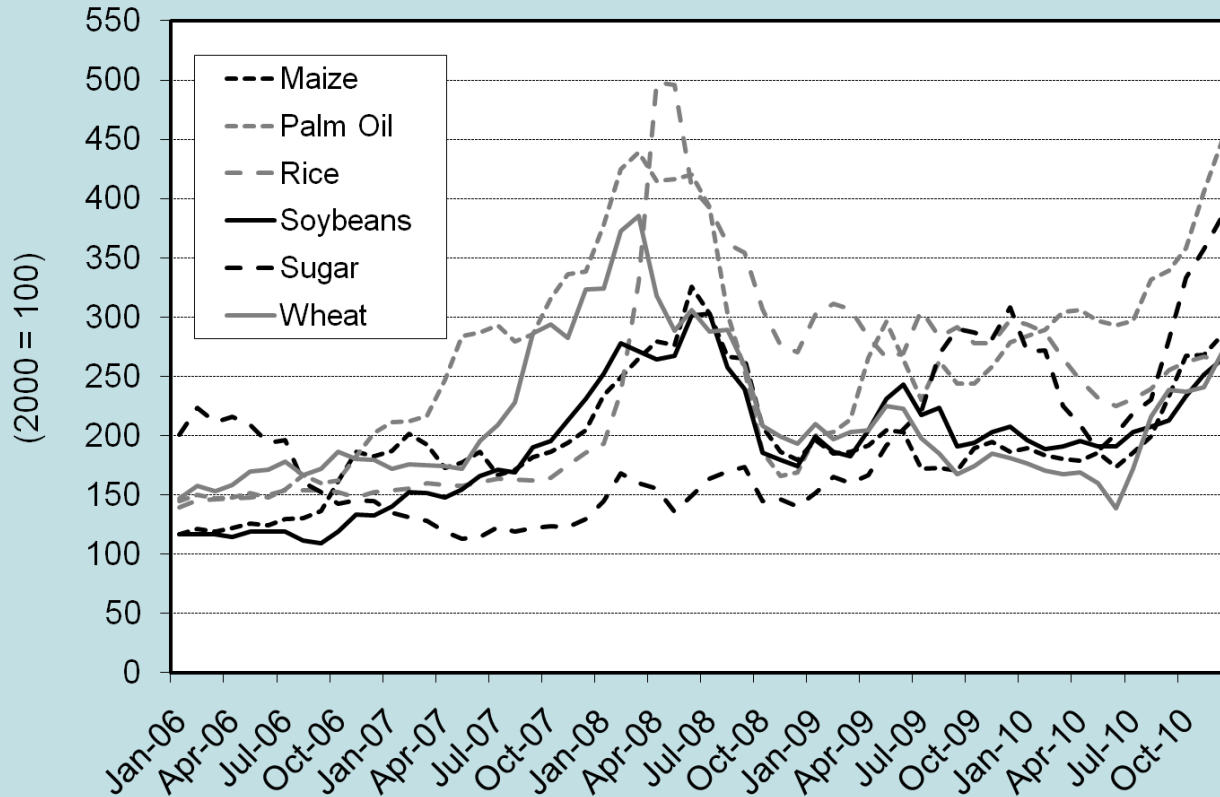


# **Food Prices and Food Price Volatility to 2020**

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# High food prices



Food prices surged on international markets in 2007-08 dropping back from the summer. Sugar remained flat. Prices rose again in 2010 with sugar and vegetable oils leading.

# Drivers of high food prices

- In my *J.Ag.Econ* 2010 paper I argued that common movements across the entire range of food prices are most likely caused by demand shocks, largely common across crops, and not by supply shocks, which tend to be crop-idiosyncratic.
- There are three main demand-side drivers of high food prices:
  1. Rapid growth in China and other emerging markets has driven up soybean prices. Because both wheat and corn land in north America can also produce soybeans, this has pushed up all grains prices.
  2. Biofuel demand has pushed up the demand for corn (maize) and vegetable oils (principally rape and palm oil).
  3. Futures market factors, in particular the growth of index-based investment, appear to have been important in 2007-08. Their role in 2010-11 is less clear.

# Granger causality tests

- The Granger-causality methodology can establish the proximate causes of changes in food prices.

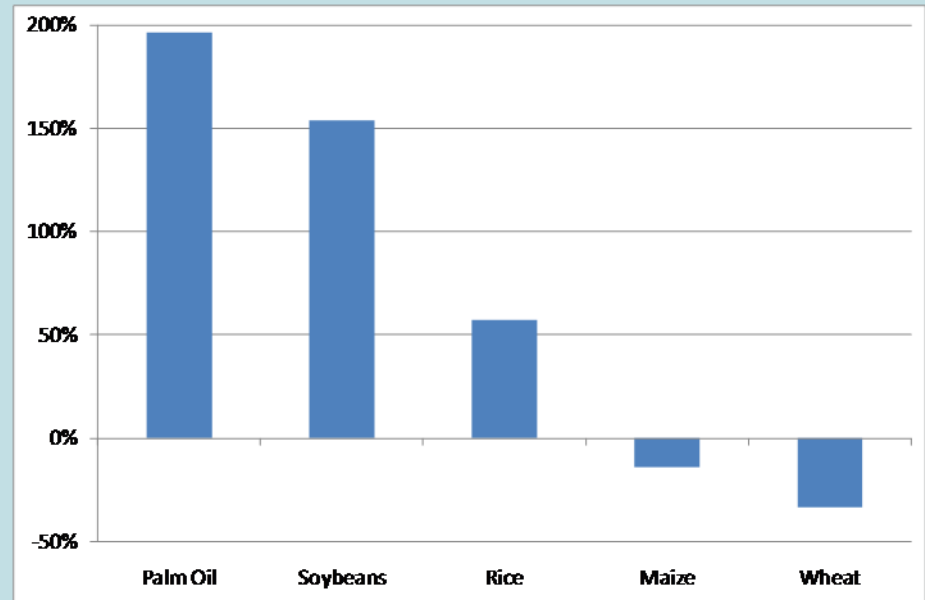
- I use the monthly sample March 2000 – December 2010 and look at changes in the IMF food price index.

- The tests show that both changes in OECD and Chinese economic activity (in both cases measured by the OECD composite trend restored leading indicator) Granger-cause changes in food prices but that when both indicators are considered, the Chinese indicator is dominant.

Granger causality tests for change in food prices			
	Bivariate		Trivariate
China	2.64	-	1.86
OECD	-	1.88	0.40

# Why is China so important for food prices?

- China has seen large increases in imports of palm oil and soybeans. The chart shows the increase in average 2007-08 imports over average 2000-2002 imports.
- Farmers can substitute land from both maize and wheat into soybeans. The rise in soybeans production may have driven up all grains prices; the rise in palm oil imports may have driven up all vegetable oil prices.



In the final analysis, China is the dominant factor. China drives up crude oil prices and this makes biofuels attractive. Index-based futures investment is a way of profiting from Chinese growth.

# Towards 2020

- China: It is unclear whether growth is limited on the supply or the demand side. My guess is that growth will slow from recent high 8%-10% levels
  - a) on the demand side, export markets are becoming saturated,
  - b) on the supply side, organizational and managerial problems will become more important as the economy becomes more sophisticated. Nevertheless, growth will remain fast. Growth in the other BRICS is more problematic.
- Oil supplies are likely to remain tight and OPEC's market share is likely to rise. I do not see any prospect of low oil prices before 2020. Biofuels demand will therefore remain important.
- Overall, I expect demand for food commodities, along with that for other commodities to remain strong over the next decade.
- The price outlook depends on whether supply can catch up with increased demand. Without substantial additional investment in agriculture, this looks unlikely. Prices are therefore likely to remain high, although poor Eurozone governance may knock them back temporarily in 2011-12.

# Food price volatility

The extent of price volatility depends upon

- a) the variability of supply and demand
  - b) the slopes of the supply and demand curves.
- It is easy to show that the price variance depends on the sum of the variances of the supply and demand shocks divided by the sum of the demand and supply elasticities.
  - It follows that price volatility will increase if either production or consumption become more variable; stock demand becomes more variable; or demand or supply become less price elastic.
  - Periods of high volatility cluster – this makes it difficult to distinguish between cyclical and secular volatility changes.

# Possible drivers of recent volatility changes

1. Global warming may result in more variable weather conditions increasing the variance of supply shocks – this is possible but currently available evidence is anecdotal rather than systematic.
2. Inventory levels have become lower, particularly in grains where governments have been encouraged to rely in trade rather than food reserves. Low stocks reduce supply elasticities in periods of shortage.
3. The use of grains, vegetable oils and sugar as biofuel feedstocks may increase the linkage between food prices and the oil price resulting in import of oil price volatility into food prices – an effective increase in the variance of demand shocks.
4. Some governments, particularly in Asia, are putting greater effort into insulating their economies from external price shocks. This can impose a greater adjustment burden on the rest of the world (reduced supply and demand elasticities in the world market).
5. Standard finance theory suggests that futures market activity should result in decreased volatility. The evidence is more mixed.



# Food price volatility 1970-2010

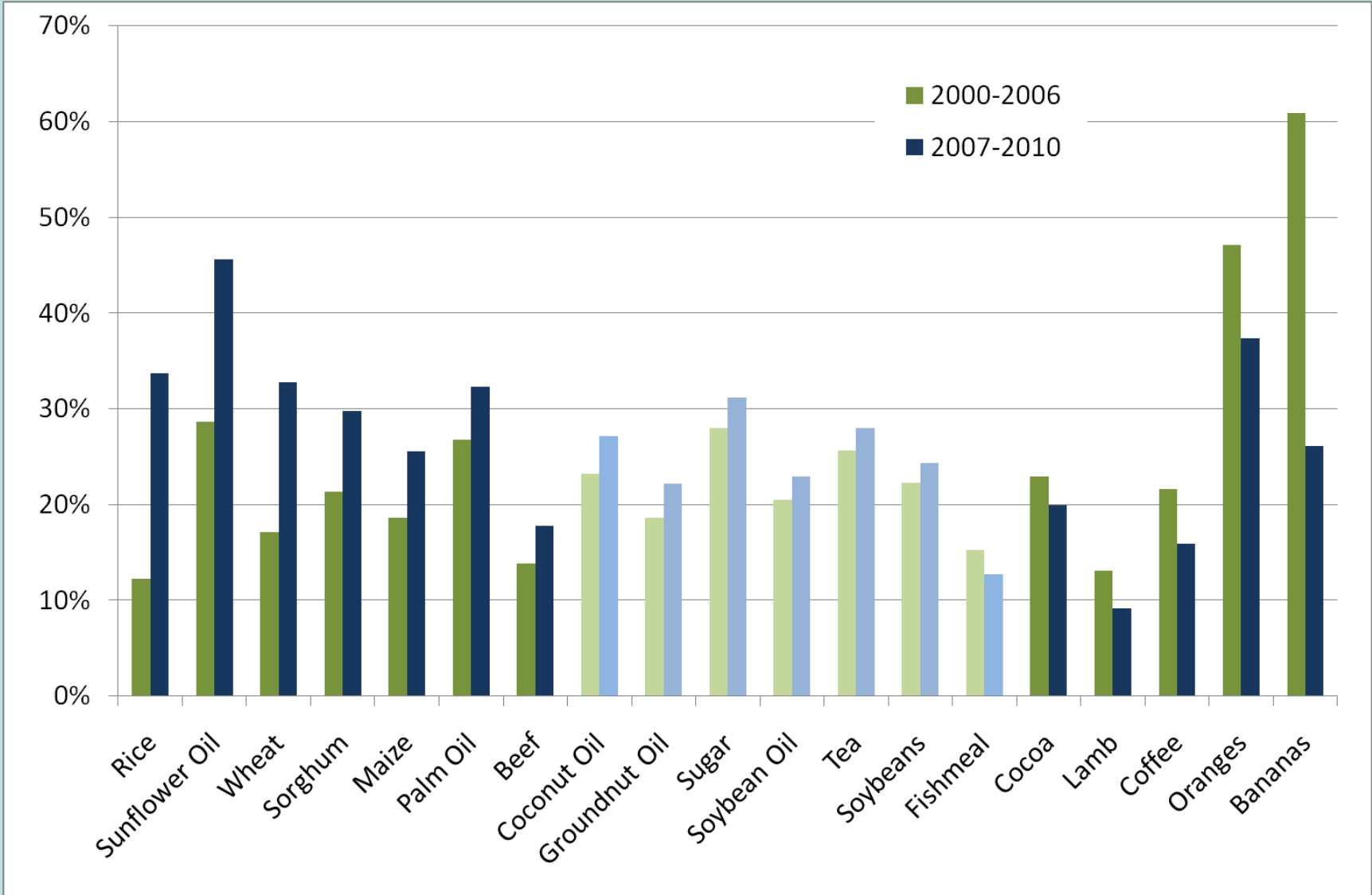
In our *Phil. Trans. Roy. Soc. B* (2010) paper, Wyn Morgan and I looked at the historical volatility of monthly average prices, as reported by the IMF, deflated by the US PPI, from 1970 to the present.

We considered 19 food and beverage commodities:

- “Tropicals”: cocoa, coffee, tea and sugar.
- Grains: wheat, rice, maize (corn), sorghum, soybeans
- Vegetable Oils: coconut, soybean, groundnut, palm and sunflower oils
- Meats and fish: beef, lamb, fishmeal.
- Fruit: oranges, bananas.
- Updating to end 2010 and comparing volatility in 1970-89 with 1990-2010: only bananas, rice and wheat show a statistically significant volatility increase (at the 5% level) while nine out of the 19 food commodities showed statistically significant volatility decreases.
- But rice and wheat are the important exceptions.

# Recent changes in food price volatility

- It is arguable that this last comparison may to a large extent be driven by the experience of the 1970s, when volatility was acute, and that the high volatility levels experienced in 2007-09 is out of line with the experience of the more recent past even if not relative to the 1970s.
- Here I compare volatilities over the four years 2007-10 with those at the start of the decade (2000-06).
- On this shorter comparison, a significant increase in volatility is seen for maize, rice, wheat and sorghum, and also sunflower oil, palm oil and beef. Significant decreases are seen for cocoa, coffee, lamb, oranges and bananas.
- Increased volatility is associated with biofuel feedstock foods.



# Towards 2020

- Fast or relatively fast Chinese growth plus inadequate agricultural investment will keep food markets tight over the coming decade. The resulting low stock levels will imply that small shocks can have large price impacts.
- I conjecture that the biofuels link is crucial in generating food price volatility, largely by importing oil price volatility into food markets. If so, this is unlikely to go away before 2020.
- Index investment has increased cross-market correlations as investors buy and sell the index baskets. This also imports energy and metals price volatilities into food prices. It also seems unlikely to go away.