Can the Agricultural Market Information System (AMIS) help to reduce food price volatility?

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Can the Agricultural Market Information System (AMIS) Help to Reduce Food Price Volatility?

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Background
Production shocks, trade restrictions, sudden changes in biofuel policies, missing stocks, speculation, intransparency, or poor data about fundamentals are potential drivers of food price volatility. In order to increase market transparency and information to strengthen international policy coordination, the ministers at the G20 conference in Cannes 2011 decided to launch the “Agricultural Market Information System” (AMIS). AMIS consists of three main bodies: the secretariat (which assesses the data quality, identifies capacity development needs and develops methodologies as well as indicators), the market information group (which collects the data and national policy developments), and the rapid response forum (which is intended to quickly discuss and align policy responses).

Objectives
- Analyze how uncertain fundamentals may affect food price volatility.
- Analyze to which extent AMIS can help to reduce food price volatility.

Uncertain fundamentals and volatility in theory

Theoretical predictions: (cf. Shiller, 2003)
- Efficient market theory: Asset prices always incorporate the best available information about the fundamentals. Thus, news about fundamentals determine the volatility.
- Behavioral finance: Changes in asset prices can be unrelated to fundamentals. Anomalies such as “animal spirits” and mass psychology may drive volatility.

Evidence from the literature in other fields – Uncertainty as driver of volatility:
- Political uncertainty (Bettinghayer, 1998)
- Economic uncertainty (Veronese, 1999; Arnold & Vrugt, 2008)
- Supply uncertainty: due to unexpected weather shocks in the natural gas market (Mu, 2007)

Our model:
Assume agents buy and sell based on fundamentals:
- Assume a demand function \( D(F) \) which is known to all agents and has the properties \( \frac{D}{DF} < 0 \) and \( \frac{D}{DF} > 0 \). Market clearing implies \( S_t = D_t \).
- Assume that the agents have different beliefs about \( S_t \) and each agent’s expectations are given by a probability distribution: \( p(\hat{S}_t) = \frac{D(\hat{S}_t)}{\sum_t D(\hat{S}_t)} \), if \( S_t < \hat{S}_t \). The overall probability distribution of the expected supply is therefore given by: \( p(S_t) = \sum_{\hat{S}_t} p(\hat{S}_t) \) (it is also possible to include a weighting factor).
- If there is better data on fundamentals available, we expect either \( \hat{S}_t = S_t \) or \( \hat{S}_t = S_t + \hat{S}_t \) with a strict inequality for at least one \( i \), or \( \text{Var} \left( \hat{S}_t \right) > \text{Var} \left( S_t \right) \).
- As a result, if there is better data on fundamentals available, the variance of the expected prices decreases.
- When no news about fundamentals arrive, the uncertainty of the fundamentals thus is an upper limit for the volatility. Prices may still change due to changing liquidity constraints (includes switching to other more profitable futures) or “animal spirits” or mass psychology if, additionally, there is a limited number of non-fundamental traders (with less liquidity than the fundamental traders).

Assessing the data quality

Idea: Estimate data uncertainty in the AMIS database and the monthly AMIS market monitors; but there is no “correct” data available
- Compare data from different sources
- The higher the deviations, the higher the uncertainty about the “real” amounts

Methodology: Calculate (1) the coefficient of variation for the absolute deviation and (2) the standard deviation of the change in % for (the deviations of the changes) for the same country-crop-element-year-combination from the 4 sources. To compare specific categories, take the average over all other categories.

Possible problems:
- Different sources might make the same systematic mistakes
- Estimations not (completely) harmonized

Therefore:
- Take averages over categories
- Careful interpretation of results as tendencies rather than exact outcomes and as a combined measure for the uncertainty and the degree of harmonization

Table: Deviations per country

Market monitor: Deviations between sources vs. over time

Regression results for linking uncertainty to food price volatility

Depen. Variable: realized food price change in %

<table>
<thead>
<tr>
<th>Oil price volatility</th>
<th>Uncertainty of opening stocks</th>
<th>Uncertainty of production</th>
<th>Uncertainty of exports</th>
<th>Stock to use ratio</th>
<th>Production shock (prod. level beyond trend)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.461***</td>
<td>0.216***</td>
<td>0.223***</td>
<td>0.251***</td>
<td>0.166***</td>
<td>0.049***</td>
</tr>
<tr>
<td>(0.166)</td>
<td>(0.121)</td>
<td>(0.192)</td>
<td>(0.206)</td>
<td>(0.117)</td>
<td>(0.089)</td>
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<td>0.155***</td>
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Conclusions
- In our theoretical model, we find that the uncertainty of the fundamentals is an upper limit for the food price volatility.
- AMIS may help to foster desired price changes and prevent undesired price changes. We call price changes desired if they occur due to changes in the estimations of fundamentals or their uncertainty. We call them undesired if price expectations change unrelated to fundamentals or if speculation on political interventions occurs.
- However, the success of AMIS is rather limited so far: AMIS deviations between the data from different sources remain huge, especially for stocks, some countries remain reluctant to share their data, and the private sector remains largely excluded.
- At least for the following year 2012/2013, the estimation from the different sources seem to converge over time but they do not converge.
- In our empirical analysis, we find correlations between food price volatility and the oil price volatility (positive and significant in all specifications), the stock-to-use ratio (negative and significant in most specifications), the uncertainty of the exports (positive and significant in half of the specifications), the uncertainty of the stocks or production (positive and significant in some specifications), as well as the production shock (high production levels lead to less volatility; significant in two specifications).

References