Market Integration and Price Leadership in the Low Quality Rice Export Market

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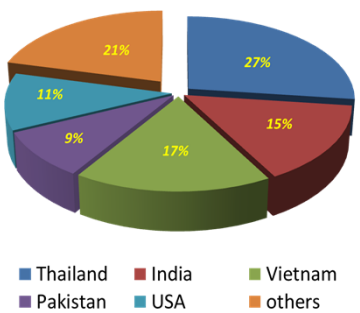
Introduction

Nearly 80 percent of market share in global rice exports are highly concentrated in top five countries (Rice yearbook, 2013). Hence, domestic agricultural and trade policies in these countries typically have profound effects on world rice prices.



There are only a few studies analyzing rice price relationships in the presence of different rice quality segments which focus on the low quality market and none have explored the role of India in this market.

Objective

To examine the dynamics of rice export prices and price leadership in the low quality rice sector (i.e., ***25% broken rice***). We particularly focus on four key exporting countries in the low quality market segment: Thailand, India, Vietnam, and Pakistan.

Data

The data set includes 902 weekly observations of free on board (FOB) prices from January 1996 to April 2013

Our study divides the data into 4 major cases:
(1)Full Sample (Jan. 5, 1996 to April 12, 2013),
(2)Subsample 1 (Jan. 5, 1996 to Oct. 5, 2007),
(3)Subsample 2 (Oct. 12, 2007 to Sept. 9, 2011),
(4)Subsample 3(Sept. 16, 2011 to April 12, 2013).

We investigate dynamic price relationships in three specific regimes – from 1996 to 2007 prior to India's export ban, from late 2007 to 2011 with India out of the market due to the export ban, and from 2011 to 2013 when India re-entered the market and Thailand started their domestic mortgage scheme.

Estimation strategies

1. Unit root tests

- *Clemente-Moñés-Reyes tests with structural breaks*
- *Augmented Dickey-Fuller (ADF) test without breaks*

2. Johansen Procedure

Using trace and maximum eigenvalue tests to investigate cointegrating price relationships in both bivariate and multivariate analyses.

3. Vector Autoregressive Model (VAR)

$$p_t = \eta + A_1 p_{t-1} + A_2 p_{t-2} + \ldots + A_k p_{t-k} + \varepsilon_t$$

where p_t is a *n x 1* vector of price variables, η is a *n x 1* vector of constant, and $A_1,\ldots,A_k$ are *n x n* matrices of parameters. ε_t is a *n x 1* vector of disturbances.

Vector Error Correction Model (VEC)

$$\Delta p_t = \eta + \prod p_{t-1} + \sum_{i=1}^{k-1} \Gamma_i \Delta p_{t-i} + \varepsilon_t$$

where $\prod = \sum_{j=1}^{k} A_j - I$, $\Gamma_i = -\sum_{j=i+1}^{k} A_j$

Note: $\prod = \alpha\beta'$ in which the adjustment coefficients (α) and the cointegration vector (β).

4. Test Hypotheses of price leadership

We test for **long-run exclusion** (i.e. $H_0 : \beta_{ij} = 0$) and **weak exogeneity** (i.e. $H_0 : \alpha_{ij} = 0$). Goulven (1999) defined price leadership status in accordance to hypothesis tests on the combination of parameter restrictions as follow:

(i) $\beta \neq 0, \alpha = 0$: price leader

(ii) $\beta \neq 0, \alpha \neq 0$: price follower

(iii) $\beta = 0, \alpha = 0$: segmented market

(iv) $\beta = 0, \alpha \neq 0$: regulator market

Results

I. Bivariate Cointegration

Variables	$\hat{\beta}_1$	$\hat{\beta}_2$	$\hat{\alpha}_1$	$\hat{\alpha}_2$	Constant
Full sample					
TH-VT	1	-1.20***	-0.036***	0.036***	1.014
TH-PAK	1	-1.214***	-0.034***	0.017**	1.071
VT-PAK	1	-1.038***	-0.054**	0.035***	0.195
Sub-sample 1					
TH-VT	1	-1.089***	-0.046***	0.039***	0.425
TH-PAK	1	-1.093***	-0.032***	0.024**	0.435
TH-INDIA	1	-0.847***	-0.0003	0.022***	-0.821
VT-PAK	1	-0.973***	-0.030***	0.018**	-0.146
VT-INDIA	1	-0.679***	-0.006	0.019***	-1.662
PAK-INDIA	1	-0.810***	-0.004	0.023***	-0.959
Sub-sample 3					
PAK-INDIA	1	6.257***	-0.0005	-0.163***	-43.147

Note: ***, **, * denotes significance at 1%, 5% and 10% level

The 25% broken rice prices of Thailand, Vietnam and Pakistan are interdependent in the bivariate analysis. Note that there is no cointegrating relationships for price pairs included India in the Full sample, even India is the second largest rice producer in the world.

II. Multivariate Cointegration

In the multivariate analysis, we find that Indian low quality rice prices are cointegrated with low quality rice prices of Thailand, Vietnam, and Pakistan.

III. Market price leadership Analysis

VARIABLES	HYPOTHESES	THAI	VIETNAM	PAKISTAN	INDIA
Full sample	Long-run exclusion	2.669	31.24***	11.42***	2.742*
	Weak exogeneity	2.51	2.88*	0.73	0.25
	Price leader status	segmented	follower	leader	leader
Subsample 1	Long-run exclusion	34.5***	54.52***	22.9***	6.736*
	Weak exogeneity	11.51***	7.14*	5.88	1.6
	Price leader status	follower	follower	leader	leader
Subsample 3	Long-run exclusion	16.72***	46.5***	29.01***	5.352*
	Weak exogeneity	2.80	7.54**	1.81	0.23
	Price leader status	leader	follower	leader	leader

Note: ***, **, * denotes significance at 1%, 5% and 10% level

Vietnam is consistently a price follower in the low quality rice market, while Pakistan and India are the leaders in this market.

Main Conclusions

We provide the following insights

- ***India has been a price leader in the market for 25% broken rice for over 17 years.***
- ***Thailand is likely a segmented market in the 1996 to 2013 period.***
- ***Thailand has emerged as a new price leader together with Pakistan and India since late 2011.***

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