

Reviewing the similarities of the 2007-08 and 1972-74 food crisis

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Abstract

Comparing the recent food crisis in 2007-08 with the one from 1972-74, this paper reveals how similar both periods were in terms of duration and extent of severity. By overlaying and correlating price data of wheat, corn and rice for the two periods, results show that these selected commodities had very similar trajectories in terms of sudden price acceleration and shape of increase and decrease. Reasons for these sudden price surges are concluded to be primarily attributed to fundamental values, such as poor harvests, low levels of stocks and distorted global agricultural trade. Despite widespread criticism against the involvement of commodity index traders in agricultural markets during the 2007-08 food crisis, this paper does not find sufficient empirical evidence that would attribute a decisive role to potential speculation activities in driving-up commodity prices. Finally, this paper provides suggestions how sudden increases of agricultural commodity prices could be alleviated in the future based on the concept of resilience.

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1. Introduction

The recent food crisis, marked by surging prices of various agricultural commodities in 2008, is often attributed to rising oil prices and speculation activities in the financial markets (Wahl, 2008, Robles et al., 2009). In an attempt to compare past periods of similar price hikes of agricultural commodities, such as wheat, corn, etc., this paper draws particular attention to the 1972-1974 food crisis which was characterised by similar features compared to the period in 2007-08.

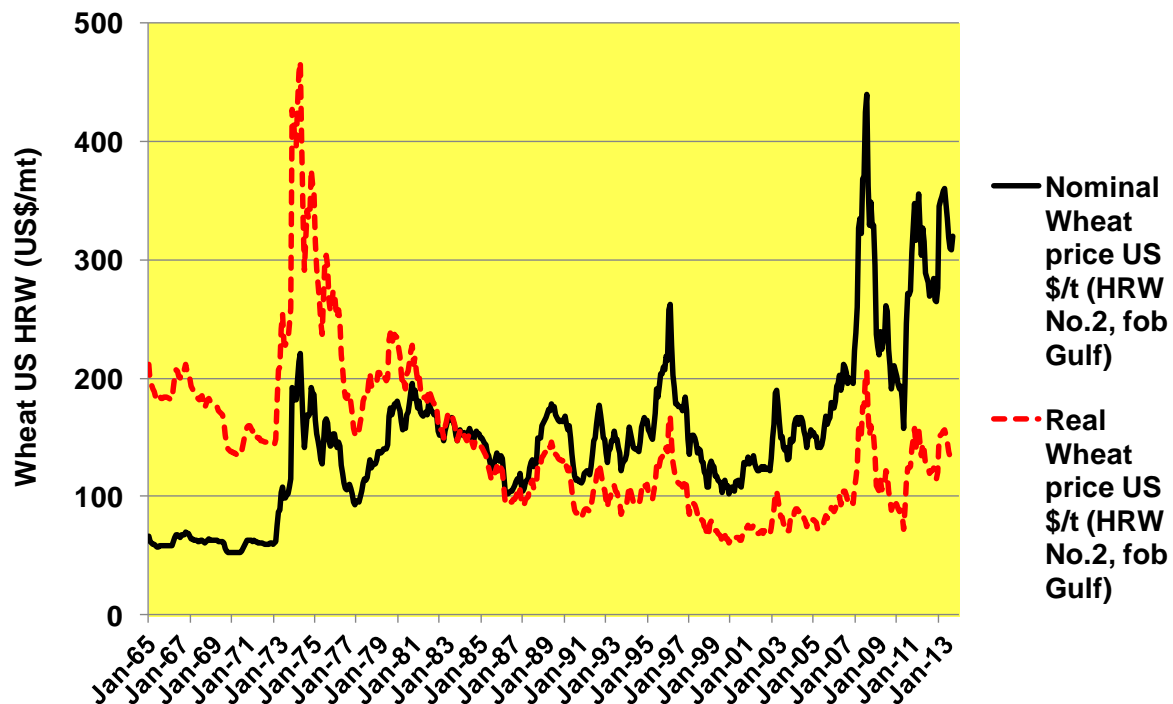


Figure 1: Nominal and real wheat price (USD) 1965-2013 (Source: The World Bank)

Figure 1 shows that, in the case of wheat, the 1972-74 food crisis was much more severe in real terms compared to the most recent one which lasted from 2007-08. Thereby, developing countries with weak economies were highly vulnerable and suffered from sudden price increases of some of the most basic commodities, such as wheat, corn, rice or oil. This resulted in food supply shortages and civil unrest in developing countries, particularly in those which had little or no protection to dampen unforeseen price changes of agricultural commodities (FAO, 2009).

In this article, the objective is to review what were the actual triggers which led commodity prices increase and furthermore, why did the shape of the graphs of futures prices of wheat, corn, and rice resemble each other (figures 2-4) during both food crises? Based on descriptive analysis of available literature, this article summarises key findings about the root causes of both food crises. Thereby, Masters (2008, 2009) argues that speculators were responsible for the sudden price increases. According to him, exchange traded funds and speculative investments into newly available index-funds provided tools that allowed non-traditional investors, so-called Commodity Index Traders (CIT), to become active in an influential manner at stock exchanges. In contrast, major opponents of Masters' explanations about the origins and reasons of the past food crisis, are Glauben et al. (2012) and Irwin (2013) who argue that speculation had a low impact on the price increases of agricultural commodities. Instead, they explain that disrupted fundamentals were causing prices to suddenly increase. Due to highly controversial positions of various scientists in the field of agricultural economics about whether speculation was part and to what extent recent empirical evidences

confirm the impact of speculation activities, this article concentrates on comparing changing fundamentals witnessed during the food crises from 2007-08 and from 1972-74. As the below figures 2-4 show, the trajectories of nominal prices of major agricultural commodities resembled each other during both food crisis. The similarity of price trajectories of wheat, corn and rice during both food crises indicate that changing fundamentals were responsible for the price increases *since newly available financial products (commodity index funds) did not exist in the early 1970s*.

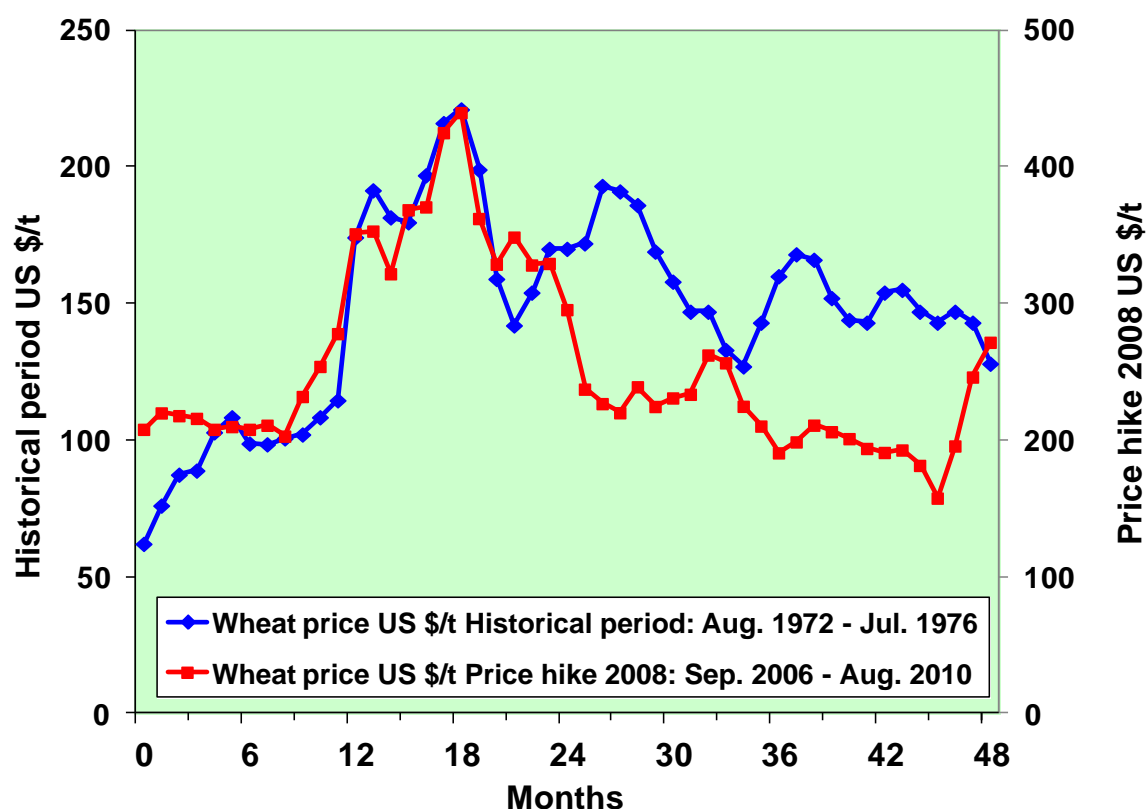


Figure 2: Wheat price (USD) 1972-74 and 2007-08 food crises (Source: The World Bank, 2013)

Figure 2 shows nominal monthly futures price data for wheat for the periods of the two food crises. Thereby, the graphs (applicable to all other graphs in figures 2-4) are calibrated around the culminating point of each food crisis period. This allows to analyse at what speed and how (shape-wise) the price acceleration took place. As shown in the above figure, nominal prices increased within the same speed. During both food crises it took around one year from steady levels to reach the tipping point. Thus, the wheat graphs highlight that the price increased rapidly before it dropped a bit before it again increased and reached the peak. In the aftermath of reaching the tipping point, within the first months a sharp decline of prices took place following a slight upward trend before stabilising again at pre-crisis periods.

Similar findings in terms of resembling trajectories can be found for corn (figure 3) and rice (figure 4). Again, in both cases, price increases were percentage-wise almost the same and the speed and movement of the price increase showed great similarity during both food crises. These facts, therefore, raise certain doubts whether speculation was the actual trigger for the 2007-08 food crisis, as it is commonly attributed to.

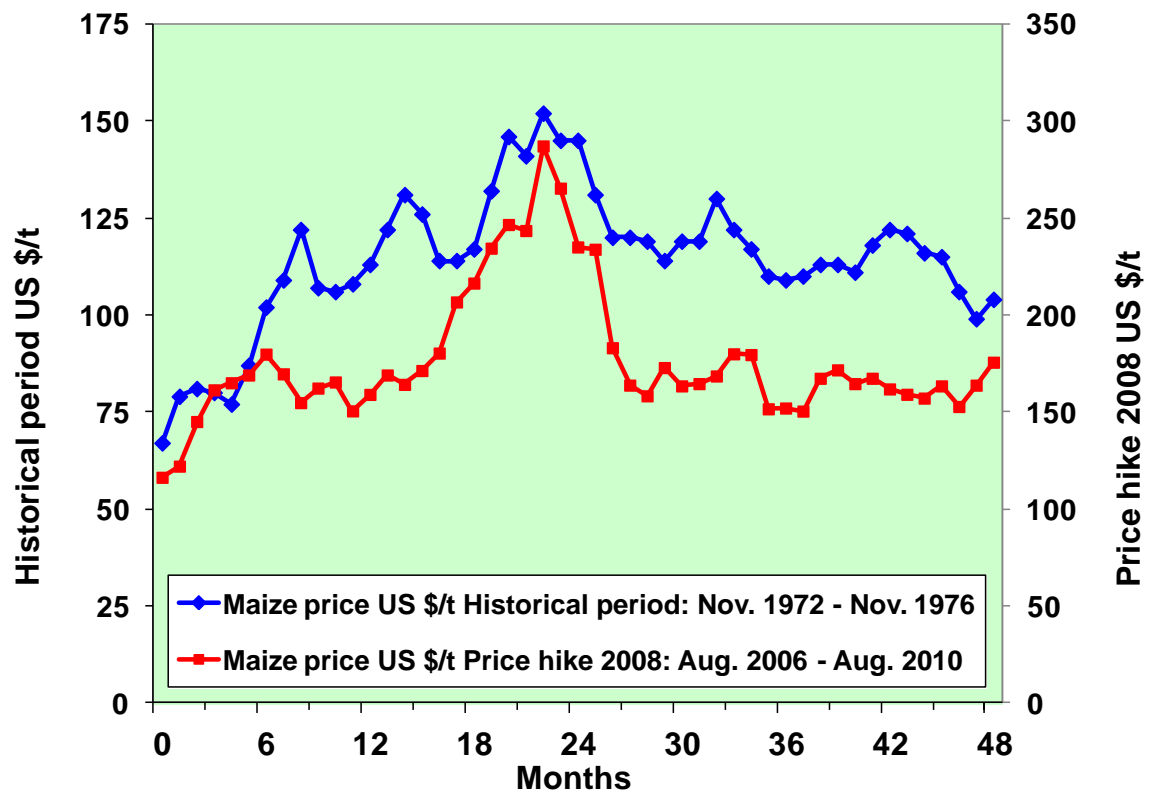


Figure 3: Maize price (USD) 1972-74 and 2007-08 food crises (Source: The World Bank)

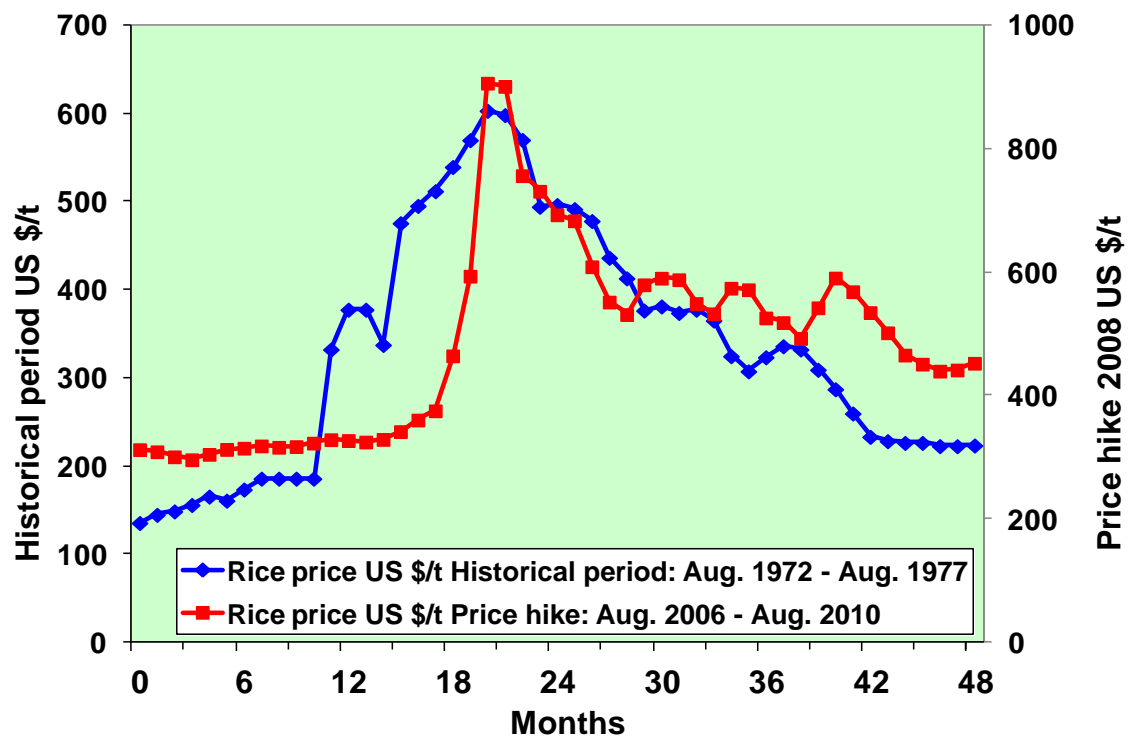


Figure 4: Rice price (USD) 1972-74 and 2007-08 food crises (Source: The World Bank)

Additionally, Irwin et al. (2009, p. 384) points out that rice and fluid milk futures “are not included in popular commodity indices tracked by index funds, but prices in these two markets increased 162% and 37%, respectively, over January 2006-April 2008. Apples for fresh use and edible beans do not have futures markets, and thus no index fund investment, yet prices in these markets increased 58% and 78%, respectively, over the same time interval. If index fund speculation caused a bubble in commodity prices, why then did prices increase substantially in commodity markets without any index fund activity?” In other words, changing fundamentals must have triggered the price increases of the above commodities, as no other reasons would explain why their prices increased.

This article is structured into different parts: firstly, key aspects of the 2007-08 food crisis are summarised for major commodities, such as wheat, corn, soybeans, rice and oil. In this part, the triggers and factors are reviewed which caused this past food crisis which includes issues related to volatility and speculation. Secondly, key aspects of the 1972-74 food crisis are summarised in the same structure as for the 2007-08 food crisis review. Thirdly, key points are discussed and put into the context of further research and ongoing efforts for new policies in response to the past food crisis.

2. The 2007-08 food crisis

2.1 Overview

To begin with the analysis of the 2007-08 food crisis, there is no doubt that it caused severe adverse impacts to households around the globe. Particularly, households with large shares of their income spent for food were most affected. Localising a region of the world which was most hit and affected by the adverse impacts of the past food crisis, it would be Africa. In nominal terms, prices of major agricultural commodities, such as wheat, corn, soy and rice accelerated sharply from the middle of 2007 and nearly doubled within one year (see figure 5).

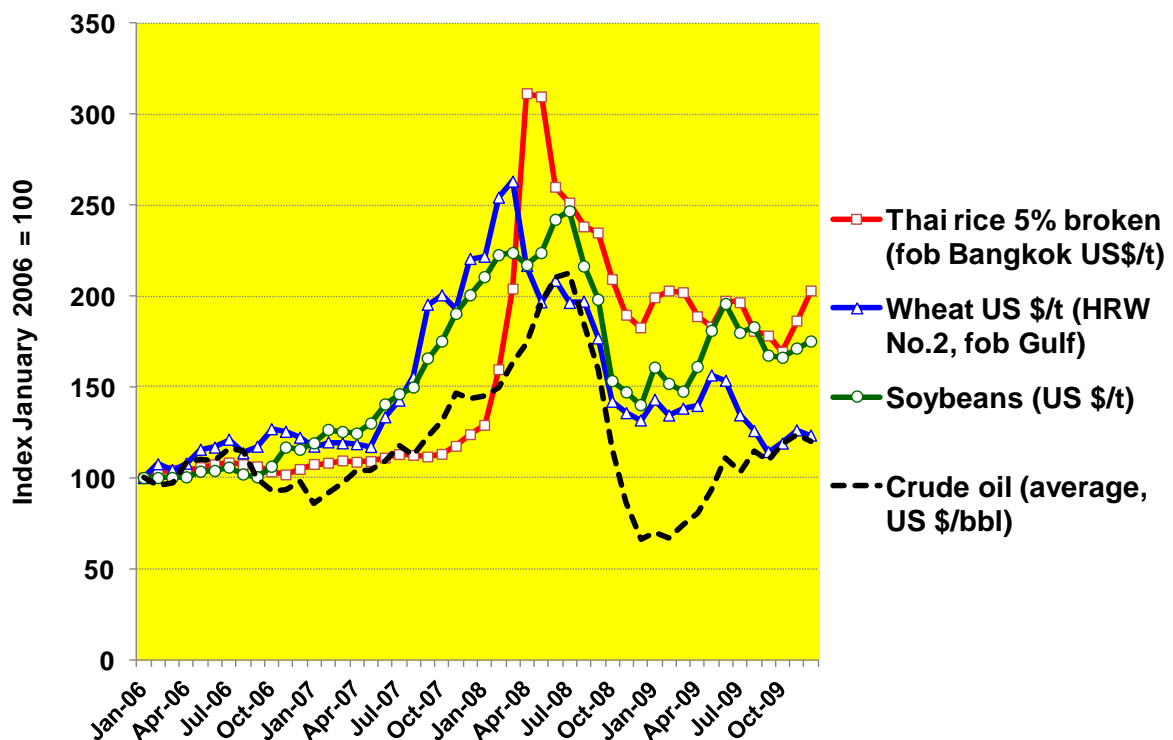


Figure 5: Prices of major commodities from 2006-2009

Estimations showed that over 100 million new people were driven into chronic hunger due to rapid price surges of various agricultural commodities (FAO, 2009). Hence, as of today, more than 1 billion people are believed to be suffering from chronic hunger. Another fact, highlighting the impacts of the past food crisis, shows that import bills of the low-income food-importing countries were estimated to be USD 170 billion, or 40%, more in 2008 compared to 2007 (FAO, 2009). Thus, as many African nations were required to import large amounts of grains to meet their demand, they were clearly affected most by this past food crisis.

The degree of rapid price acceleration of commodities is highlighted in figure 5. Thereby, a high correlation between wheat and soy is shown which exemplifies the substitutability of the two commodities. Hence, they are often also referred to as the “grandes cultures” due to their requirement of large amounts of land for their production. As a result, they compete each other about available arable land. Another crucial correlation exists between agricultural commodities and crude oil prices. This is due to the nowadays highly energy intensive agricultural production which also includes oil-based products, such as fertilisers and pesticides. Additionally, the increasing use of agricultural commodities, such as corn and sugar, tightens the dependence of agricultural commodity prices to crude oil prices.

Before going into detail about the latest food crisis, a brief summary of some of the key literature about how and what caused the past food crisis shall give an overview about the complexity of this issue. Hence, various scholars (Abbot et al., 2008; Baltzer, 2008; Headey and Fan, 2008; Headey and Fan, 2010; Headey, 2011; Mitchell 2008; Pisse and Thirtle, 2009; Prakash, 2011; Robles et al., 2009; Trostle, 2008) provide explanations about what the reasons and factors were behind the 2007-08 price hike. The most prominent explanations are summarised (see figure 6) and categorised into two groups of economic factors, demand and supply:

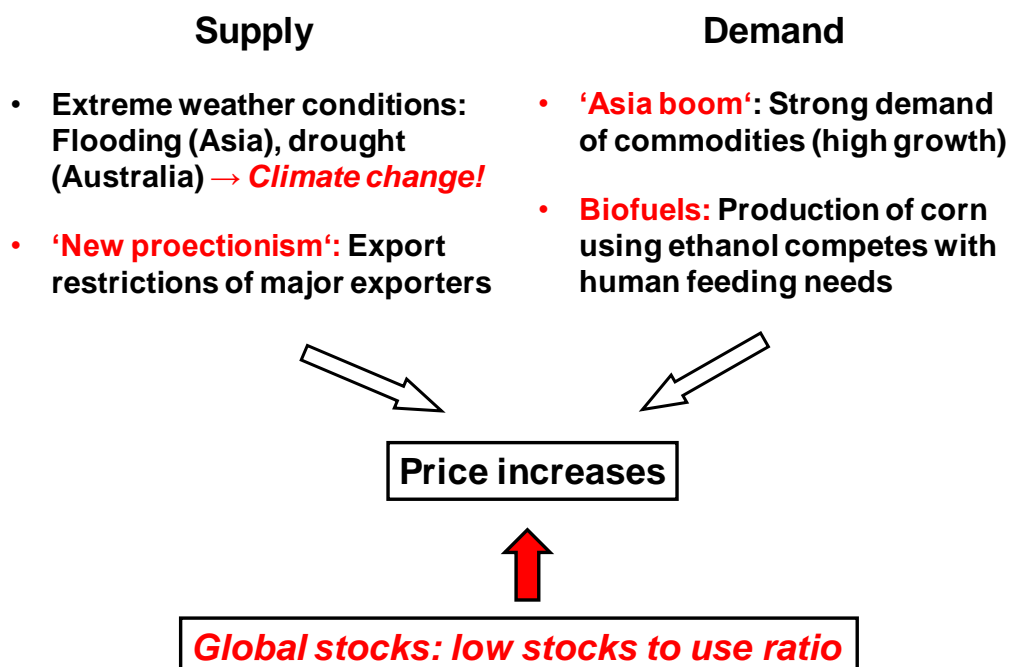


Figure 6: Changing fundamentals in agriculture commodity markets during the 2007-2008 food crisis

The above figure highlights that various demand and supply-side changes were responsible for the price hikes of key agricultural commodities. Additionally, the timing and accumulation of shocks or

negative news about future production caused a chain reaction which is also popularly referred by Headey and Fan (2008) as a 'perfect storm' resulting in rapid price surges.

2.2 Global stocks: Low stocks to use ratio

In general, supply and demand of commodities are reflected by their respective current stock levels. Hence, the stocks to use ratio shows the relationship between the available stocks of a particular commodity and its rate of consumption. During the 2007-08 food crisis, stock levels of major crops, particularly wheat, were extremely low at the end of the harvest year in June 2007. For example, the US declared particularly low stock levels due to poor harvests in the same year in North America which also affected Canada. Hence pressure was high on Australia, a major wheat producer and exporter, to provide a good 'winter' harvest at the end of 2007 until early 2008. However, forecasts of expected poor yield outputs became viral in the media in September 2007 (The Sydney Morning Herald, 2007) which accelerated fear that Australia's harvest could not still the demand of wheat at low prices. Thus, prices continued to grow at a slightly higher pace.

Crucial in reviewing the low stocks to use ratios during the 2007-08 food crisis is the fact that already since 2004/05 stock levels of commodities began to deteriorate (see figure 7). Warnings about sinking stocks to use ratio were repeatedly issued by the FAO, but with little recognition by its member states.

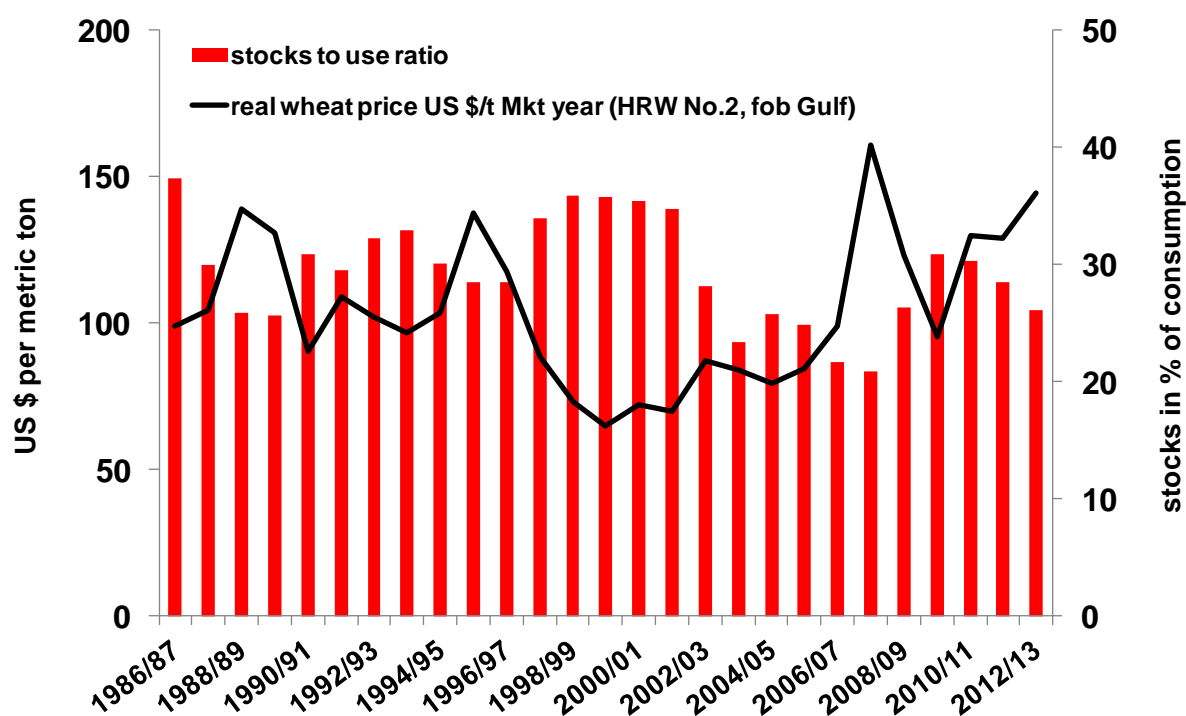


Figure 7: Wheat price (real) and stocks to use ratio from 1986-2013
(Source: The World Bank, USDA)

2.3 Supply-side factors

Adverse weather and poor harvests

Regarding the impact of supply-side factors, a crucial trigger of the 2007-08 food crisis was undoubtedly the adverse weather which caused poor harvests around the globe. For example, poor harvests of wheat led various nations to ban exports which caused amplifying effects on the wheat price on the world market. Although, natural fluctuations of yield outputs may seem obvious, figure 8 highlights that yield outputs have become more volatile over the past ten years, especially in Australia. This may already be an early indication that weather extremes become more frequent due to climate change and cause varying yield outputs of commodities. The result is that agricultural markets become more volatile.

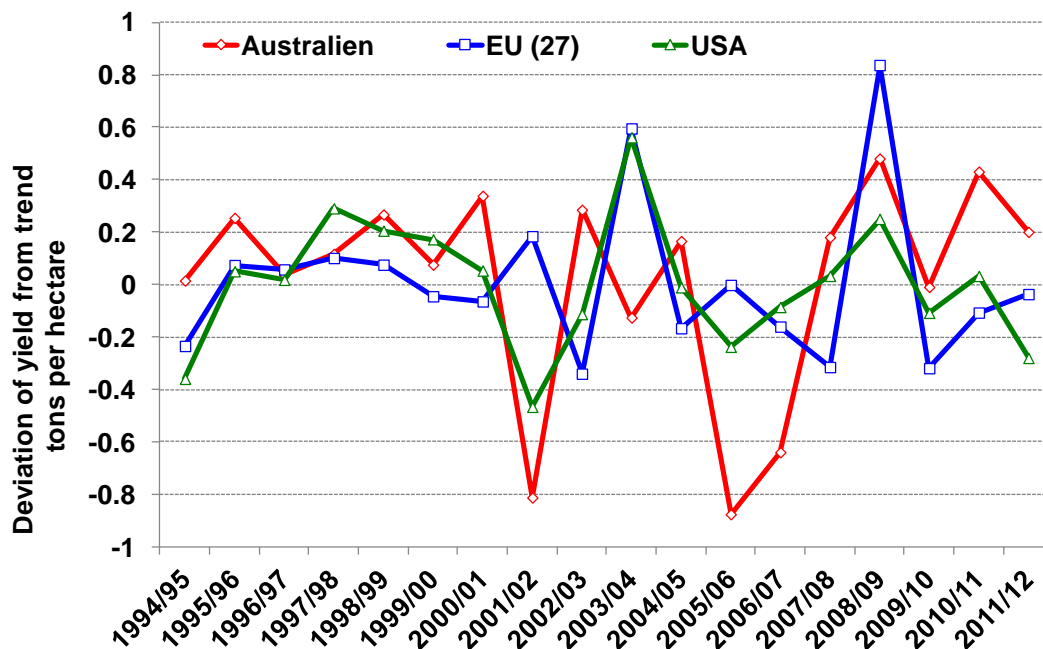


Figure 8: Volatile harvest outputs in Australia, EU and USA (Source: OECD-FAO and IGC)

Export restrictions of large countries

As poor harvests cause reduced yield outputs, the 'logic' step for many nations is to shorten their exports of commodities in order to secure low domestic food prices.

However, the impact of 'self-concentrated' measures to protect a nation's domestic supply causes worldwide imbalances of supply of commodities. Hence, trade becomes distorted with detrimental effects on prices and actual supply. Looking at the price trajectory of rice, export restrictions were more or less solely responsible for the price increase during the 2007-08 food crisis. Figure 9 shows how export restrictions were imposed by various countries on wheat and rice.

Among the countries which imposed export restrictions during the 2007-08 food crisis were: Argentina, China, India, Indonesia, Kazakhstan, Russia, Thailand, Ukraine and Vietnam. These countries attempted to reduce exports in order to increase their domestic supply and to dampen domestic price increases. The impact of banning the export of rice and wheat undoubtedly triggered their prices to increase on the world market. Although, in the case of rice, some major producing countries had poor harvests; the rice price hike was caused by aspects of fear among major rice consuming countries that the supply may not be upheld. Another crucial point supporting the

detrimental impacts of export restrictions on the price of rice is the fact that all price increase took place within around six months and following the imposition of such measures.

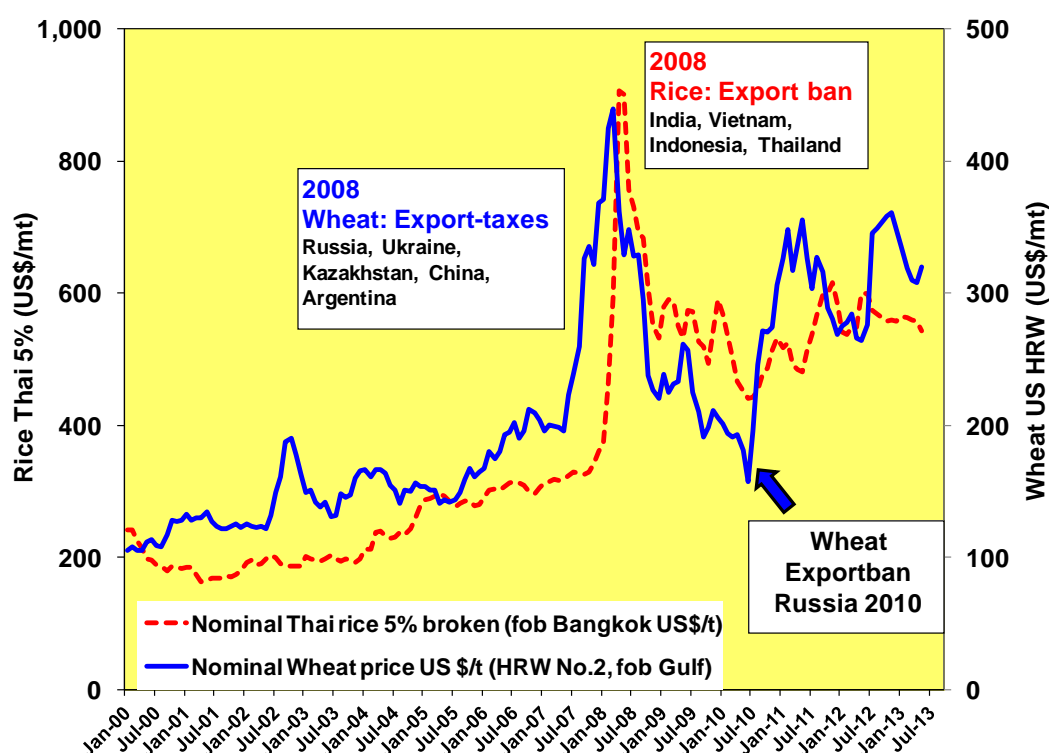


Figure 9: Surging wheat and rice prices (nominal) due to poor harvests and export restrictions
(Source: The World Bank)

2.4 Demand-side factors

The 'Asia boom'

Apart from short-term measures or incidents that caused commodity prices to rise during the 2007-08 food crisis, the rise and hunger of many Asian countries increased their demand about agricultural commodities. Thereby, the main driver is the rising crop demand from emerging nations, such as China, India and Brazil and also Indonesia and other countries, particularly in Asia.

Due to their recent high economic performance, larger shares of their populations gain access to food of higher value, such as meat and dairy products. In other words, higher demand of animal products ultimately leads to higher demand of crops from the grandes cultures which serve as basic ingredients for feeding animals.

One such example is China which became a net import nation in recent years (figure 10). Although, many Asian countries are still net exporters, exports are likely to be reduced in the future due to rising domestic demands to keep food price levels at stable prices.

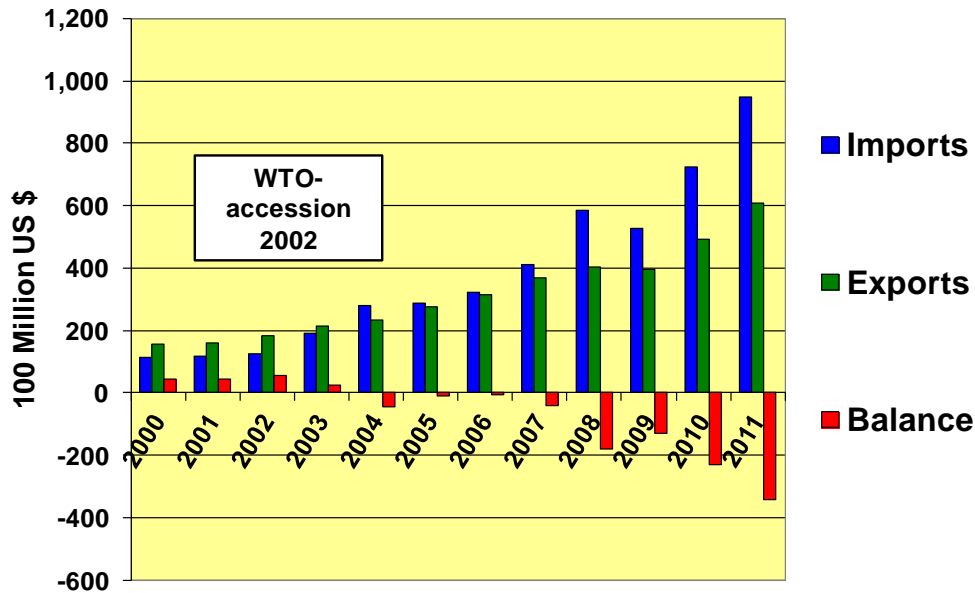


Figure 10: China's change from exporter to a large importer of agricultural commodities
(Source: Ministry of Agriculture, Beijing)

Increasing production of biofuels

Another demand-side factor causing impacts on price levels of agricultural commodities, is the rising demand of sugar and corn for biofuel production. As of today, the US is the world's biggest producer using predominantly corn as a resource to produce ethanol (figure 11).

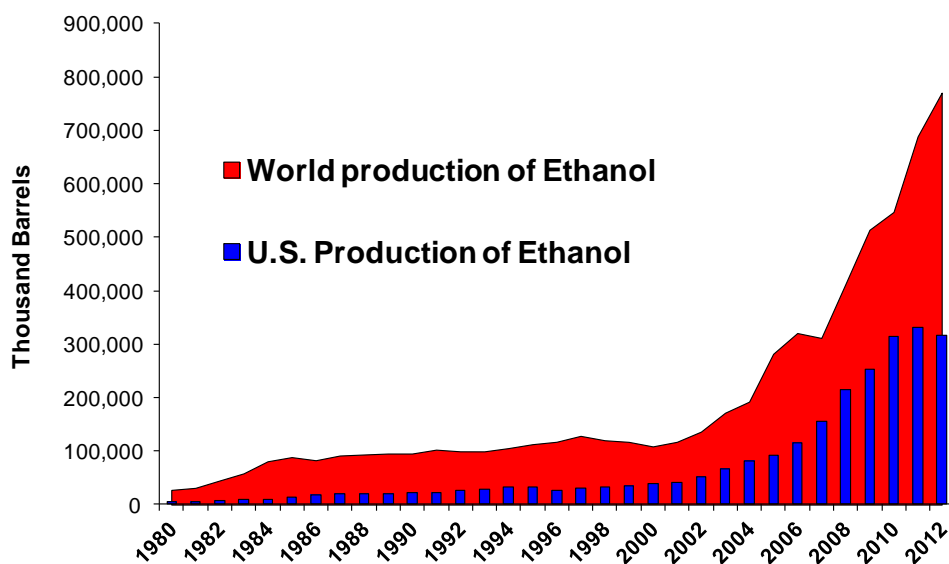


Figure 11: World and US production of Ethanol 1980-2013 (Source: ethanolrfa.org)

The second biggest producer, before the EU, is Brazil which is using sugarcane as a source for biofuel (ethanol) production. Although, it is difficult to break-down to what extent the use of corn for biofuel or ethanol production influenced the price increases during the past food crisis, the recent increase of use of corn for biofuel production is regarded as a crucial aspect steering up the demand of corn. Hence, it is commonly believed that recent policy changes promoting the use of corn for biofuel

production in the US and Europe have initiated a ‘new’ demand on corn (Headey and Fan, 2010, Pisse and Thirtle, 2009, Trostle et al., 2011).

Crude oil price: increasing impact on agricultural commodity prices

Although, oil is not an agricultural commodity, variations of oil prices cause direct impacts on other commodities, such as corn, wheat and soy. The reason is that oil is used for the production of fertilizers and pesticide products. Whereas, the demand of crude oil is dependent on the global economic performance, corn prices are bound to input costs (oil-based products) and the demand for corn-based biofuel products. Figure 12 exemplifies the correlation between corn and crude oil as goods which began to correlate highly between each other since the middle of 2006.

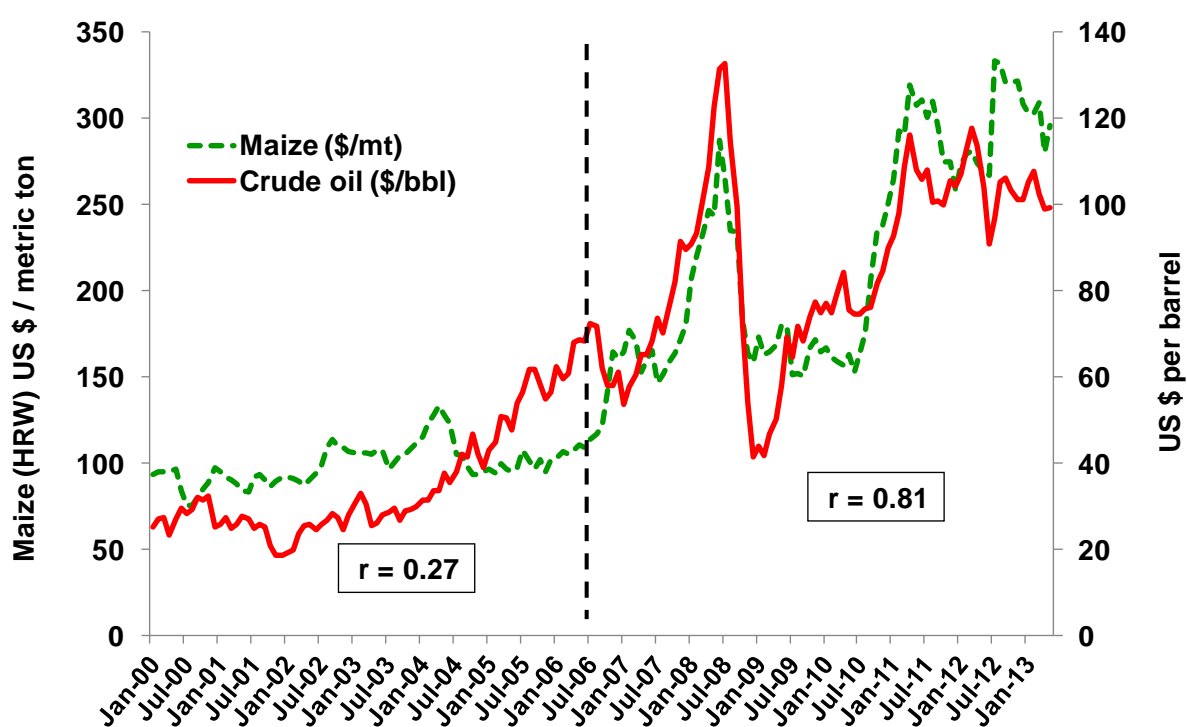


Figure 12: Comparison of corn (maize) and crude oil prices from 2000-2013
(Source: The World Bank, 2013)

2.5 The debate about speculation and “non-convergence” in commodity futures markets

In the previous sections, the ‘fundamentals’ were explained which caused commodity prices to increase during the past food crisis. Although, one may argue that the evidence provided is sufficient to explain the price increases during the past food crisis based on changing fundamentals, there is resistance to accept this notion. Notably, Masters (2008, 2009) challenges the argument that fundamentals were responsible for causing the recent price hike. In his words – he is the founder of the hedge fund firm Masters Capital Management LLC:

“Index Speculators’ trading strategies amount to virtual hoarding via the commodities futures markets. Institutional Investors are buying up essential items that exist in limited quantities for the sole purpose of reaping speculative profits” (Masters, 2008, p. 6).

Gilbert (2010) argues that non-traditional speculators were choosing specific commodities for speculation activities. Thus, non-traditional investors (incl. institutional investors, pension funds) or index speculators are made responsible for the price hikes during the past food crisis. The key difference between traditional and index speculators is that the latter invest or speculate into a set of commodities which follow commodity futures indices, such as the UBS E-TRACS Constant Maturity Commodity Index or S&P GSCI from Goldman Sachs, to name some of the biggest funds. Due to the recent financialization of the commodity markets, large amounts of money have flown into commodity futures markets. The recent changes of the commodity markets are exemplified by the following statement from Masters and White (2008, p.1)

“Institutional Investors, with nearly \$30 trillion in assets under management, have decided en masse to embrace commodities futures as an investable asset class. In the last five years, they have poured hundreds of billions of dollars into the commodities futures markets, a large fraction of which has gone into energy futures. While individually these Investors are trying to do the right thing for their portfolios (and stakeholders), they are unaware that collectively they are having a massive impact on the futures markets that makes the Hunt brothers pale in comparison. In the last 4½ years assets allocated to commodity index replication trading strategies have grown from \$13 billion in 2003 to \$317 billion in July 2008. At the same time, the prices for the 25 commodities that make up these indices have risen by an average of over 200%. Today’s commodities futures markets are excessively speculative, and the speculative position limits designed to protect the markets have been raised, or in some cases, eliminated. Congress must act to re-establish hard and fast position limits across all markets”.

Two major issues come out of this statement from Masters and White (2008): firstly, commodity markets are experiencing huge inflows of money; secondly, money has gone into indices which are aggregating a large number of different commodities (up to 25). As a result, Masters and White (2008) make a simple linkage that the recent large increase of money into commodity markets caused speculation. Whether this is true or not is disputed.

Some of the major critics are Irwin and Sanders (2011) who question whether this large inflow of money put on positions that are linked to commodity index funds ought to be regarded as speculation or a form of hedging or something else. Accordingly, they refer to Stoll and Whaley (2010) who make the point that commodity index investments are long-term investments only. In other words they are regarded as passive and serve to the diversification of an investor’s portfolio and hence, are not attractive for speculation activities. Another important point made by Irwin and Sanders (2011) who contradict Masters and White’s argument is that holdings on commodity index futures funds reached their peaks before the recent food crisis unfolded. Hence, if the large inflow of money would have simply driven up commodity prices this should have taken place between 2004 and 2006. However, as seen, prices peaked in 2008 following a 12-15 months of steady growth.

Similar to Irwin and Sanders (2011), Adjemian et al. (2013) argue in their most recent analysis of the 2007-08 that so-called Commodity Index Traders (CITs) (see further details about CITs in the glossary) were actively investing into futures contracts to diversify their portfolio – in a functioning market, futures contracts reflect the current mechanisms of supply and demand of commodities. However, according to Adjemian et al. (2013), the increased activity of CITs did not influence the price levels of commodities and were not responsible for a period of *non-convergence* between futures and cash prices of various major commodities during the 2007-08 food crisis. Non-convergence between futures and cash prices means that market signals of supply and demand are not well enough reflected in commodity prices, as usually expiring futures prices and cash prices should be similar (converge). In other words, if futures prices are decoupled from cash prices, market participants may

become unaware about to what extent grains should be stored or sold, or at what price levels grains should be bought or sold. As a result, the market becomes ineffective with severe economic losses as a consequence.

The reason for this non-convergence is attributed by proponents of speculation to excessive investment activities of CITs which were regarded as price drivers during the 2007-08 food crisis. However, Adjemian et al. (2013) argue that diverging storage fee rates for the underlying commodities serve as a better explanation why non-convergence of major commodity prices, such as wheat, corn and soy, was witnessed. Whereas the physical storage rate is increasing if there is a big harvest, prices of storing commodities fall if yield outputs are projected to be poor. In the case of the past food crisis, physical storage fees deviated heavily by up to 25 percent down from the mean per bushel and per month in 2008. Accordingly, Adjemian et al. (2013, August, 14) argues that “significant changes in grain inventories can generate a divergence between the value of futures contracts and cash grain”. The result is that shocks, for example, poor yield outputs or sudden demands are likely breaking apart mechanisms that assure futures and cash prices converge.

To avoid or lower the risk of non-convergence of agricultural commodities, Adjemian et al. (2013) propose the following measures:

- **Increase the delivery instrument storage rate:** Increase and align the prices of maximum delivery instrument storage fees and physical storage rates
- **Force load-out:** Prohibit traders from holding large amounts of delivery instruments
- **Make grain futures cash-settled:** Change delivery system from physical to cash settlement
- **Make the delivery process easier**
- **Apply limits on speculators:** Phase-put existing hedging exemptions of CIT traders in futures markets

Finally, the problem of non-convergence is nowadays less likely to happen since learning from the past crisis, constant storage rates – which were either too high or too low – have been replaced by variable storage rates which are flexible in accommodating changes of supply of commodities.

Bubbles in agricultural commodity markets during the past food crisis?

Addressing existing beliefs of bubble creation during the 2007-08 food crisis, Irwin and Sanders (2012) challenge Masters’ claims that increased demand from index funds created a bubble where commodity futures prices cannot anymore be explained through fundamentals. Accordingly, they refer to various studies which assessed whether a bubble effect was inherent during the past food crisis and found no significant empirical evidence. For example, they refer to Brunetti and Buyuksahin (2009) who used Granger causality tests to assess whether there was a statistical link between swap dealers positions, regarded as a proxy for commodity index fund positions, and subsequent price changes of natural gas, crude oil and corn futures markets. Their conclusion is that no link could be found, similar to Stoll and Whaley’s (2010) Granger causality tests which analysed potential connections between positions of CITs and increases of agricultural commodities futures prices. Accordingly, Irwin and Sanders also conduct own tests and do not find empirical evidence that would support a bubble situation during the past food crisis. Hence, based on little or no hard empirical evidence available in the literature, various scholars (Glauben et al., 2012; Prehn et al., 2013 and Irwin and Sanders, 2012) reject the claims made by Masters that neither excessive speculation nor bubbles caused the price hikes of agricultural commodities during the past food crisis.

Instead, Tang and Xiong (2010) claim that prior to the financialization, commodity markets were not entirely integrated in the financial markets. As a result, the rapid financialization process which expedited from 2004 to 2006 made agricultural commodity prices to behave more like prices of

financial assets. In other words, commodity futures prices, including oil, increasingly follow and respond to global economic shocks and trends (Irwin and Sanders, 2012). As a final point, Gilbert (2010, p. 420) summarises the previous explanations by arguing that “the correlation between the oil price and food prices, both in terms of levels and changes, is the result of common causation and not of a direct causal link”.

Increased volatility of agricultural commodities due to index funds?

To what extent index funds and new financial products, such as ETFs and others, caused commodity prices to increase, is currently still being researched. Extensive studies were carried out, amongst others by Gilbert (2010, Gilbert and Morgan (2010), Irwin and Sanders (2011, 2012) and Etienne et al. (2013). Thereby, Irwin and Sanders, 2012, p. 372) who refer to Bessembinder and Seguin (1993) argue that “greater trading volume can be associated with greater price volatility, but market price volatility can be mitigated by large open interest”. This argument points directly at the financialization which brought large inflows of new money into the commodity sector which equipped Masters (2008) with an argument in favour of his theory that more money and more financial products were responsible for the recent price hike. However, whether this ‘new’ money really changed trading mechanisms, is severely challenged by Irwin and Sanders (2011, 2012) and Jacks (2007) who do not find significant empirical evidence that larger investments into futures markets are attracted by potential profits. Instead, they refer, as mentioned earlier, to the passive character of investments into futures index funds which serve large institutions and pension funds to diversify their portfolio.

Based on the above evidence and descriptive review of the past food crisis, there is little empirical evidence available that would indicate that speculation activities played a decisive role in driving up agricultural commodity prices. Hence, arguments made by (Irwin and Sanders, 2011, 2012), Etienne et al. (2013) and others are more plausible, considering the large number of factors which are referred to have influenced prices.

3. The 1972-74 food crisis

3.1 Key aspects of the 1972-74 food crisis

According to the FAO (2009), in 1972, bad weather hit crops across the globe and world food production went down for the first time in 20 years. And this, at a time when the world needed higher yield outputs to meet the needs of a growing global population. As a result, major grain producing countries, such as the US, Canada and the former Soviet Union gathered remaining yield outputs to support drastically sinking stock levels. Despite these efforts, world cereal reserves (stocks) reached a 22-year low in 1974. During this evolving food crisis, the US denied the exportation of 10 million tonnes of grains (mostly to the former Soviet Union) due to concerns that such an export would compound domestic food price inflation (FAO, 2009). The ban of export of grains from the US to the Soviet Union is regarded today as a principal underlying cause which had severe impacts on various crops prices to rise.

The severity of the 1972-74 food crisis is best shown in figure 13 where real prices of wheat, corn and rice nearly quadrupled within very few months. Compared to the 2007-08 food crisis, when commodity prices only marginally increased in real terms, the 1972-74 food crisis was much more severe in real terms (Pisse and Thirtle, 2009). However, according to the FAO (2009), there is a big difference between the two food crises: whereas, the 1972-74 food crisis was caused by supply-side

shocks, demand factors such as a new demand of corn for biofuel were strongly characterising the 2007-08 food crisis.

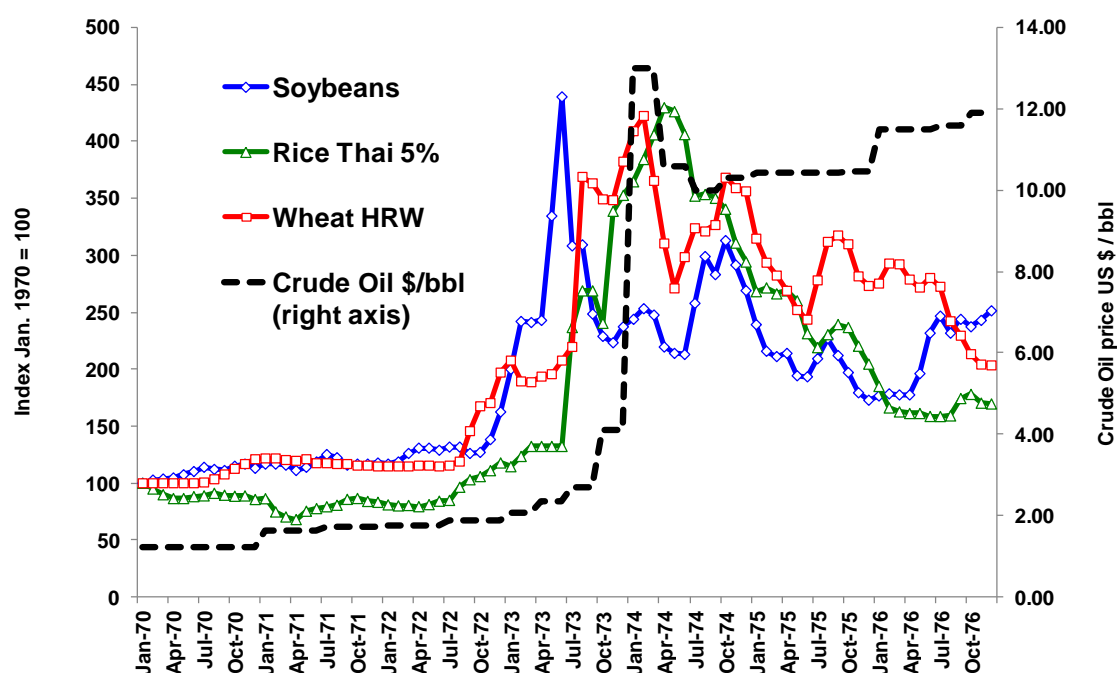


Figure 13: Real prices of wheat, corn, rice and crude oil from 1970-1976
(Source: The World Bank, 2013)

According to various scholars (Baffes and Cosic, 2013; Cooper and Lawrence, 1975; FAO, 2009, 2011; Headey and Fan, 2008; Headey and Fan, 2010; Headey, 2011; Labys and Thomas, 1975; Pisse and Thirtle, 2009; Prakash, 2011; The World Bank, 2013; Trostle, 2008; Uhlmann, 1972-75) explanations are provided about what the reasons and factors caused the 1972-74 commodity price hike. The most prominent reasons are summarised and categorised into three groups of macroeconomic factors (demand, supply, other):

Demand-side factors:

- Low stocks to use ratios of various commodities in major grain exporting countries
- Depreciation of the US dollar
- Soviet Union bought one quarter of global grain output: switched from an export to an import nation during this crisis period
- Hoarding purchases: Japan
- Changing food habits of rising global population which was becoming wealthier causing increase of demand of grains for human and animal purposes

Supply-side factors:

- Adverse weather which caused poor global harvests of wheat, rice and corn
- Export ban of US (10 million tonnes of grains)
- Rising crude oil prices
- Rising input costs (fertilisers, etc.)

According to Uhlmann's review about the state of the agricultural market in 1974, he refers to the tense situation in the agricultural market whereby low harvest yields, stocks and rising demands in all parts of the world were responsible for persistent high levels of commodity prices. Prices of grains went down from November 1974, but did not reach levels before the increase in 1972. Prices were brought down due to the following reasons: overestimation of import demands, a dwindling economic situation caused by the 1973 oil crisis which resulted in lower consumption rates of grain in major export countries.

Similar to the 2007-08 food crisis, low stock levels of wheat preceded the crisis. Although production levels increased heavily in the 1960s, stock levels deteriorated among major grain producing countries towards the end of that decade and reached all-time lows, in the case of wheat, in the harvest year of 1972-73 (figure 14). The major reason that caused a low stocks to use ratio for wheat is a global reduction of wheat production due to adverse weather which cut expected yield outputs. Again, similar to the 2007-08 food crisis, a 'vicious cycle' took place with imposed export bans. Whereas during the most recent crisis developing and emerging countries blocked the export of grains, the US was primarily responsible for imposing detrimental export restrictions. The ban to export grains to the Soviet Union to protect its own market and economy, raised fears that global supply could become dangerously short. This resulted in hoarding activities largely from Japan to make sure domestic supply would be secured.

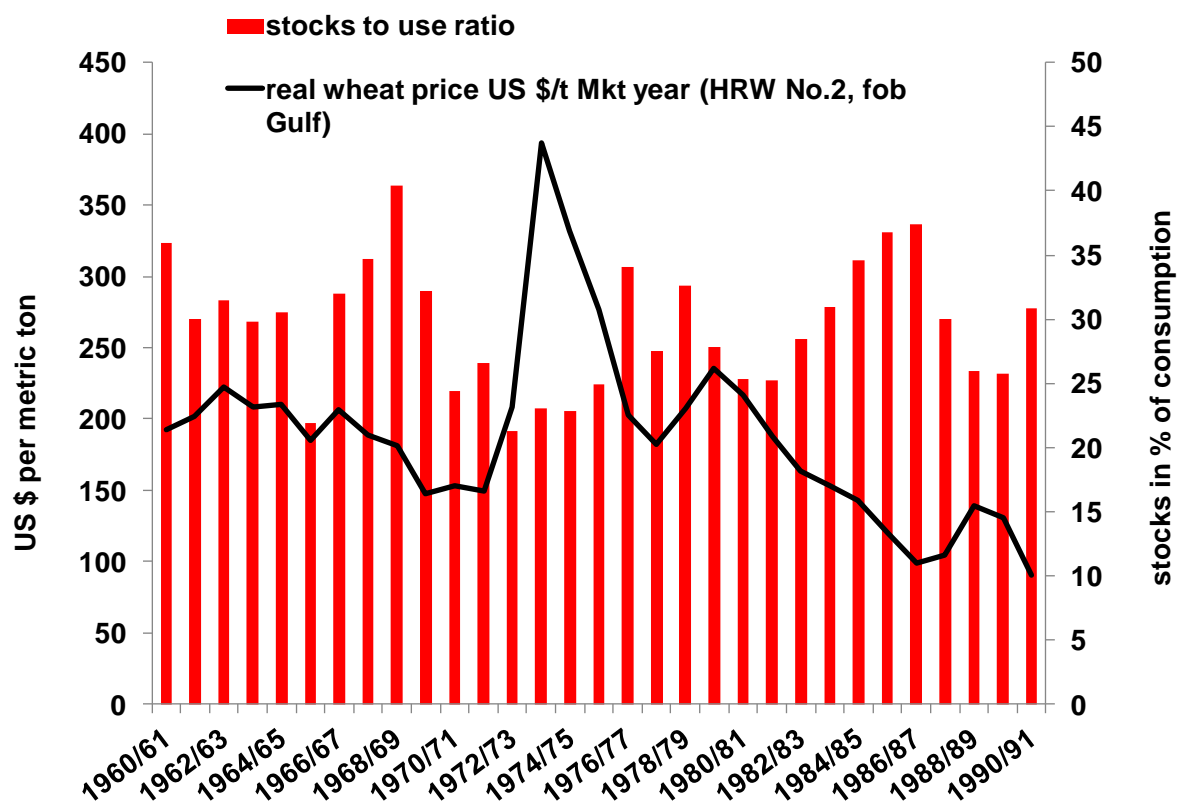


Figure 14: Wheat price (real) and stocks to use ratio from 1960-1991 (Source: The World Bank, USDA)

Whereas the previous explanations focused on the direct short-term causes of the 1972-74 food crisis, changing food habits in developed countries became similarly visible as during the most recent food crisis in developing countries. Hence, European and Western countries were affected by a shift of food habits which led to a larger demand of meat and an intensifying meat production causing higher demands of crops.

Very similar to the 2007-08 food crisis, but still slightly different, oil prices increased sharply during the 1972-74 food crisis, commonly known as the oil crisis. Whereas during the most recent food crisis, global demand of crude oil reached new heights, the reason for a rising oil price in the 1972-74 food crisis was due to embargos from major oil exporting countries. These actions immediately drove-up oil prices and as a result of higher oil prices, input costs (fertilisers, etc.) for the production of major crops became more expensive.

To summarise briefly, both food crisis were caused by similar factors of changing demand and supply. Poor weather initially caused poor harvests and triggered fears of insufficient supply due to low stock levels of major commodities. Fears were compounded when the US denied the export of 10 million tonnes of grains to the Soviet Union to protect its own economy from inflatable food prices. The denial of US exports during a period of high oil prices caused detrimental activities, such as hoarding, which further pushed prices up.

4. Discussion and conclusions

In the last part of this article, the aim is to provide some ideas how future food crises could be avoided or at least become less severe. Reflecting the serious impacts from the past food crises which hit mostly poor and less privileged people in developing countries, measures need to be taken. We focus on solutions that make the provision of agricultural commodities more resilient against sudden shocks.

4.1 Key points

Storage of agricultural commodities: It is crucial to avoid low stocks to use ratios. The main objective is to stabilize the world food system. Each country should have sufficient storage facilities. For countries with few or insufficient storage facilities, financial and logistic support could be a viable solution. The leading global agency to implement and control the future handling of storage capacities should be the FAO.

However, the following problems and open questions persist:

1. Who decides about the storage levels (loading and removal)?
2. If nations provide incentives for higher storage levels, there are potential risks that private storage keeping capacities may be reduced. How can this be avoided?

Overall, the goal is to keep stocks to use ratios at levels which allow sufficiently to absorb risks of varying harvest outputs. Additionally, adequate supply of agricultural commodities may become more difficult due to more frequent and intense weather-related impacts caused by climate change.

Weather extremes and hedging of prices at stock exchanges: In the future, instruments that provide adequate hedging of price risks may become increasingly important as all market participants rely on well functioning stock exchanges.

Export restrictions: These measures have distorting impacts on the formation of prices of agricultural commodities (e.g. rice in 2008). Similar to measures taken during the Uruguay Round when export subsidies were curbed, export restricting measures should be limited and finally eliminated. The WTO is the suitable leading institution to deal with these issues.

Biofuels – reviewing of support programmes: Intensive support of programmes pushing the production of biofuels has arguably led to a shortage of available agricultural products designated for

human feeding purposes. Additionally, in many cases, the production of biofuels may reveal a negative CO₂ balance which may not serve as a viable solution to serve as a CO₂ neutral fuel. However, there is hope that the second generation of biofuel production – based on bio mass – may not anymore stand in contrast to human consumption. (see http://en.wikipedia.org/wiki/Second-generation_biofuels).

Apart from implementing single measures, a comprehensive strategy is needed. In this regard, we suggest the concept of resilience as an appropriate approach which may provide a conceptual framework for future research activities in this field.

4.2 Building resilience

In order to address the capacities of fundamentals, the concept of resilience may serve as an approach to strengthen mechanisms of demand and supply. The notion that the provision of food needs to better absorb unforeseen shocks is becoming an idea with mainstream acceptance. Thus, the FAO (2011), in response to the last food crisis, provides recommendations to increase the resilience of the agricultural market by reducing the risk of food insecurity and volatile commodity markets. The following measures are proposed by the FAO (2011):

- Increased productivity and improved technical management of production
- Investments in infrastructure, extension services, education, research and development -> food supply increases in developing countries -> better functioning of local agricultural markets
- Loss of harvest due to poor storage facilities, major issue in developing countries -> better storage facilities needed
- Public sector investment:
 - Direct investment in agricultural research and development on practices that enhance the resilience of small farm-holders to be protected against climate change
 - Investments in sectors linked to agricultural productivity, such as extension services, roads, ports, power, etc.
 - Non-agricultural investment: education, empowerment of women, sanitation and clean water supply, etc.
- Private sector investment in all sectors of the agricultural market

In a similar response to the 2007-08 food crisis, the G20 adopted measures that have the objective to reduce price volatility and strengthen agricultural commodity markets. The recommendation measures are somewhat similar to the ones from the FAO and also reiterate that measures need to be taken at all levels and in all sectors. This notion of a holistic approach by addressing all actors from the farmer, trader, distributor and consumer, goes well with the concept of resilience which advocates a participatory and multi-stakeholder approach to strengthen adaptive capacities against sudden disturbances in form of sudden price changes caused by changing fundamentals.

Another aspect, taken up by the FAO (2011), asks why high agricultural prices during the last food crisis after long periods of low prices were not an opportunity for poor farmers to increase their income. This aspect is relevant, particularly if the concept of resilience ought to be a new approach to improve mechanisms in the agricultural sector. Hence, further research using the concept of resilience may identify nations or regions or even individual farmers which are likely to absorb better sudden price changes and also, those that are having less capacity. In light of an envisaged increase of agricultural production in the extent of 60 percent by 2030, new steps need to be taken if such ambitious goals ought to be reached. This is why both, the FAO and the G20, advocate for measures

that go beyond technical improvement measures that simply focus on increasing yield outputs. Instead, affiliated sectors which are connected to the agricultural sector need to be better integrated into the entire process of farming and distributing yields.

Whereas numerous countries in Europe struggle with ongoing structural change in the agricultural sector, they are also heavily dependent on subsidies and measures which protect their domestic markets. As these countries adopt tariffs and quotas to protect their markets, developing countries suffer from being discriminated to properly access the markets in developed countries. The result is that developing countries are entirely exposed to global price fluctuations, whereas the consumers in developed countries may not feel big differences. Thus, whether simple transfers of money in form of Overseas Development Assistance (ODA) may support farmers in developing is difficult to predict. However, what is certain is that the most vulnerable farmers need to be lifted away from risk of sudden price changes of commodities and made more resilient to absorb sudden price shocks.

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Further useful information:

OECD-FAO Stats (database):

<http://www.oecd.org/statistics/datalab/>

USDA estimation of production, consumption and stocks of agricultural commodities (1973-2013):

<http://usda.mannlib.cornell.edu/MannUsda/viewDocumentInfo.do?documentID=1194>.

USDA Stats, Foreign Agricultural Service (database):

<http://www.fas.usda.gov/psdonline/psdQuery.aspx>

The World Bank, commodity markets (pink sheets):

<http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTDECPROSPECTS/0,,contentMDK:21574907~menuPK:7859231~pagePK:64165401~piPK:64165026~theSitePK:476883,00.html>.

GLOSSARY

Overview of key terms

Some of the key terms used in the debate of the food crisis 2007-08 are explained in this glossary. As introduced in the above article, scientists researching in this field are unclear whether especially the most recent food crisis was caused by unfavourable incidents disrupting the demand and supply balance of commodities (Headey and Fan, 2008, 2010), or not. Others, such as (Masters, 2008, 2009) argue that speculation was the cause and was driven by newly available financial products and tools which led commodity prices increase sharply. Accordingly, the discussion goes further to resolve the question whether the past food crisis was culminating in a bubble (Irwin and Sanders, 2011), or not.

In the following sections, the above mentioned key terms are briefly explained:

- **Fundamentals or Fundamental Values:** In well-functioning markets, fundamentals determine the level and behaviour of prices (e.g. commodities, assets) (Ng and Pirrong, 1994). In other words, if the supply and demand mechanism of a particular commodity is sound, fundamentals or fundamental values determine the price of that commodity. In case the fundamentals are not sound and prices are driven by inexplicable reasons, speculation may be the reason for price changes of a commodity, asset or index, and in an extreme extent may even cause a bubble.
- **Natural risk in agricultural markets and volatility**
Among the most important fundamental data are weather-related variations of yield outputs of agricultural commodities. In this regard, forecaster impacts of climate change are expected to increase the natural risk factor in terms of volatile harvest outputs. High variations of yield outputs from major producing countries already show that the supply of grains is becoming more volatile (see figure 8).

To understand volatility, Gilbert and Morgan (2010, p.3023) refer to it as “a directionless measure of the extent of the variability of a price or quantity”. In other words, the deviation of a value of a variable from the mean within a set time period represents volatility. Hence, if a certain value varies highly from the mean, then the volatility is regarded as high. To calculate the level of deviation and fluctuation from the mean (volatility), the formula named standard deviation is commonly used, however, it must be noted that other approaches as well exist to calculate volatility. Since calculations of volatility may serve to better understand trends of an economic variable, it may also express no trend or uncertainty. For example, if an economic variable is showing high fluctuations from the mean over a selected period, a trader may find it difficult to decide whether buying or selling of such commodity is advantageous. On the other hand, low fluctuation from the mean may provide confidence about future price expectations of a certain economic variable. Measuring volatility serves to understand to what extent households are expected to spend more or less money on food (Prakash, 2011). This is of particular importance in countries where households spend much of their income on food. Figure A exemplifies how the volatility of major agricultural commodities increased during both food crises. Interestingly, the volatility was higher during the 1972-74 food crisis. The reason is largely due to higher commodity prices in real terms at that time.

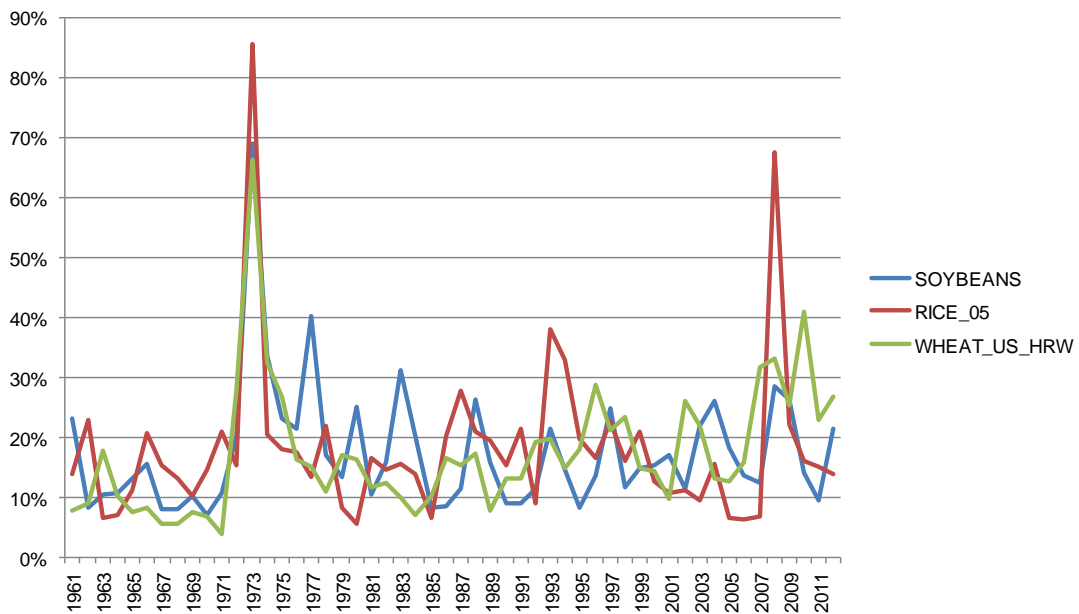


Figure A: Historical volatility (real prices, yearly) of major agricultural commodities from 1961-2012
(Source: The World Bank, 2013)

- **Price hedging in futures markets:** The more volatile the markets, the more important it is to hedge price at a stock exchange. The producer can hedge against sinking prices and the buyers of agricultural products can hedge against expected rising prices. This is the basic function of a futures market.
- **Financialization**
The term financialization is attributed to the introduction of index-based funds and other financial products which allow non-traditional participants, such as pension funds and other institutions to place investments for commodities (Irwin and Sanders, 2012).

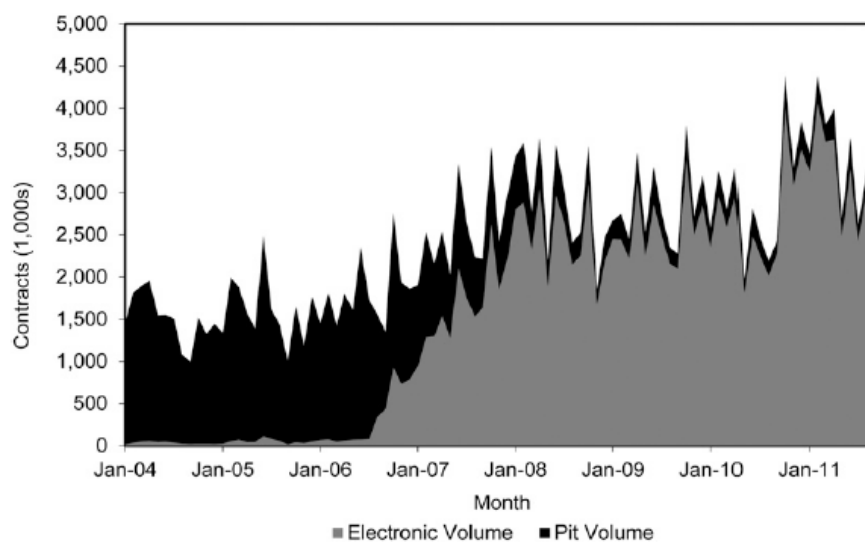


Figure B: Financialization of agricultural commodity market (Source: Irwin and Sanders, 2012)

The result was an increase of trading activities among agricultural commodities (see figure B). In this context, it is crucial to note that the trading of commodity futures is in a constant state of transformation. Since the beginning of the modern trade era in the 1850s, the trading of commodity

futures was altered many times to become more flexible, such as, for example, lower transaction costs. Thus, the recent financialization is simply a logic step in an increasingly internet- and computer-driven world to ease the trade of commodity futures and involve a wider range of trade participants. Thereby, the participation of non-traditional investors, such as non-commercials, is holding a viable function to bear risks. To summarise briefly, the recent financialization has made commodity futures markets more liquid which is advantageous for the formation of prices at the stock exchanges.

- **Speculation:** According to proponents that speculation was a crucial driver for commodity prices to increase in the 2007-08 food crisis, Robles et al. (2009, p. 2) define speculation as “the assumption of the risk of loss in return for the uncertain possibility of a reward”. This implies that a speculator is someone who takes a certain risk that buying or selling of a particular commodity, asset, etc. at a particular time may perhaps end-up in a loss. Now, the question is whether a speculator may become active without any information/knowledge about the current trend and market situation of a particular commodity, asset, etc. To determine whether speculation occurred and if yes to what extent during past food crises is widely disputed.

- **Exchange Traded Funds (ETFs) and Exchange Structured Notes (ETNs) or Exchange Traded Products (ETPs):**

According to Irwin and Sanders (2011, p.4) “both exchange-traded funds (ETFs) and structured notes (ETNs) have been developed that track commodity indices. ETFs are essentially mutual fund shares that trade on a stock exchange and are designed such that the share price tracks a designated commodity index. ETN’s are actually debt securities where the issuer promises to make pay-outs based on the value of the underlying commodity index”. ETFs have been introduced in the 1990s for other than agricultural-related financial products. However, since the financialization of the agricultural commodity market, ETF products such as the (S&P GSCI) Goldman Sachs Connect Standard & Poor’s Goldman Sachs Index or the UBS E-TRACS Constant Maturity Commodity Index are some of the biggest index-based funds which include agricultural commodities within large portfolios including non-agricultural commodities. Finally, ETPs provide a tool by which retail and institutional investors can essentially trade commodity futures markets as though they are equities. This is sometimes referred to as the securitization or equitisation of commodity futures. Looking at above figure C from Trostle et al. (2011), there is little significant evidence that ETFs were primarily responsible for the price increase during the 2007-08 food crisis. Although, the amount of contracts and also the share of total open interests have increased steadily at the Chicago Board of Trade (CBOT) during the years preceding the food crisis, there is no rapid acceleration noticeable that would indicate a sudden hoarding or buying of future contracts.

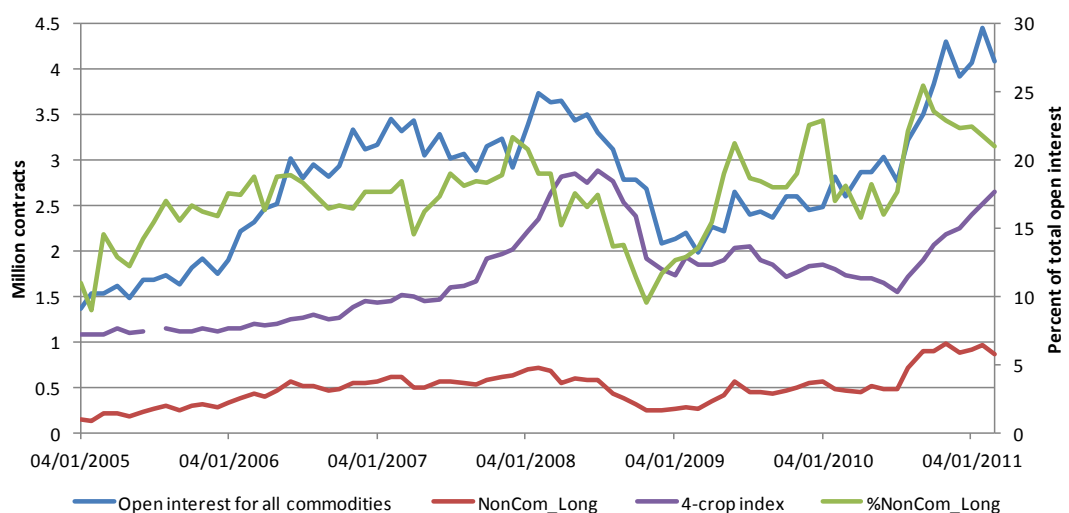


Figure C: Open interest and non-commercial long positions: US futures markets for wheat, corn and soybeans (Source: Trostle et al., 2011 from US Commodity Futures Trading Commission)

- **Bubble:** A bubble is occurring if the following situation appears if prices of a stock/commodity/etc. become “inexplicable based on fundamentals” (Garber 2000, p. 4). In other words, “the trading motive is unrelated to fundamental values, as market participants believe they can always sell to a greater fool” (Irwin and Sanders, 2011, p. 9). Hence, the major challenge is, according to Irwin and Sanders (2011) who refer to Barlevy (2007), to declare whether large price changes (resembling a bubble) are responding to natural shifts in supply and demand, or not. Hence to identify a price bubble is strongly linked to how fundamentals are behaving. As a result, the assessment to what extent fundamentals become inexplicable in a price surge and whether a rapid price increase is fully, partly or not at all representing a bubble becomes very difficult (Irwin and Sanders, 2011, Etienne et al. 2013).
- **Commodity Index Traders (CIT)**
According to Adjemian et al. (2013, August, 14)¹, CITs have emerged and appeared in trading commodities due to the following reasons: “unlike stocks, bonds, and cash, commodity prices tend to rise during periods of inflation. Although buying and storing physical commodities themselves is costly, it is far less expensive to trade derivatives for these commodities. As a result, beginning in the early 2000s, institutional investors increasingly traded commodity futures contracts passively—that is, they pooled their resources with a fund manager who entered and held positions in these markets indefinitely—as a way to protect their investment portfolios from inflation risk. Individual investors, too, anticipated some benefits from investing in these markets and began trading exchange-traded funds, which work like mutual funds by splitting the derivatives holding into shares. Together, these participants indirectly trade futures contracts through a sponsor trader known as a Commodity Index Trader (CIT). The CIT presence in commodity futures markets has grown rapidly; they are now among the largest traders of agricultural derivatives.
- **Futures contracts**
According to Adjemian et al. (2013, August, 14, footnote 1), “in a commodity cash market, goods are exchanged for cash on the spot. Cash markets are established regionally in the United States. In contrast, in a physically settled futures market, like those for corn, soybeans, and wheat, traders form contracts with each other by agreeing on a price at which to exchange a set amount of the commodity on a future date. Because the futures contract value is derived from the expected future cash market price of an underlying commodity, it is a derivative, rather than a real asset. The party who agrees to provide the commodity in return for payment is known as the short; the party who agrees to pay the specified price in exchange for the commodity is called the long. A short position earns value as prices fall, while long positions improve when prices rise. Futures contracts are zero-sum, since any gains (losses) made by the short equal any losses (gains) to the long. To facilitate trading, a futures exchange standardizes the characteristics and amount of the commodity represented by each contract; the cash markets in which the contract can be terminated via exchange of commodity for cash, or physical delivery, can occur (the delivery markets); as well as the dates at which different futures contracts expire. In general, only just one domestic futures market offers futures contracts for a given commodity. Since they are heavily traded, grain futures markets serve as a forum for price discovery, meaning that commodity prices are set as informed traders compete, using fundamental information about commodity supply and demand. Nearly all futures contracts in those markets that allow physical delivery are offset. That is, rather than engaging in the delivery process, futures traders frequently terminate their position and exit the market by taking an opposite position to the one they currently hold. Of those contracts whose traders choose to engage in the delivery process, most are actually satisfied by the transfer from short to long of another derivative (instead of the commodity itself) called a delivery instrument. The delivery instrument gives its holder the right to take possession of the commodity from a specified warehouse on demand. The price of an expiring futures contract then is equivalent to the going price of a delivery instrument.”

¹ <http://www.ers.usda.gov/amber-waves/2013-august/solving-the-commodity-markets'-non-convergence-puzzle.aspx#.UjWKYbl6kdU>

- **Storage fees of commodities**

According to Adjemian et al. (2013, August, 14, footnote 1), “the price of storing a physical commodity from one month to the next is freely set in the storage services market. That price occurs at the intersection of the supply and demand for storage services, which changes over time. As the demand for storage services rises, the price of physical storage also rises, all else equal. In contrast, the storage fee for a delivery instrument is set by its futures exchange. When a long futures contract holder receives a delivery instrument from the short, he or she pays the latter fee to the warehouse that is responsible for providing grain, until the (former) long chooses to sell the instrument or cancel it by taking physical possession of the grain (a process known as “loading-out”). Historically, the delivery instrument storage fee remains unchanged by exchanges for long periods of time.”

APPENDIX

Regulating Measures

If Masters' (2008, 2009) recommendations would be implemented by the US Congress and new restrictions imposed on the trade of agricultural commodities, the list of regulating measures and acts would become one entry richer. According to Bayer's (2009) historical review of regulations and acts which had the objective in the past to stabilise and control commodity futures markets, there have been varying positions on the issue about limiting open-interest positions in agricultural commodity markets. Table A highlights that since 1917 measures have tried to better regulate futures commodity markets and abolish loopholes on how commodities are traded. Hence, efforts to regulate markets are not new.

Table A: Chronological overview on regulating measures (Source: adapted from Bayer (2009))

Regulating Measures	Key Aspects
Food Control Act (1917) during 1 st World War	<ul style="list-style-type: none"> Trade of wheat banned Trade of corn limited at 0.5 million bushel <i>Impacts</i> <ul style="list-style-type: none"> No manipulation of agricultural markets
Future Trading Act (1921) (unimportant)	<ul style="list-style-type: none"> Farmers make speculants responsible for low grain prices Aim to limit positions, but not accepted by US Senate
Grain Futures Trading Act (1922) (evolved from Future Trading Act)	<ul style="list-style-type: none"> Still no controls on futures market
Commodity Exchange Act (1936)	<ul style="list-style-type: none"> Development of Commodity Exchange Commission (CEC) CEC received the right to limit open positions 1938 CEC limits open positions of wheat, corn, oat and others at 2 million bushel 1940 open position limit on cotton 1951 limits on soybeans 1960s limits on onions, eggs and potatoes
Commodity Futures Trading Commission (CFTC) (1974)	<ul style="list-style-type: none"> CFTC responsible to control limits of open positions CFTC took over responsibilities from USDA 1979 all upper limits removed
Futures Trading Act (1986)	<ul style="list-style-type: none"> CFTC has full discretion to remove limits from different actors including swap dealers <i>Impact</i> <ul style="list-style-type: none"> Caused the 'swap gap' which was seen as negative: swap dealers could hedge and take over risk from index investors
Chicago Mercantile Exchange (CME) (1992)	<ul style="list-style-type: none"> No upper limits, but high open limits must be justified Due to the available Eurodollar-futures and currency contracts trade became more liquid, no limits anymore needed
Commodity Futures Modernization Act (2000)	<ul style="list-style-type: none"> No limits on positions Enacting of threshold levels justifying open limits
CFTC Reauthorizin Act (2008)	<ul style="list-style-type: none"> CFTC can investigate against market participants who trespass threshold levels that require justification CFTC is allowed to oversee electronic trading markets
Next Act (?)	<ul style="list-style-type: none"> New limits (?)

However, whether Masters' ambition to regulate the trading of index funds would be the right response to the last food crisis, is highly disputed. As of today, there is no compelling evidence available that would prove that long-only index funds have a direct connection to influencing agricultural commodity prices (Prehn et al., 2013). Actually, Prehn et al. (2013) even argue that index funds have a stabilising effect on agricultural commodity prices as they are represented by a large portfolio comprising of different commodities. Hence, they serve to represent the market index. They further argue that index funds provide liquidity on the agricultural futures commodity market which allows farmers to hedge their prices at lower costs. This hedging at lower prices makes it less attractive for speculators to become active as not much is expected to be gained. As a result, there is large consensus among agricultural economists (Glauben et al., 2012) that index funds are positive for the trade of agricultural commodities. Finally, they reject the notion that speculators or index funds would have anyhow been responsible for the past food crisis. Instead, it is believed that changing fundamentals triggered price increases among various commodities.