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CHANGING PRICE DYNAMICS IN AGRICULTURAL COMMODITY MARKETS

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braucht eine nachhaltige Agrarentwicklung?“**

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Changing Price Dynamics In Agricultural Commodity Markets

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1. Background

- Commodity prices are hypothesized to tend back to an equilibrium level after stochastic disturbances.
- Does this behavior still hold after 'financialization' and coupling of agricultural and energy markets?

2. Objectives

- To detect mean reversion using term structure models
- To test, if there is evidence for a change in the dynamics of spot prices and convenience yields

3. Methodology

- Schwartz (1997) Two-factor model

$$dS = (\mu - \delta)Sdt + \sigma_1 S dz_1$$
$$d\delta = \kappa(\alpha - \delta)dt + \sigma_2 dz_2$$
$$dz_1 dz_2 = \rho dt$$

S = Spot price, μ = Drift parameter of S
δ = Convenience yield, α = Mean-level of δ
κ = Speed of mean reversion of δ
dz = Increment to a standard Brownian Motion
ρ = correlation coefficient between S and δ
σ_1, σ_2 = Diffusion parameter of S and δ

- Proxy for S: Nearby futures
- To compute δ : Futures with different maturities
- State space form
- Kalman Filter
- R package 'schwartz97'

4. Empirical Application

- Wheat, Corn, Soybeans (CBOT, Cents/bu.); Sugar (ICE-US, Cents/lb); Lean Hogs (CME, Cents/lb.) Crude Oil (NYMEX, USD/barrel); Copper (COMEX, USD/lb.); 4 to 6 Futures contracts; Wednesdays
- Jan 1989 - Dec 2012, Two sub-periods

5. Preliminary Results

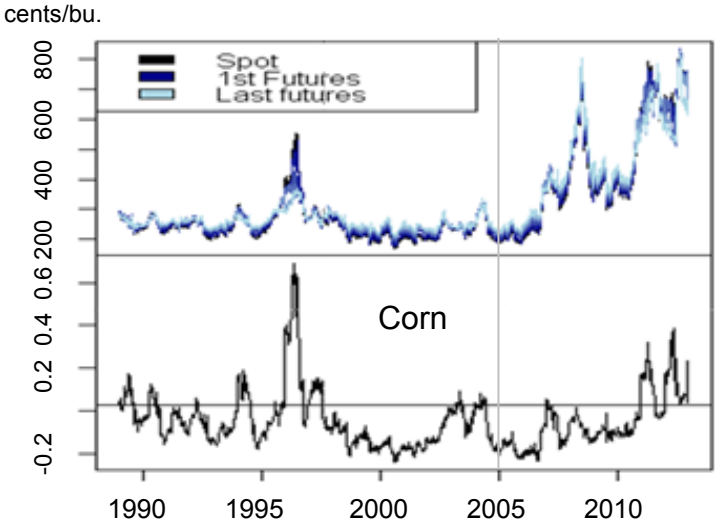
- State variables
  Spot price (upper), Convenience yield
- Mean reversion parameter for δ

κ	89-12	89-04	05-12
Wheat	0.512	0.815	0.003
Corn	0.753	(0.982)	0.125
Soybeans	0.207	0.393	0.486
Sugar	1.582	1.225	(1.095)
Hogs	4.165	4.517	(1.088)
Oil	1.351	1.829	0.385
Copper	1.474	1.336	1.726

(not significant)

- Spot price volatility

σ_1	89-12	89-04	05-12
Wheat	0.334	0.282	0.376
Corn	0.288	0.253	0.309
Soybeans	0.244	0.235	0.319
Sugar	0.402	0.323	0.406
Hogs	0.435	0.492	0.452
Oil	0.288	0.280	0.331
Copper	0.380	0.430	0.367



6. Conclusions

- 5 out of 7 commodities show an attenuation of mean reverting behavior compared to the pre energy period.
- The spot price volatility of most commodities (except hogs and copper) has increased.
- Our method does not allow for a causal explanation of observed changes in the prices dynamics (e.g. financialization or bioenergy markets).

Reference: Schwartz, E. (1997): The Stochastic Behavior Of Commodity Prices: Implications for Valuation and Hedging. The Journal of Finance Vol. 52 No. 3, 923-973