HOW CLOSELY RELATED ARE THE PRICES OF ORGANIC AND CONVENTIONAL CORN?

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5 - Estimation

For each market location we:
1. Used Elliot, Rothenberg, and Stock test to check for unit-roots
2. Ran OLS of organic log-prices (ln POC) on conventional log-prices (ln PC)

Problem: Organic prices behave like jump processes rather than diffusions

 Designed Monte Carlo experiments to compute appropriate critical and p-values, and power, for (1) and (3) above:

 Organic log prices simulated as the jump process

\[ \text{ln } P_t = (\text{ln } P_{t-1}) + \epsilon_t^* \text{ with probability } \alpha \]
\[ \text{ln } P_t = (\text{ln } P_{t-1}) + \epsilon_t + \gamma \text{ with probability } (1-\alpha) \]

For step (3) we assumed organic-conventional cointegration was driven by organic prices reacting to restore the following long-run relationship with conventional prices:

\[ \text{ln } P_t = \alpha_0 + \alpha_1 \text{ln } P_{OC,t} + \epsilon_t \]

Jump probability and jump size were made functions of lagged cointegration residuals (v^c
\[ \gamma = [0, 1] \text{ a parameter that can be fixed to yield price cointegration of varying strength. } \]
\[ \lambda^c_0 \text{ and } \lambda^c_1 \text{ are coefficient estimates of a log where the dependent variable took value 1 if an organic price change occurred, and the ind. var. were a vector of ones and the absolute value of the cointegrating errors when regressing log-prices against conventional log-prices. (Note: The values of variables were reordered before fitting log to have the jumps aligned with the largest absolute cointegrating errors.)} \]
\[ \lambda^c_0 \text{ is associated with the opposite case of no cointegration. So, it is the point estimate of the coefficient of another log in which the independent variable was just a vector of ones.} \]
\[ \text{Size of cointegrating jumps is governed by } \theta^c_0 \text{ and } \theta^c_1 \text{. } \theta^c_0 \text{ takes the value of an OLS estimate computed by regressing organic log-price jumps against the corresponding lagged cointegrating errors. Previous rearrangement of the variable sizes so as to associate the largest (smallest) jumps with the smallest (largest) cointegrating errors.} \]
\[ \text{Use } \text{ was fixed at the standard deviation of the residuals from such regression.} \]
\[ \text{Size of non-cointegrating jumps is driven by } \gamma^c_0, \text{ whose value was fixed at the standard deviation of the log-jump magnitudes in the data.} \]

Design of the MC experiment followed reasoning behind error correction model

Also analyzed spatial cointegration between organic market locations (results not model)

6 - Key Findings

- No evidence of cointegration between organic and conventional corn prices
- Relationships obtained from OLS for different locations we had data for are spurious
- "Doubling" hypothesis is not supported by our data

Results show that organic corn prices do not follow conventional ones

Spatial cointegration in organic corn markets was to be weaker than that present in conventional markets

7 - Conclusions

If our findings for organic corn markets extend to other organic crop markets

it would imply that organic crop markets have unique characteristics and
do not just follow their conventional counterparts

Such idiosyncrasies would prevent usage of conventional derivatives markets to hedge organic price risks, and would need to be taken into consideration, for example, by RMA when setting the Federal crop insurance policy for organic farmers.