

Global Food Supply Risk Indicator

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What is it?

- A tool to assess whether forecasted production is enough to meet (forecasted) demand
- Simple tool that accounts for market fundamentals
 - Demand changes due to population and income growth
 - Production and storage
- Checks whether extreme price movements are in line with market fundamentals

Expected Price Change

- Founded on the competitive storage model: Equilibrium prices are a function of current and expected supply and demand fundamentals

$$\ln(SS_t) = A + B\ln(P_{t-1}) + f(t)$$

$$\ln(DD_t) = C + D\ln(P_t) + g(t)$$

$$\rightarrow \ln\Delta p_t = \alpha \ln\Delta x_t + \beta \ln\Delta y_t + \gamma + \varepsilon_t$$

where Δx_t = change of total supply per capita

Δy_t = total GDP per capita

- A simple OLS regression of the above equation on global crop supply gives:
 - price elasticity of expected supply change α (-)
 - price elasticity of expected income change β (+)

The Risk Indicator

$$E_t \ln[\Delta p_t] = \alpha E_t \ln[\Delta x_t] + \beta \ln E_t[\Delta y_t]$$

$$R_t = \frac{E_t \ln[\Delta p_t]}{\sigma} = \frac{\alpha E_t \ln[\Delta x_t] + \beta E_t \ln[\Delta y_t]}{\sigma}$$

- What should σ be?
 - Standard deviation of historical monthly prices?
- Which thresholds to alert for different risk scales?

Risk-Scales	Arbitrary?	Crop-specific?
Green	0.1	$R < \mu - 2\sigma$
Yellow	0.4	$\mu - 2\sigma \leq R < \mu + 2\sigma$
Red	0.6	$\mu + 2\sigma \leq R$

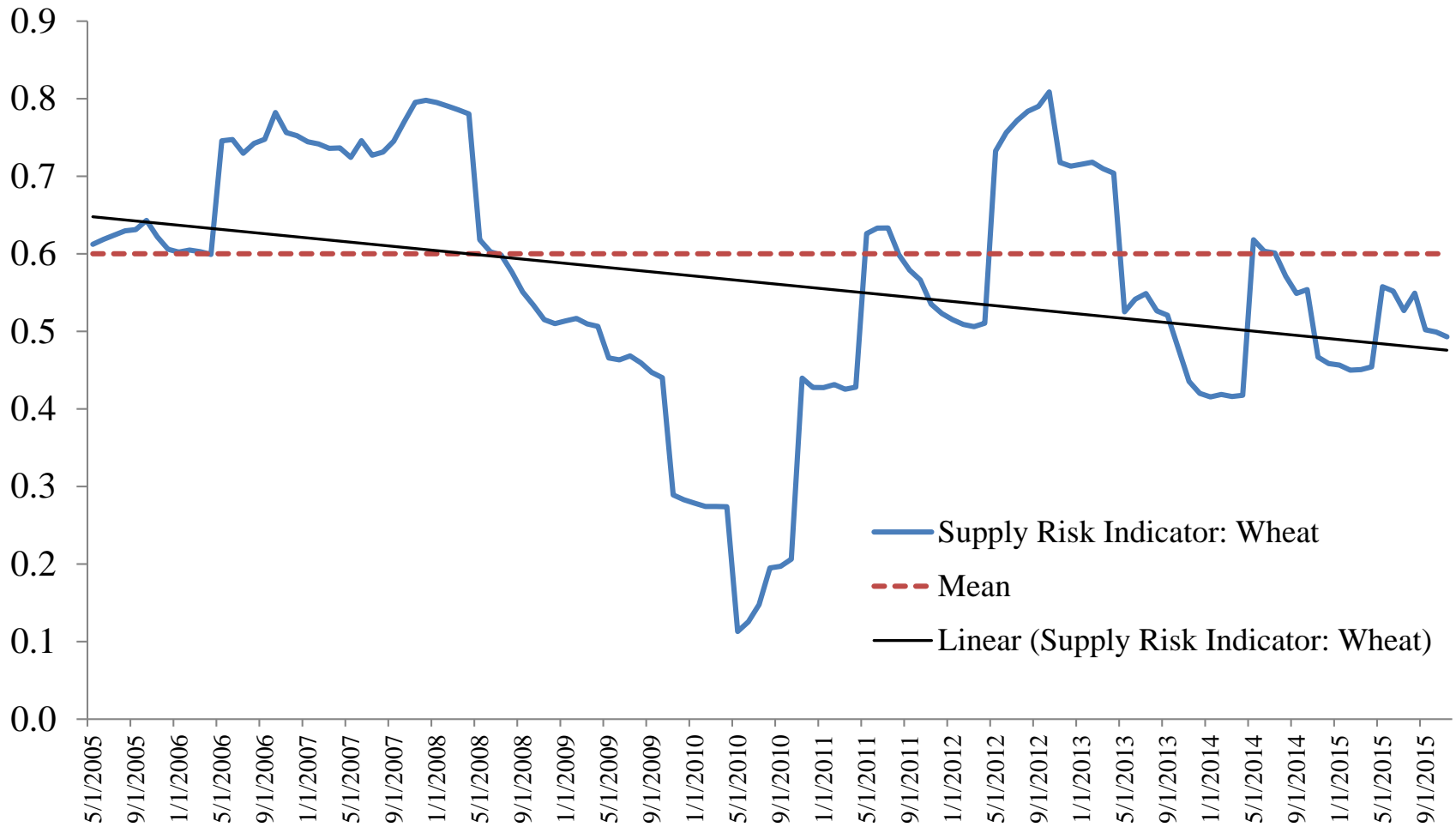
Data

- $E_t \ln[\Delta x_t]$ (= *Supply per capita*) =
$$\ln \left[\frac{SS_{forecast}(t)}{SS_{estimate}(t-1)} \right] - (PoPgrowth_{(t)})$$
- $E_t \ln[\Delta y_t]$ (= *GDP per capita*) =
$$GDPgrowth_{(t)} - PoPgrowth_{(t)}$$
- **Sources**
 - USDA monthly Production forecasts
 - Supply = production + Beginning stock
 - Bi-annual (spring and fall) GDP predictions from IMF
 - “Mid-year population growth” from the US census bureau

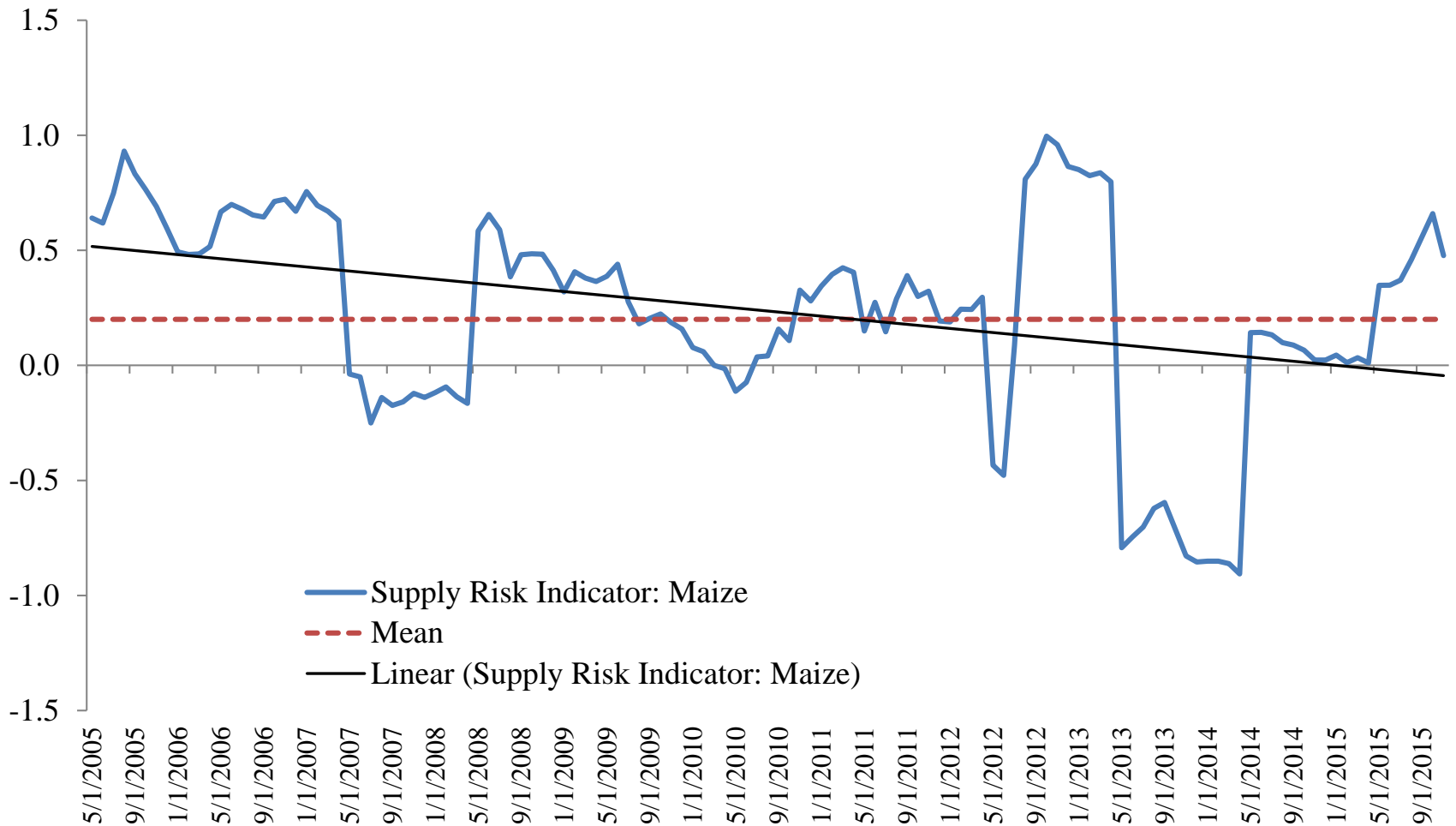
Estimated Parameters

	Parameters	Maize	Wheat	Soybean
Supply/capita	α	-2.72	-0.48	-0.92
GDP/capita	β	2.52	3.54	1.13
SD of prices	σ	0.21	0.18	0.14

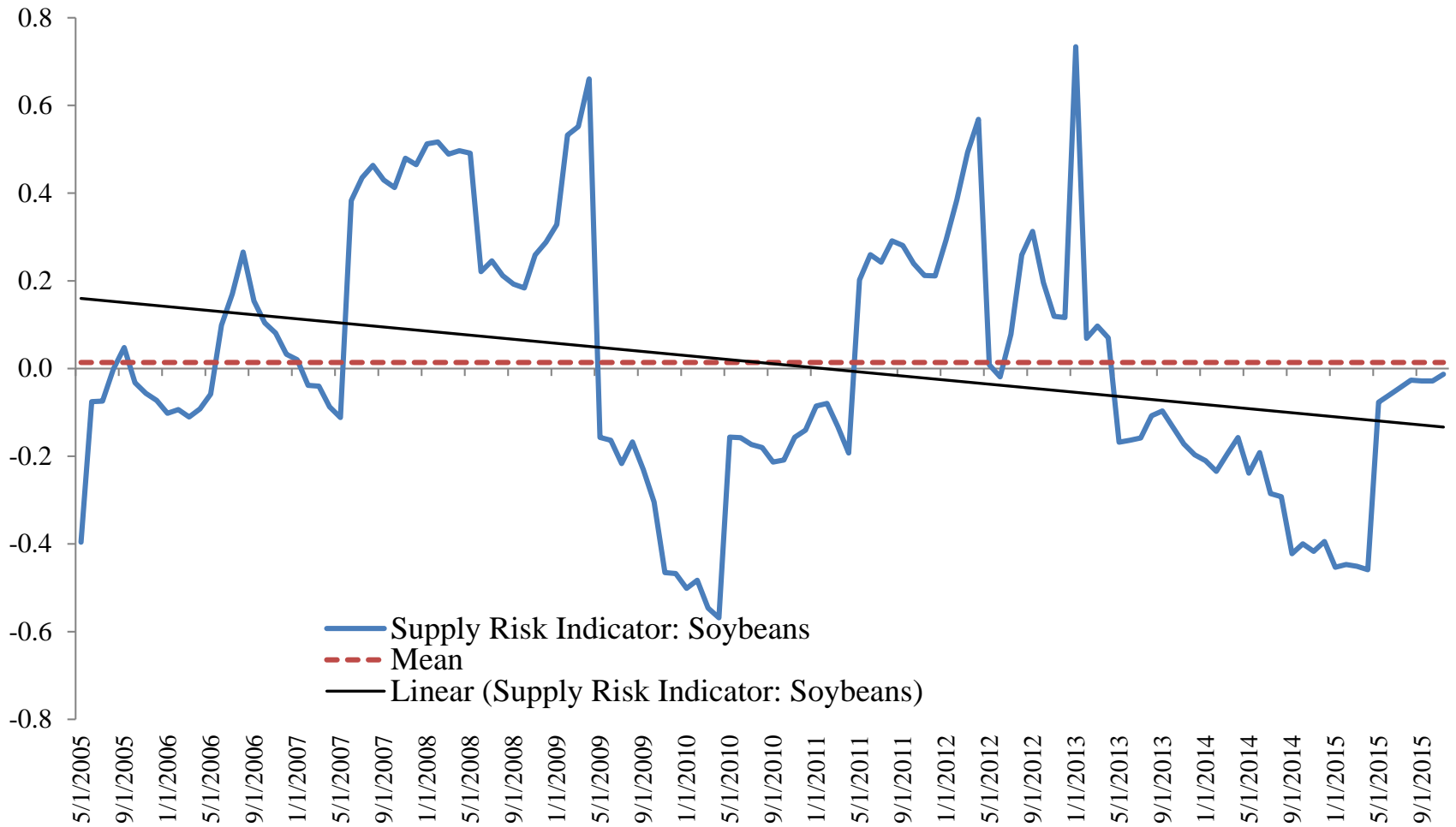
Risk Indicator: Wheat



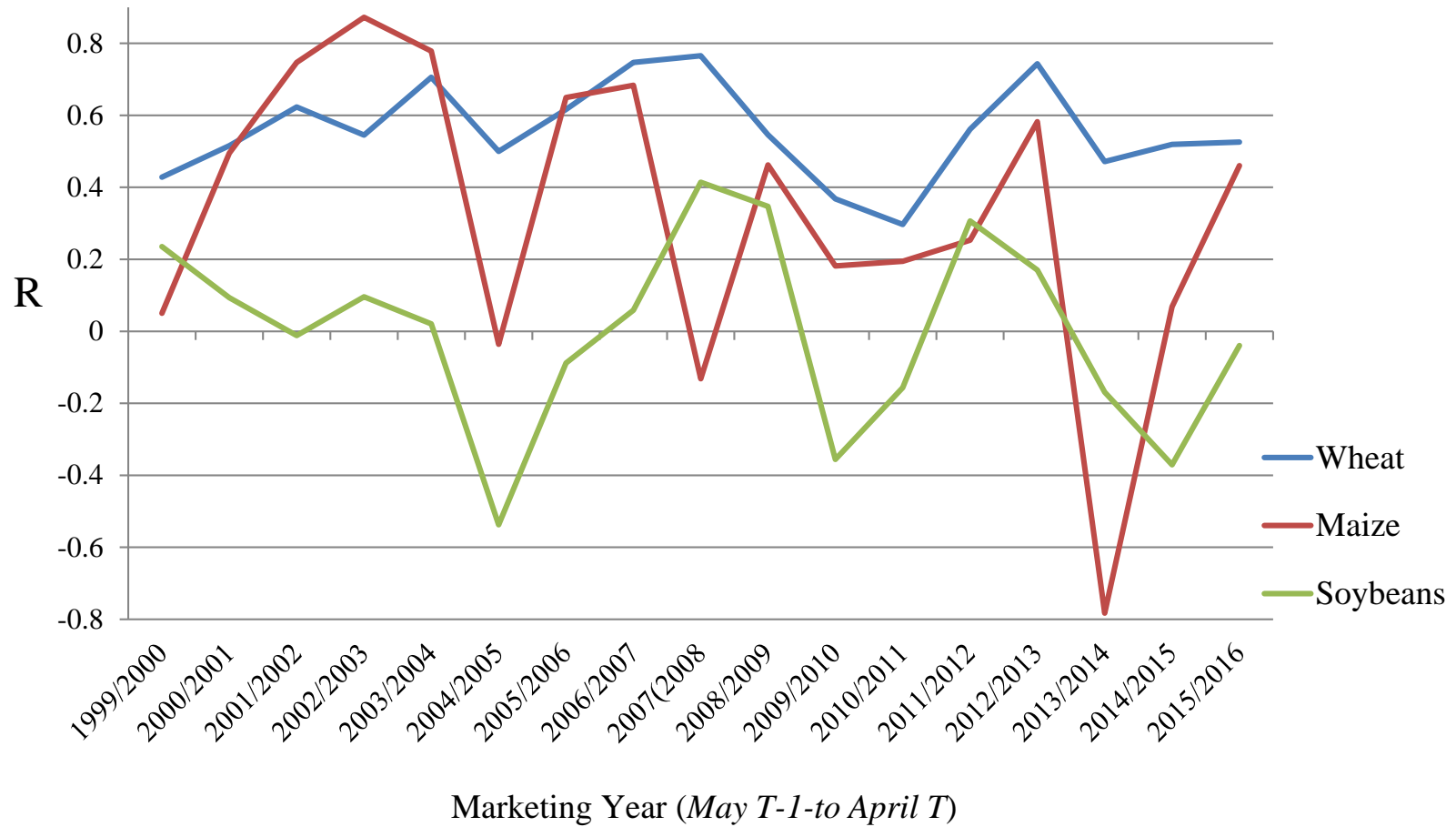
Risk Indicator: Maize



Risk Indicator: Soybeans



Annualized Supply Risk Indicator



Outlook

- Country level risk indicators
 - Trade, and national supply and demand forecasts
- Own production forecasts