Multi-markets analysis of cereals prices and price volatility transmission and implication for food security

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Introduction

- The recent commodity price spikes have revived the attention on understanding the source of volatility in commodities prices with a great focus on food commodities.
- The causes often cited supply shocks and demand shocks in conjunction with macroeconomics factors.
- But there are also evidence of comovement and interdependence among commodities.
- The literature on price co-movement has mainly focused in quantifying the extent of excess comovement of unrelated commodity.
- However, the analysis of the interrelation between related commodities can shed light of the inter-commodity price transmission and the diffusion of shocks across market.

Objective

Characterize and estimate the causal relations among the prices of the grain crop and how shocks are diffused (or not) between their respective markets with the implication for food security.

Data and Descriptive analysis

- Data. Monthly prices from 1960m1 to 2013m12 of the most internationally traded cereals. wheat, maize, rice, sorghum, rice and barley (97% of all grains). The data are from the World Bank commodity database.
- Figure 1 shows that grain prices exhibit an upward trend in commodity prices with great variability> Both the level and volatility follow the same trends

Figure 1 : Log of grain prices

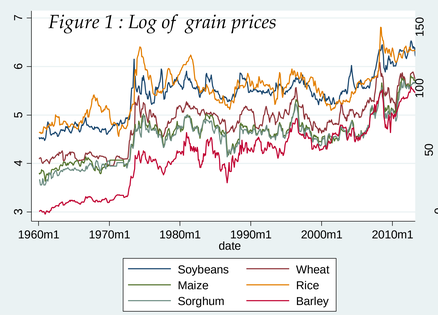
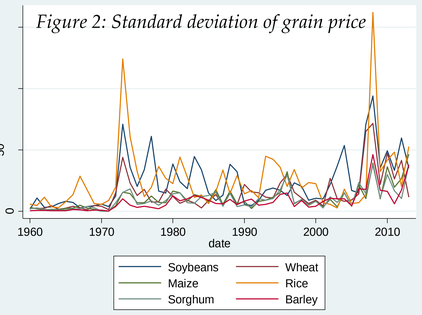


Figure 2: Standard deviation of grain price



Methods

i) Examine properties of the prices

- Use Augmented Dickey Fuller and Phillip Perron unit root test.
- Use Clementes et al. (1998) test to account for the presence of structural breaks in the series.

ii) Testing for comovement

- Use Engle-Granger and Johansen Cointegration methods to test the existence of long run relationship among the prices.
- Estimate Vector Error Correction Models of short run fluctuation in grain prices.

$$\Delta y_t = \alpha\beta' y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \, \Delta y_{t-i} + v + \delta t + \varepsilon_t$$

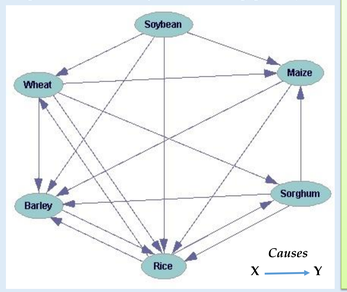
iii) Causality, Shocks and Volatility Diffusion

- Use the VECM to test the Granger Causality among the prices.
- Conduct an innovation accounting analysis through Impulse Response Function.
- Estimate Dynamic Conditional Correlation GARCH.

Results

- The prices are all I(1), despite the presence of two structural breaks. This suggests that shocks on grain markets are persistent and vanishes slowly.
- We find a strong evidence of cointegration for all price pairings. The prices of soybean and major cereals co-move together pair by pair as well as a whole group in a long run equilibrium relation.
- In all bivariate error correction models, the error correction coefficient is negative and statistically significant ranging between 2% and 11%.
- The change in the price persists in the following period. The degree of persistency ranges from 8% to 32%.

Figure 3 : Causality links among grain prices



- There is a complex causal link among the grain prices with soybean, wheat and maize playing a central role.
- Shocks local to one market has a strong and persistent effect on the other markets

The GARCH shows that there is a sizable correlation between all pairs of prices in mean and in variances

Summary and Implications

There is complex causality links among the grain prices and their volatilities. Soybean, wheat and maize, individually and together, play a central role in causing the other grain prices. Policies to stabilize food prices for food security should focus on these key cereals

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