	0.0035
Maitumbi→Maito	4.5108**	0.0155

directional causal relationship with only Maitumbi prices. In addition, Maitumbi prices also showed a bi-directional causation with Baddegi, New market and Maito prices at 5% level whereas, Dandaudu prices manifested uni-directional relationships with Baddegi and Maitumbi prices at 1% and 5% significance level, respectively, which implies that the causal relationship between Dandaudu and Baddegi was stronger than that of Maitumbi prices. Based on this premise, it can be concluded that the price formation process was not led by a single market but rather, a combination of Maito, Maitumbi and Dandaudu markets dominated the leadership positions in rice price formation process in the area. This was quite unexpected because Baddegi in Katcha Local Government Area is believed to be the highest producer of rice in the State. Conclusively, since majority of the market pairs (11 out of 16) granger-caused each other, then there was a clear pattern of the impact of price shocks at the various markets within the State.

CONCLUSION

This study revealed that stationarity in the price series was eliminated after the first differencing and that there was a stable long-run equilibrium relationship among the markets. The vector error correction estimates showed that most of the markets were not well integrated in the short –run, and finally, the causality test revealed that no single market dominated the price formation either in the rural or urban markets in the study area. Therefore, to improve the rate of spatial price adjustment in the study area, policy makers should intensify their efforts on improving the functioning of rice markets through increasing marketers' access to accurate and timely marketing information (through T.V shows, radio programmes, newspapers) as well as reduction of the prices of mobile phones to make it more affordable to the marketers) so as to improve the degree of integration of the markets in the study area.

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