

# Transmission of world food prices to African markets

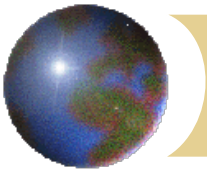
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on 31 Jan – 1 Feb 2013  
at the Center for Development Research (ZEF), University of Bonn.

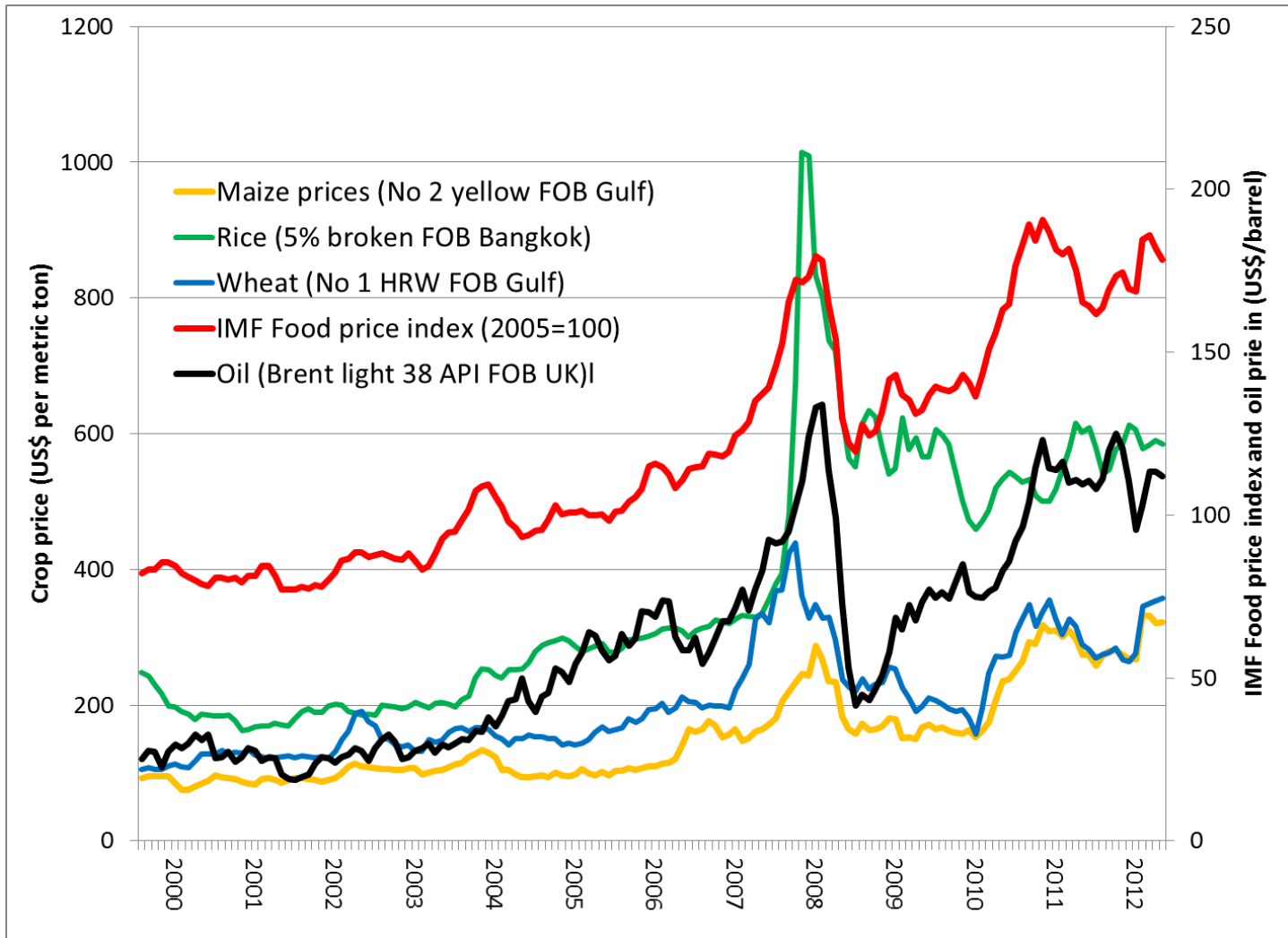


# Outline

- ⊕ Motivation
- ⊕ Previous research
- ⊕ Price trends in 2007-2008
- ⊕ Statistical analysis of price trends
- ⊕ Discussion of results



# Motiviation





# Motivation

- ⊕ If world price shocks are transmitted, then impact of global food crisis of 2007-08 more worrisome
- ⊕ If world price shocks are not transmitted, then Africa is (at least partially) insulated from food price shocks



# Previous research

- ✦ Mundlak and Larson (1992)
  - ❖ International-local price transmission for 58 countries
  - ❖ Very high transmission, median elasticity 0.95
  - ❖ But statistical problem (non-stationarity)
- ✦ Quiroz and Soto (1996)
  - ❖ Similar data but 78 countries
  - ❖ Better statistical method (error correction model)
  - ❖ No long-run relationship (LRR) for 30 of 78 countries
  - ❖ No LRR for 7 of 16 African countries
- ✦ Conforti (2004)
  - ❖ Price transmission for 16 countries
  - ❖ Ethiopia: LRR for 4 of 7 commodities
  - ❖ Ghana: no LRR for maize and sorghum
  - ❖ Senegal: LRR for rice but not maize



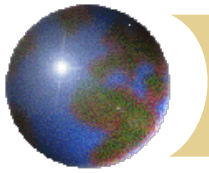
# Description of trends

## ✦ Data

- ✦ 83 prices
- ✦ Maize, rice, wheat, beans, sorghum, and teff
- ✦ Cameroon, Ethiopia, Ghana, Kenya, Malawi, Mali, Mozambique, Senegal, South Africa, Tanzania, Uganda, and Zambia
- ✦ Source: FAO GIEWS

## ✦ Method

- ✦ Calculate ratio of % increase in domestic price increase over the % increase in world price over June 2007 to June 2008
- ✦ Example: If domestic price of maize rises 40% and world maize price rises 80%, then ratio is 50%



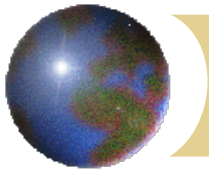
# Statistical analysis: Data & methods

## ✚ Data sources

- ✚ International prices: FAO  
(<http://www.fao.org/es/esc/prices/PricesServlet.jsp?lang=en>)
- ✚ Domestic prices: FEWS-NET and others
- ✚ Monthly price data for nine sub-Saharan African countries
- ✚ 62 price series (commodity-market combinations)
- ✚ 5-10 years of monthly data, usually including 2008

## ✚ Methods

- ✚ Convert domestic prices to real US\$ prices
- ✚ Test for stationarity using ADF test
- ✚ Test for cointegration (long-run relationship) using Johansen test
- ✚ If long-run relationship, use error correction model



# Statistical analysis: Methods

## Methods – Vector error correction model (VECM)

$$\Delta p_t^d = \alpha + \rho (p_{t-1}^d - \beta p_{t-1}^w) + \delta \Delta p_{t-1}^w + \theta \Delta p_{t-1}^d + \varepsilon_t$$

Change in domestic price

Error correction term (speed of adjustment)

Long-run relationship

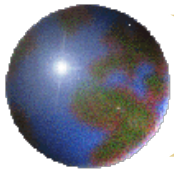
Long-run elasticity of transmission

Short-run elasticity of transmission

Lagged change in world price

Lagged change in domestic price

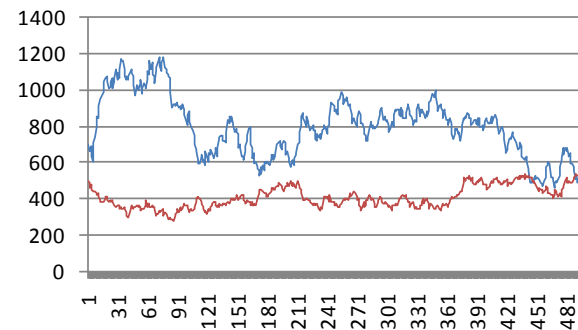
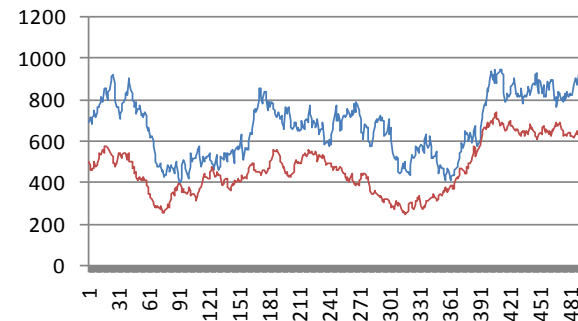
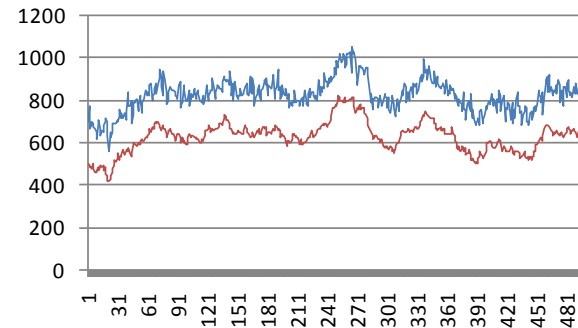


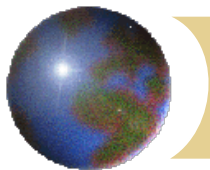


# Statistical analysis: Methods

## Illustration

- ☉ Cointegrated prices with rapid adjustment toward long-term relationship
- ☉ Cointegrated prices with slow adjustment toward long-term relationship
- ☉ No cointegration relationship



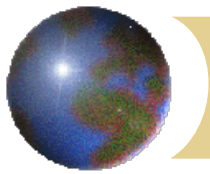


# Statistical analysis: Summary results

By country:

- Percentage of price showing transmission from world to domestic markets
- Higher transmission in Tanzania, Mozambique, & Malawi
- Lower transmission in Ghana and Zambia
- No higher in coastal countries

	Prices with relationship	Total nbr. of prices	Percentage
Ethiopia	1	3	33%
Ghana	1	7	14%
Kenya	0	2	0%
Malawi	3	8	38%
Mozambique	4	11	36%
South Africa	0	4	0%
Tanzania	4	16	25%
Uganda	0	2	0%
Zambia	0	9	0%
Total	13	62	21%



# Statistical analysis: Summary results

By commodity:

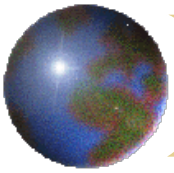
- ✦ Transmission highest for rice
- ✦ Lower for maize and sorghum

	Prices with relationship	Total nbr. of prices	Percen- tage
Maize	4	40	10%
Rice	8	17	47%
Sorghum	1	4	25%
Wheat	0	1	0%
Total	13	62	21%

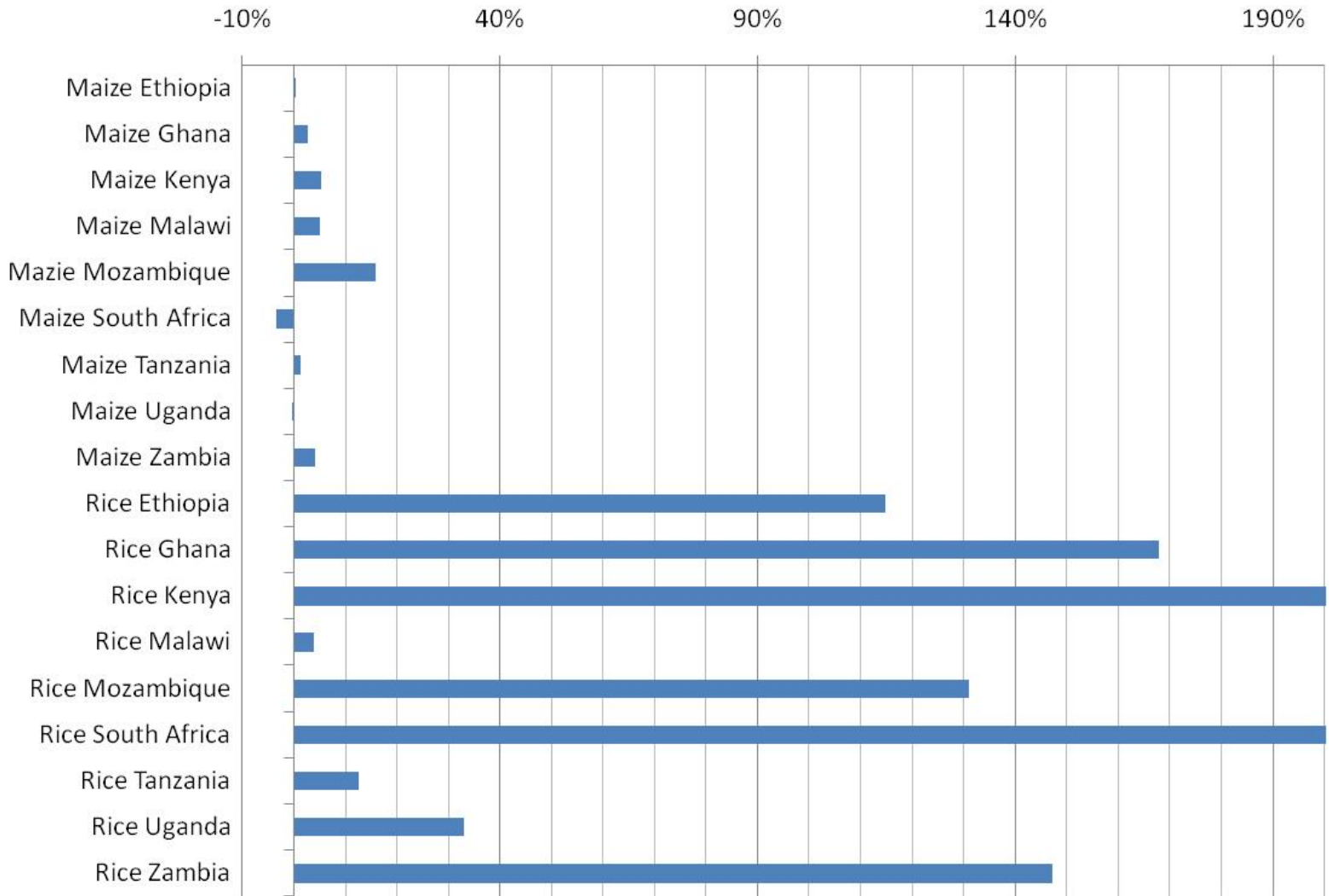


# Discussion

- ⊕ Reasons for lack of price transmission in maize
  - ❖ Most African countries are self-sufficient in maize
  - ❖ Domestic price falls between export parity and import parity
  - ❖ Even efficient markets will not show price transmission in this situation
  - ❖ Intervention in maize markets also reduces transmission
    - Kenya supports price, Tanzania bans exports, Malawi and Zambia have large state trading enterprises that intervene in maize markets
  
- ⊕ Reasons for higher price transmission in rice
  - ❖ Almost all African countries rely on rice imports
  - ❖ Imports are usually more than half of domestic consumption



### Net imports of maize and rice as a percentage of production

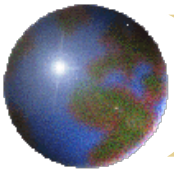




# Discussion

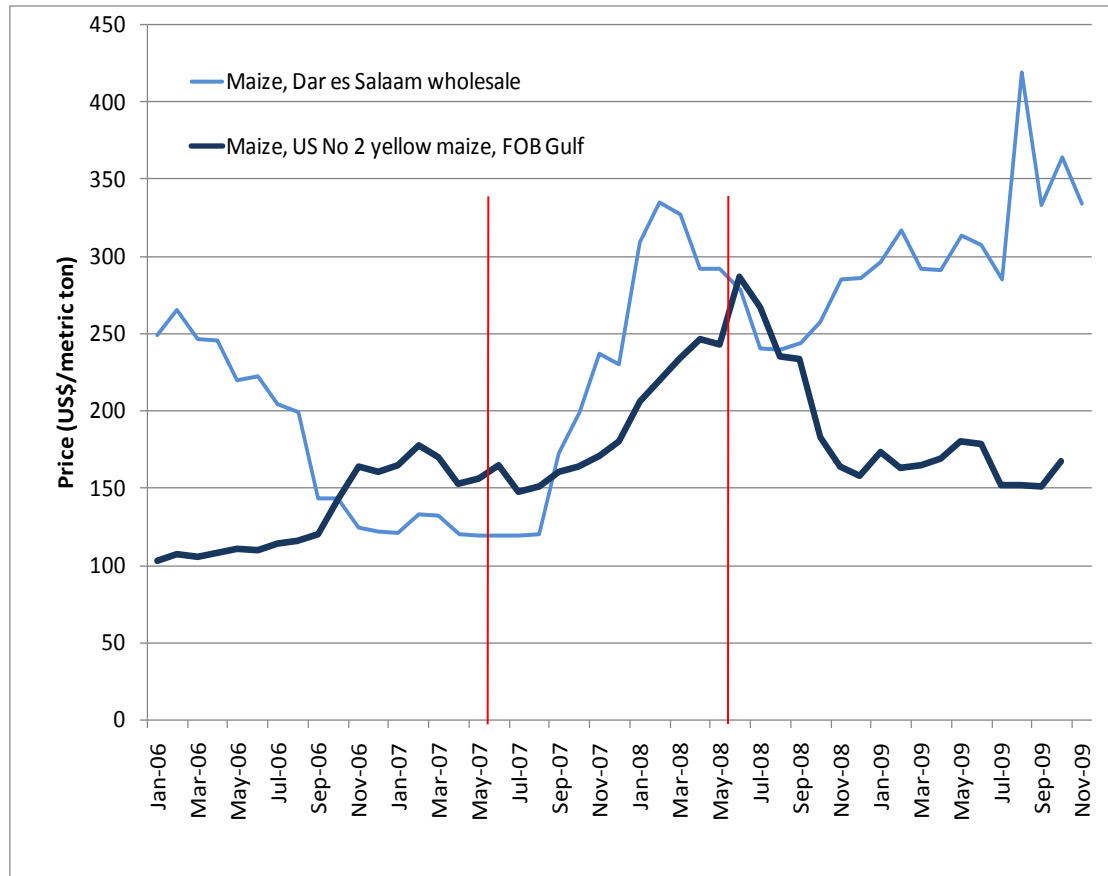
## ✦ Conflicting results:

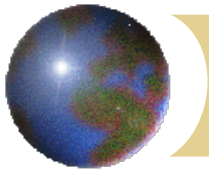
- ✦ Trends show sharp increases in food prices (including maize)
  - Price of maize, rice, and wheat increase more than 60% between June 2007 and June 2008
  - Percentage increase in maize and wheat price larger than percentage increase in world price
  
- ✦ ... but statistical analysis shows weak relationship between world and domestic prices (particularly in maize)
  - 47% of African rice markets statistically linked to world markets
  - 10% of African maize markets statistically linked to world markets



# Discussion

## ✚ Conflicting results – Example of maize in Tanzania



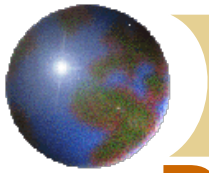


# Discussion

## ⊕ Most likely explanation

- ❖ Increase in rice and wheat prices caused by higher world prices
- ❖ Increase in maize prices not due to higher world maize prices
- ❖ Rather price of maize and non-tradable commodities rose due to:
  - Substitution effects with rice & wheat
  - Oil price increase which raised cost of transport
  - Grain export bans by Ethiopia, Tanzania, Zambia, and Malawi, among others
  - Local events such as post-election violence in Kenya and rationing of foreign currency in Ethiopia





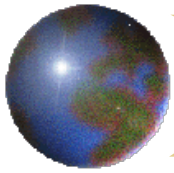
# Price volatility - Data and methods

- Sources of price data
  - IMF for world price of maize, rice, and wheat
  - FEWS-NET for 67 food prices in 11 African countries: Chad, Kenya, Malawi, Mali, Mauritania, Mozambique, Niger, Rwanda, Tanzania, Uganda, and Zambia.
- Measuring volatility
  - Standard definition is the standard deviation in “returns” (percentage changes in price from one period to next)

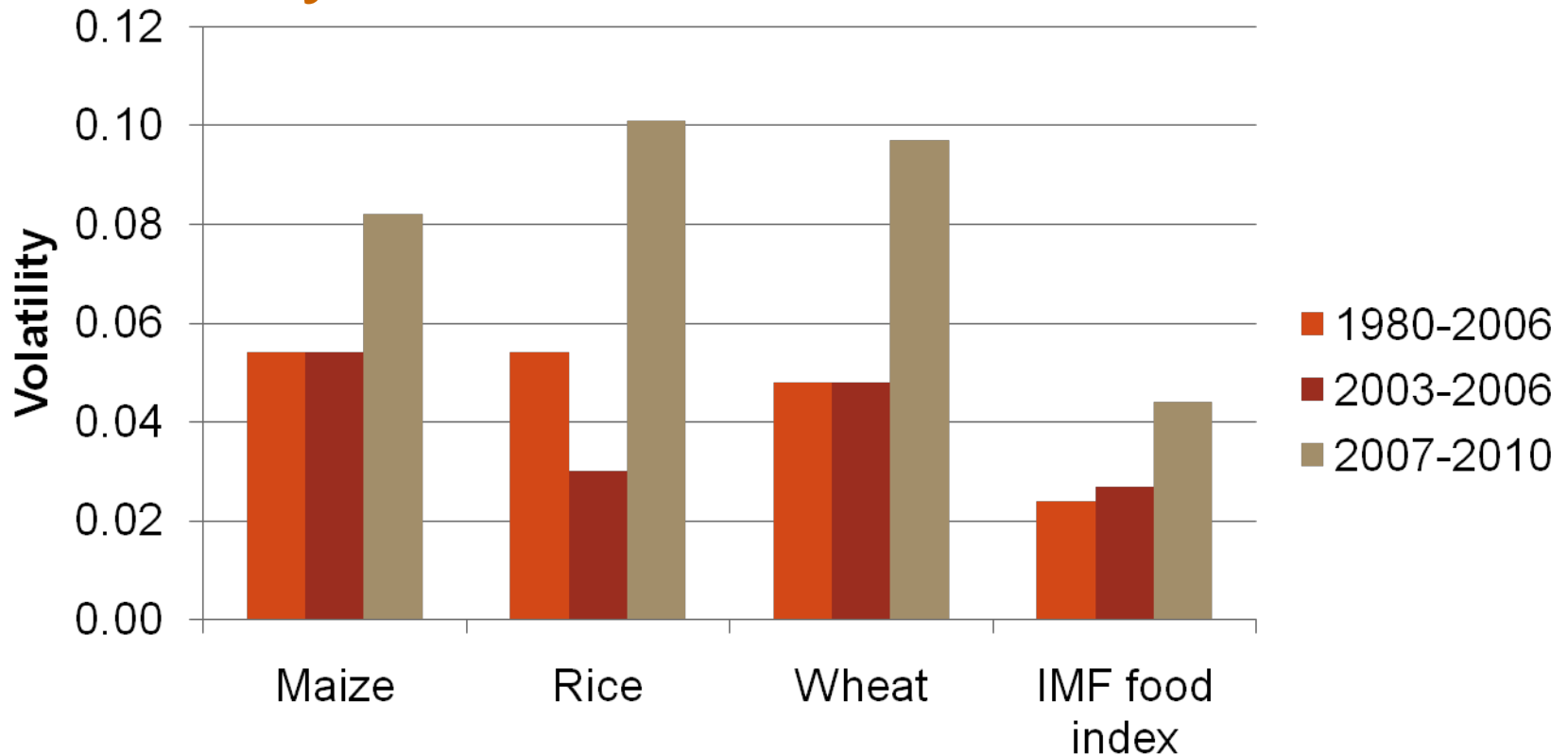
$$\text{Volatility} = \text{stdev}(r) = \left[ \sum \frac{1}{N-1} (r_t - \bar{r})^2 \right]^{0.5}$$

$$\text{where } r_t = \ln(p_t) - \ln(p_{t-1})$$

$$\bar{r} = \sum \frac{1}{N} r_t$$



# Volatility in international markets

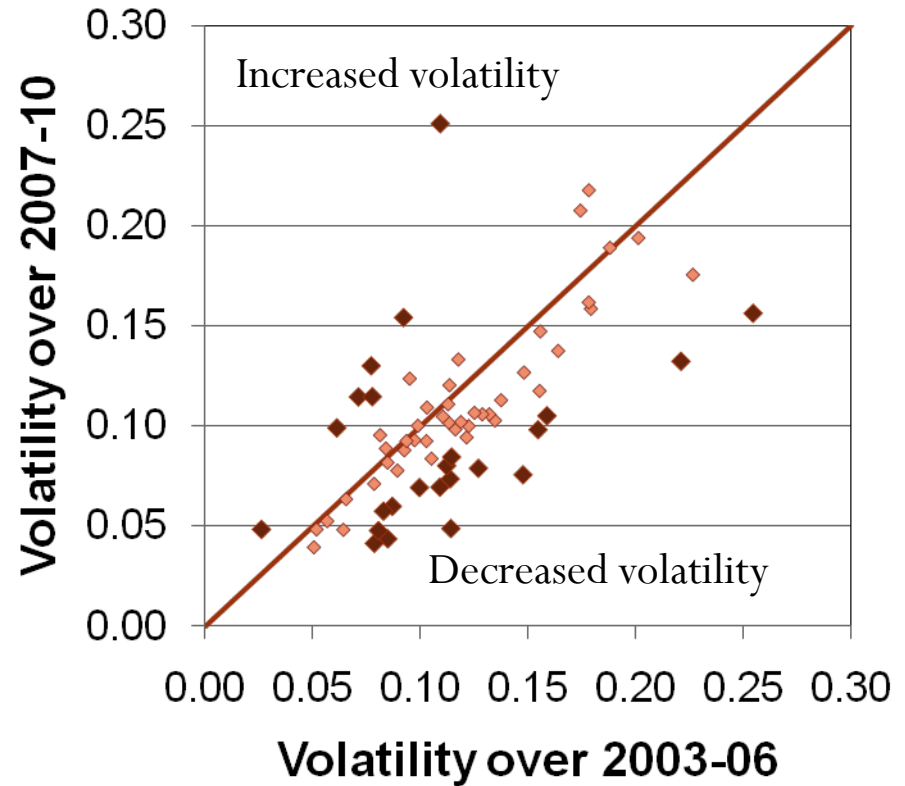


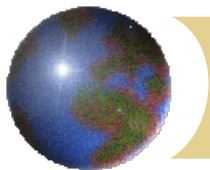
- ✪ Volatility in world prices increased in 2007-2010 compared to previous three years (2003-06) and compared to previous 26 years (1980-2006)
- ✪ Increases are statistically significant at 1% level in all cases



# Trends in price volatility in Africa

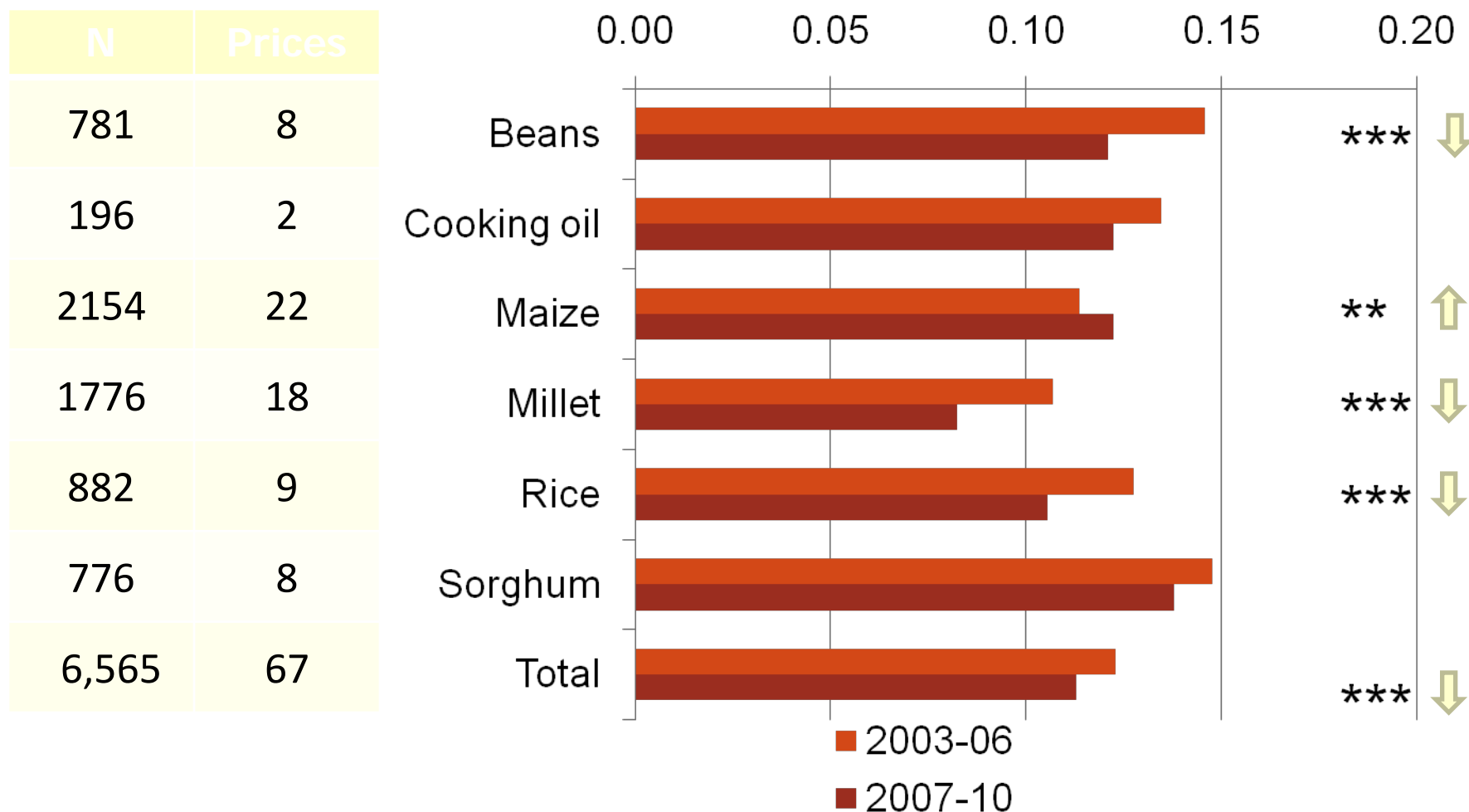
- ⊕ Compared volatility of 67 food prices in 2003-06 and 2007-10
- ⊕ Dark points represent statistically significant change ( $p < 0.05$ )
- ⊕ 7 prices had significant increase in volatility
- ⊕ 17 prices had significant decrease in volatility
- ⊕ Overall decrease in volatility
  - ⊞ Small ( $0.123 \rightarrow 0.113$ ) but statistically significant ( $p < .01$ )





# Trends in price volatility in Africa

## Change in volatility by product

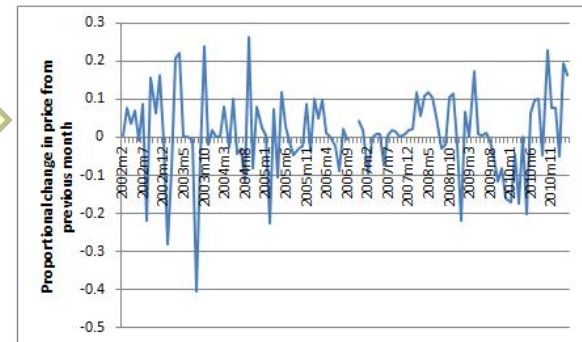
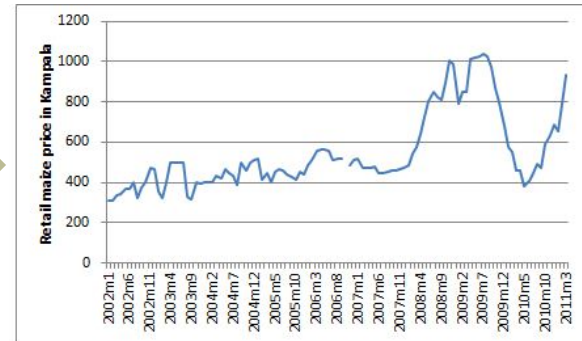


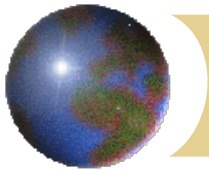


# Trends in price volatility in Africa

Does our perception of volatility match the standard measure of volatility?

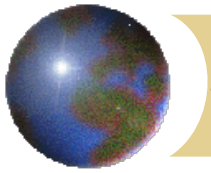
- Kampala maize prices rose dramatically in 2008-09, fell sharply, then rose again in 2010
- But percentage changes each month were similar to before
- Slight *decline* in standard measure of volatility





# Conclusions

- ✦ Food price volatility in international markets is lower than in African markets
- ✦ International food price volatility has increased since global food crisis of 2007-08
- ✦ For 67 African food prices tested, price volatility has not increased since 2007
- ✦ Possible explanations
  - ❖ Conventional wisdom is wrong?
  - ❖ Eleven countries are not representative
  - ❖ Measure of volatility does not accurately reflected intuitive idea



Thank you

**Comments and suggestions welcome:**

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