Price Transmission on Markets for Agricultural Commodities

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Causes and Effects of Food Price Crises

- What causes food price crises?
- Is financialization of commodity markets to blame?
- How are food prices and volatilities transmitted between markets?

Price and Volatility Transmissions between

- Spot and futures market
- International (US) and national market
- Wholesale and retail markets (commodity and processed food)

Commodities: Maize, Wheat, Rice and Soybeans
Transmission of prices for agricultural commodities and food

- International Spot Market
- International Futures Market
- Domestic Wholesale Market
- Domestic Retail Market
International Food Prices Since 1960

Data source: World Bank
Financialization of Commodity Markets

In the 1990s financial investors started to move funds on a massive scale into commodity markets (futures and OTC). Increase from $ 15 billion (2003) to $ 200 billion (2008)

Benefits:

• Gains from diversification (negative correlation of commodities with stock and bond returns) → reduction of portfolio risk
• Expected price increases
• Inflation hedge
Commodity index investors
Invest in a portfolio of commodities often via swap dealers who hedge their positions on the futures market
Passive, long term investment with long positions

Goldman Sachs Commodity Index (May 2004)

<table>
<thead>
<tr>
<th>Energy</th>
<th>Livestock</th>
<th>Agriculture</th>
<th>Metals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crude Oil</td>
<td>Live Cattle</td>
<td>Wheat</td>
<td>Gold</td>
</tr>
<tr>
<td>Heating Oil</td>
<td>Lean Hogs</td>
<td>Corn</td>
<td>Silver</td>
</tr>
<tr>
<td>Gas</td>
<td>Feeder Cattle</td>
<td>Soybeans</td>
<td>Aluminium</td>
</tr>
<tr>
<td>Brent</td>
<td></td>
<td></td>
<td>Copper</td>
</tr>
<tr>
<td>Gasoil</td>
<td></td>
<td></td>
<td>Zinc</td>
</tr>
<tr>
<td>Natural Gas</td>
<td></td>
<td></td>
<td>Nickel</td>
</tr>
<tr>
<td>Natural Gas</td>
<td></td>
<td></td>
<td>Lead</td>
</tr>
<tr>
<td>Total</td>
<td>Total</td>
<td>Total</td>
<td>Total</td>
</tr>
<tr>
<td>26.1</td>
<td>3.8</td>
<td>4.8</td>
<td>1.9</td>
</tr>
<tr>
<td>6.9</td>
<td>2.3</td>
<td>4.3</td>
<td>0.2</td>
</tr>
<tr>
<td>8.9</td>
<td>0.8</td>
<td>2.7</td>
<td>3.0</td>
</tr>
<tr>
<td>12.0</td>
<td></td>
<td>1.5</td>
<td>2.4</td>
</tr>
<tr>
<td>3.7</td>
<td></td>
<td>1.2</td>
<td>0.6</td>
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<tr>
<td>11.0</td>
<td></td>
<td>0.7</td>
<td>0.8</td>
</tr>
<tr>
<td>11.0</td>
<td></td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>68.6</td>
<td>6.9</td>
<td>15.5</td>
<td>9.0</td>
</tr>
</tbody>
</table>

Price Transmission on Markets for Agricultural Commodities
Granger Causality Test (Wheat)
Sample Jan. 2006 – Dec. 2016 (574 weekly observations)

Correlation between

\[ P_{\text{fut}} \text{ and Positions}_{\text{CIT}}^{\text{long}} = 0.413 \ (0.000) \]

\[ P_{\text{fut}} \text{ and Percentage Positions}_{\text{CIT}}^{\text{long}} = 0.157 \ (0.000) \]

Pairwise Granger Causality Tests
Sample: 1/03/2006 2/28/2017
Lags: 7

<table>
<thead>
<tr>
<th>Null Hypothesis</th>
<th>Obs</th>
<th>F-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHANGE_CIT_LONG_ALL does not Granger Cause DLP_FUT</td>
<td>566</td>
<td>2.14842</td>
<td>0.0372</td>
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<tr>
<td>DLP_FUT does not Granger Cause CHANGE_CIT_LONG_ALL</td>
<td>1.15175</td>
<td>0.3291</td>
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</tbody>
</table>
Testing the Masters Hypothesis

Dependent Variable: P_FUT
Included observations: 573 after adjustments

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>-0.048042</td>
<td>0.177260</td>
<td>-0.271024</td>
<td>0.7865</td>
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<tr>
<td>P_FUT(-1)</td>
<td>0.967074</td>
<td>0.009457</td>
<td>102.2566</td>
<td>0.0000</td>
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<tr>
<td>CRIT_35</td>
<td>0.608485</td>
<td>0.264626</td>
<td>2.299414</td>
<td>0.0218</td>
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<tr>
<td>PCT_OI_CIT_LONG_ALL</td>
<td>0.007423</td>
<td>0.006349</td>
<td>1.169236</td>
<td>0.2428</td>
</tr>
<tr>
<td>CRIT_35*PCT_OI_CIT_LONG_ALL</td>
<td>-0.015660</td>
<td>0.007798</td>
<td>-2.008185</td>
<td>0.0451</td>
</tr>
</tbody>
</table>

Adjusted R-squared 0.960633
Durbin-Watson stat 2.059186
Prob(F-statistic) 0.000000

• When CITs hold more than 35% of long positions, futures prices will be higher by 61.85 cents
• Significant interaction term but with unexpected sign
Wheat Prices: Spot and Futures

Date
Wheat_spot Wheat_futures


Wheat Spot and Futures Graph
Cross-Correlogram:
Price Change in the Spot and Future Markets
International and Ukrainian Wheat Prices
Steps in the Analysis

- International and Ukrainian wheat prices have unit roots
- Both prices are cointegrated
- Results for vector error-correction model:
  - 95% confidence interval for slope of cointegration equation: $[-2.064631, -1.115394]$
  - International prices Granger-cause Ukrainian prices but not vice versa.
- Low speed of adjustment to disequilibrium on Ukrainian market (6.0 percent)
Ukraine: Wheat and Flour Prices
Empirical Evidence for Ukrainian Wheat and Flour Markets

- Strong co-movement
- Price difference increased from 600 to 1700 UAH; relative price differential decreased from 80 to 40 percent (both with much short-run variation)
- No lead or lag relationship
Conclusions

• No strong and stable lead-lag relationships between wheat spot and futures markets
• Price shocks on international markets cause price shocks on the Ukrainian market
• Price shocks on different segments of the Ukrainian market are contemporaneous
• Strong “distortions” from the exchange rate
• It is unclear whether volatility has increased in recent years
• It is also unclear what to do about uncertainty and volatility in the wheat market
Thank you for your attention!