

Assessing Rice Market Competitiveness in the Greater Accra Region of Ghana

Kofi Kyei^{1,*}, Kenichi Matsui²

¹Graduate School of Life and Environmental Sciences, University of Tsukuba, Japan

²Faculty of Life and Environmental Sciences, University of Tsukuba, Japan

*Corresponding author: kofikyiejnr@gmail.com

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Abstract Although Ghana has increased its rice production, it still relies on imported rice. The Ghanaian government has shown its concerns about this import dependency that may negatively influence the competitiveness of domestic rice. However, does the price of imported rice really affect that of domestic rice? This paper examines the price relationship between local rice and foreign one at markets in the Greater Accra region of Ghana. The study selected Makola and Tema markets, the two major markets in this most populated region of the country. For analysis, we used annual retail prices of local and foreign rice in the two markets from 2006 to 2015. The Granger causality model test was applied to examine the relationship between local and foreign rice prices. The Johansen co-integration test was used to test the long-term price relationships of local and foreign rice prices. The Granger causality test results revealed that the price of foreign rice does not have any significant influence on that of local rice. The result of the Johansen co-integration test confirmed the existence of a long-term co-integration between local and foreign rice prices.

Keywords: rice, market, granger causality, Johansen co-integration, Greater Accra, Ghana

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1. Introduction

Rice is one of the most important staple foods in Ghana, but Ghanaian customers highly depend on imported rice. The total annual rice import ranges from 650,000 metric tons to 690,000 metric tons. Ghana spends about US\$280 million per year for importing foreign rice [1]. For the government of Ghana, this situation has negative implications on the development of the domestic rice industry. It believes that its foreign rice dependency has slowed the local rice production and negatively affected the competitiveness of local rice [2].

However, we do not yet have any study that shows that foreign rice negatively affects the competitiveness and prices of local rice. This lack of study could lead to the wrong policy directions. This paper, therefore, examines the relationships between the foreign and local rice in the Greater Accra Region of Ghana. It further assesses the long-term price relationships of markets in the Region.

2. Study Area

Ghana has ten administrative regions. Each has at least two major markets. The Greater Accra Region represents one of the most viable economic centers in Ghana. This region encompasses the nation's capital. The Region has

the total population of 4,010,054, making it the second most populous regions after the Ashanti region [3].

Makola and Tema markets are among the two major markets in the region. Makola Market is in the Accra metropolitan area and Tema Market in the Tema metropolitan area. These two markets handle most of agricultural commodities in both retails and wholesales of the Region. They are open daily to trade. Tema Market is influenced by the presence of a port and industries in the Tema metropolitan area. There are different varieties of foreign rice products in Tema Market because of the presence of the port. The prices of foreign rice at Tema Market are generally cheaper than those at Makola Market. However, since 2013, prices of foreign rice have increased at Tema Market partly because the Ghanaian government cut down the number of rice imports.

3. Materials and Methods

3.1. Data Sources

This study used the mean annual retail prices (measured in cedis per kilogram) of both local and foreign rice from 2006 to 2015 (Table 1). We obtained the data from the annual market statistical publications from the Statistics, Research and Information Directorate of Ghana's Ministry of Food and Agriculture. The study period covered annual retail prices for both Makola and Tema markets.

Table 1. Mean Annual Retail Prices of Local and Foreign Rice (2006-2015) [3]

Year	Makola Market (cedis/kg)		Tema Market (cedis/kg)	
	Local Rice	Foreign Rice	Local Rice	Foreign Rice
2006	0.55	0.68	0.58	0.69
2007	0.64	0.78	0.65	0.80
2008	0.83	1.24	0.87	1.09
2009	1.08	1.32	1.23	1.30
2010	1.31	1.41	1.58	1.40
2011	1.79	1.83	1.80	1.78
2012	2.52	3.12	2.52	3.13
2013	2.62	3.42	2.66	3.39
2014	3.09	3.78	3.10	4.21
2015	4.25	4.60	4.28	5.36

3.2. Methodology

3.2.1. Rice Price Relationships by the Granger Causality Test

In order to find the price relationships between local rice and foreign rice at the two markets, the Granger causality test was used. This test is used to determine the competitiveness of local and foreign rice. One-sided result implies price inefficiency in price movement between the foreign rice and the domestic one. Mutual Granger causality implies efficient price movement. This implies strong competitiveness of both markets in the study area.

Several authors have applied the Granger causality test to study agricultural price transmission in various markets. Reference [4] investigated the price transmission of fresh tomato at markets in Greece by using monthly retail price data from January 1995 to May 2011. They applied the Markov switching vector error correction model for their estimation. The results indicated the existence of mutual causality between producer and consumer prices in the short and long periods. Similarly, [5] found that causality runs from producer to retailer in French tomato markets. In Nigeria, [6] examined the price transmission and market integration between local and foreign rice market in the southern region of Nigeria by using mean monthly prices of local and foreign rice in rural and urban markets from 2005 to 2014. The study found mutual relationships between prices of local and foreign rice. It also revealed the presence of co-integration between prices of the two commodities.

The findings from these studies imply that prices of foreign rice do not always influence those of local rice. Based on this understanding we tested the following hypotheses by using the Granger causality test:

Null hypothesis: Prices of foreign rice do not influence prices of local rice at Makola and Tema markets.

Alternate hypothesis: Prices of foreign rice do influence prices of local rice at Makola and Tema markets.

If the probability value generated from the test is greater than the 5% level of significance, the null hypothesis is accepted, and the alternate hypothesis is rejected. Also, if the probability value generated from the test is less than the 5% level of significance, the null

hypothesis is rejected, and the alternate hypothesis is accepted.

3.2.2. Johansen Co-integration Test

Co-integration involves the determination of the long relationship among non-stationary time series. If two markets are integrated, then there exist long-term relationships between these markets. Co-integration involves the determination of a long relationship among non-stationary time series [7]. We used the Johansen co-integration test to determine co-integration between prices of local and foreign rice from 2006 to 2015 in the study area.

Researchers use the Johansen co-integration to determine the long-term co-integration among agricultural commodity markets [8,9]. Reference [8] examined food market reforms and the integration of rice and maize markets in Malawi and found positive long-term co-integration existed among rice markets than maize markets. Reference [9] investigated the market integration of Vietnamese and Thai rice in Indonesia. The Johansen co-integration test showed long-term co-integration among Thai, Vietnamese and Indonesian rice. Based on this understanding, we tested the following hypotheses by using Johansen co-integration test:

Null hypothesis: There exists no co-integration between local and foreign rice at Makola and Tema markets.

Alternate hypothesis: There exists co-integration between local and foreign rice at Makola and Tema markets.

If the p-value produced from the test is greater than the 5% significance level, the null hypothesis is accepted, and the alternate hypothesis is rejected. If the p-value generated from the test is less than 5%, the null hypothesis is rejected, and the alternate hypothesis accepted.

4. Results and Discussion

4.1. Descriptive Analysis of Prices of Local and Foreign Rice

We found that there was not much difference in the mean price of local and foreign rice from 2006 to 2015 at Makola and Tema markets (Table 2). This implies that a substantial market competition existed between local and foreign rice since the difference in the mean prices of the two commodities is negligible.

The mean retail prices of local and foreign rice at Makola Market was 1.87 cedis/kg and 2.22 cedis/kg (Table 2). At Tema Market, the mean price was 1.93 cedis/kg and 2.31 cedis/kg for local and foreign rice respectively. The minimum and maximum prices of local rice at Makola Market were 0.55 cedis/kg and 4.25 cedis/kg. At Tema, it was 0.58 cedis/kg and 4.28 cedis/kg.

Prices of foreign rice had larger ranges in both Makola and Tema markets compared to those of local rice. If prices closely correspond at these two markets, the annual prices from 2006 to 2015 should not differ substantially. Also, to indicate a continuous flow from one market to the other, the annual prices of the two commodities must have a lower standard deviation.

Table 2. Descriptive Statistics of Rice Variables

Parameters	Local Rice		Foreign Rice	
	Makola Market (cedis/kg)	Tema Market (cedis/kg)	Makola Market (cedis/kg)	Tema Market (cedis/kg)
Mean	1.87	1.93	2.22	2.31
Median	1.55	1.69	1.62	1.59
Minimum	0.55	0.58	0.68	0.69
Maximum	4.25	4.28	4.60	5.36
Range	3.70	3.70	3.92	4.67
Standard Deviation	1.22	1.20	1.39	1.61
Variance	1.49	1.44	1.93	2.59
Skewness	0.77	0.73	0.57	0.84
Kurtosis	-0.23	-0.11	-1.24	-0.52

4.2. The Granger Causality Test between Prices of Local Rice and Foreign Rice

Our Granger causality test analysis on foreign rice prices do not show any significant impact on local rice prices ($p\text{-value} > 0.05$). This implies that prices of foreign rice do not determine prices of local rice in the two markets. This result is contrary to a study in Science, in which the researchers found a significant impact of foreign rice in both rural and urban markets in Akwa Ibom State in Nigeria (Akpan et al., 2016).

Table 3. Result of Granger Causality Test

Hypothesis	Observations	Makola Market		Tema Market	
		P- Value	Decision	P- Value	Decision
Foreign rice does not influence local rice	10	0.233	Accept	0.940	Accept

4.3. Johansen Co-integration Test for Local and Foreign Rice Markets

Table 4. Results of Johansen Co-integration Test

Hypothesis	Makola Market			Tema Market		
	Trace Statistics	P- Value	Decision	Trace Statistics	P- Value	Decision
No co-integration exists between local and foreign rice	18.630	0.016	Reject	44.624	0.0001	Reject

Our analysis on long-term relationships between local and foreign rice shows positive co-integration between local and foreign rice prices at Makola and Tema markets ($p\text{-value} < 0.05$). This implies that prices of the two commodities influence each other in the long run. This finding confirms the finding in Akpan et al. (2016). Their study examined the price transmission and market integration between local and foreign rice markets and found mutual price co-integration between local and foreign rices. It also revealed the presence of

co-integration between prices of the two commodities.

5. Conclusion

This paper examined the price co-integration between local and foreign rice at two markets in the Greater Accra Region of Ghana. We found that foreign rice import did not significantly affect local rice prices at retail and wholesale markets. This signifies the presence of a strong market competitiveness between the foreign and local rice. We also tested the long-term price relationships of these two markets and found the presence of price co-integration between foreign and local rice at the two markets. This implies that prices of foreign and local rice affect each other in the long run, if not in the short period. Price differences was high in the foreign rice market compared to the local rice market.

These results can be understood that the local rice can potentially compete with and replace the foreign rice in the Greater Accra Region of Ghana. At this moment, the amounts of available local rice at markets is less than that of foreign rice. Marketing and value addition to the local rice may increase prices for the local rice.

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