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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 and 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 (Bittlingmayer, 1998)
- Economic uncertainty (Veronesi, 1999; Arnold & Vrugt, 2008)
- Supply uncert. due to unexpected weather shocks in the natural gas market (Mu, 2007)

Our model:

- Assume n agents who buy and sell based on fundamentals.
- Assume a demand function $D_t(P_t)$ which is known to all agents and has the properties $\frac{\partial P_t}{\partial D_t} < 0$ and $\frac{\partial^2 P_t}{\partial D_t^2} > 0$. 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: $p_i(\hat{S}_{i,t}) = \begin{cases} \frac{1}{b_i - a_i} = \frac{1}{2\sigma_i} & \text{if } a_i < \hat{S}_{i,t} < b_i \\ 0 & \text{else} \end{cases}$.
- The overall probability distribution of the expected supply is therefore given by: $p(\hat{S}_t) = \frac{1}{n} \sum_{i=1}^n \hat{S}_{i,t}$ (it is also possible to include a weighting factor).
- If there is better data on fundamentals available, we expect either $\tilde{\sigma}_{i,t} \leq \sigma_{i,t} \forall i$ with a strict inequality for at least one i , or $Var(E(\hat{\hat{S}}_{i,t})) < Var(E(\hat{S}_{i,t}))$.
- 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 sprits” 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

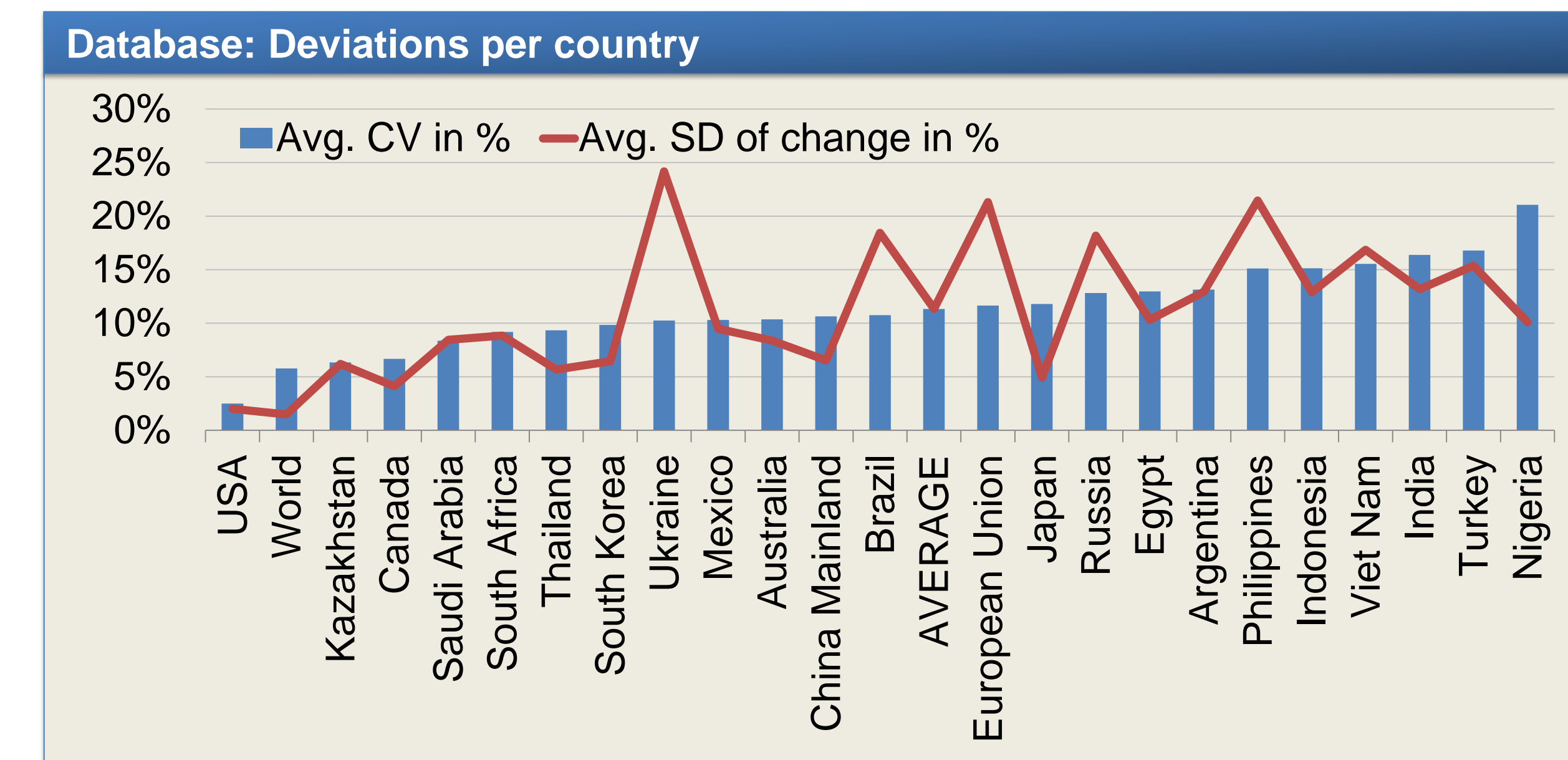
Methodology: Calculate (1) the coefficient of variation (for the absolute deviation) and (2) the standard deviation of the change in % (for the deviations of the changes) for the same country-crop-element-year combination from the 4 sources. To compare specific categories, take the average over all other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



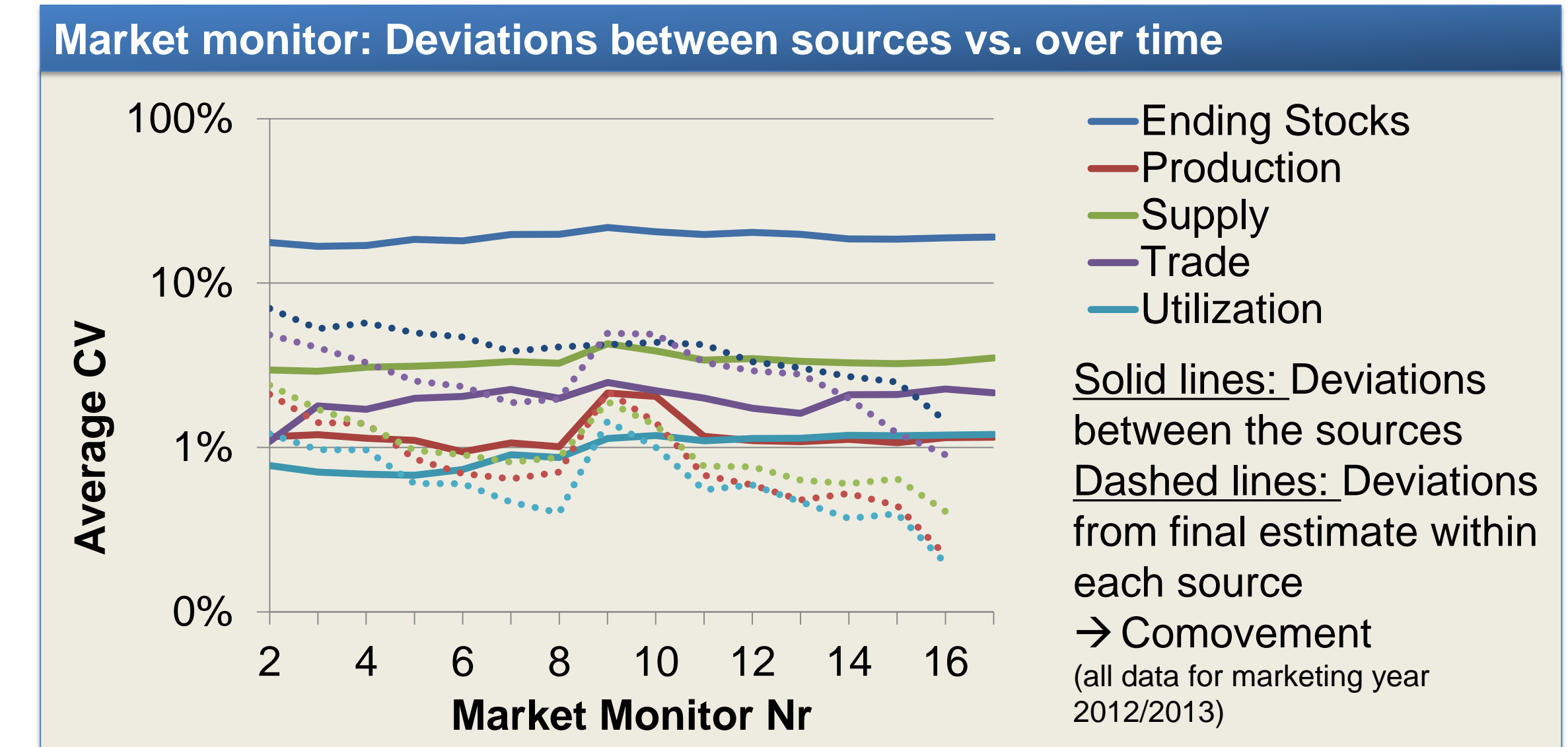
Empirical link from uncertain fundamentals to volatility

Idea: Use deviations between the sources as measure for uncertainty and investigate the impact on food price volatility.

Possible problems: AMIS database only has the latest estimate for past years but not the estimates over time. But this might not be so problematic if the “unresolved” component of the uncertainty is bigger than the “resolved” component (i.e. if the sources “comove”).

Methodology: Panel regression with crop fixed effects/ random effects

Qualitative Analysis: How can AMIS affect prices?							
Factors which can potentially influence prices							
	Produ- ction costs	Costs of access to the final product	Market conditions and political environment	Expectations of market actors unre- lated to fund.	Speculation on political interventions	Costs of access to information	Estimations of fundamen. and their uncertainty
Affected by AMIS due to	-	Prior consultations may reduce trade barriers	Prior consultations may reduce trade barriers	Only indirectly by other factors	Reduction of the likelihood of political interventions	Easily accessible AMIS market monitor	Improved data collection capabilities
Major difficulties	-	Opposing internal and external pressures	Opposing internal and external pressures	-	No agreement on which rules to enforce	No definition of “abnormal” market conditions; Reluctance to share data	Resources; Harmoniza- tion; Reluc- tance to share data; private sector



Regression results for linking uncertainty to food price volatility								
Depen. Variable: realized food price volatility	Absolute deviation (Avg. CV)				Deviating changes (Avg. SD of %-change)			
	no lag of ind. var. FE	RE	6 month lag FE	RE	no lag of ind. var. FE	RE	6 month lag FE	RE
Oil price volatility	0.451** (0.134)	0.418** (0.171)	0.580** (0.128)	0.560*** (0.121)	0.564** (0.131)	0.523*** (0.192)	0.538** (0.174)	0.564** (0.227)
Uncertainty of opening stocks	0.073 (0.212)	0.216** (0.095)	-0.068 (0.310)	0.272*** (0.097)	0.021 (0.206)	0.135 (0.220)	0.125 (0.100)	0.175 (0.171)
Uncertainty of production	-0.046 (0.235)	-0.212 (0.206)	0.062 (0.354)	-0.183 (0.305)	0.343** (0.107)	0.413** (0.166)	0.209 (0.417)	0.262 (0.419)
Uncertainty of exports	0.149 (0.154)	0.403*** (0.082)	0.373 (0.195)	0.460*** (0.094)	-0.250* (0.107)	0.141*** (0.029)	-0.097 (0.110)	0.180*** (0.023)
Stock to use ratio	-1.090** (0.266)	-0.704* (0.419)	-1.461** (0.464)	-0.920*** (0.316)	-0.665** (0.183)	-0.174 (0.534)	-1.183 (0.795)	-0.469 (0.303)
Production shock (prod. level beyond trend)	-0.204* (0.092)	-0.147* (0.087)	-0.014 (0.076)	0.015 (0.080)	-0.171 (0.100)	-0.136 (0.088)	-0.002 (0.048)	0.039 (0.072)
N	61	61	66	66	56	56	61	61
* p<0.10, ** p<0.05, *** p<0.01								

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: the 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 marketing year 2012/2013, the estimation from the different sources seem to comove 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).

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