

A Review of the G20 Meeting on Agriculture: Addressing Price Volatility in the Food Markets

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Abstract

Food price volatility has spiked to levels last seen in the 1970s. For low-income countries, food price hikes, such as have occurred recently, tend to significantly increase the incidence of intra-state conflicts, according to IMF research. Therefore, it was fitting and proper that the G20 meeting of agricultural ministers, which was hosted by France at the end of June, put food insecurity squarely at the top of the 2011 G20 agenda.

The June G20 agricultural meeting resulted in an action plan that will be carried forward at the Cannes Summit of G20 leaders in November.

The 2007-2008 food crisis, and the resumption of more recent food price spikes, clearly have a number of causes, which will require a great deal of political courage to address and ameliorate. That said, in reviewing over a century of commodity price volatility, there are episodes of low volatility and high volatility, which would indicate that this may be a pattern of recurrent phenomena. As a result, it may be wise to focus on how to manage price volatility rather than believe that this phenomenon can be eradicated, as noted by Dr. Pierre Jacquet of the Agence Française de Développement.

The World Bank, for example, has launched a program that will assist and encourage companies in developing countries to buy insurance in the derivative markets against sudden changes in food prices, according to the Financial Times. Notably, the action plan, agreed to by the G20 agricultural ministers in June, largely embraces market-based solutions to the problems of food insecurity and food volatility, amongst its many action items.

In contrast to the benign view of commodity derivatives trading, French president Nicolas Sarkozy stated at the opening of the June G20 agricultural meeting that "the financialization of agriculture markets ... is a contributory factor in price volatility" and that this was a priority issue for regulators to address.

Ultimately, whether commodity derivatives trading (and speculation) increases price volatility is an empirical question. Assuming that one has access to transparent market-participant, position, and price data, one can carry out empirical studies to confirm or challenge this assumption.

In reviewing the evidence so far regarding the impact of commodity trading, speculation, and index investment on price volatility, this report finds that the evidence for the prosecution does not seem sufficiently compelling at this point. That said, given the disastrous performance of financial institutions in 2007 and especially, in 2008, it is fully appropriate to revisit one's assumptions regarding the economic usefulness of all manner of financial instruments, including commodity derivatives contracts.

This paper's conclusion is to agree with the World Bank president who has said, "the answer to food price volatility is not to prosecute or block markets, but to use them better." And one sensible use of financial engineering is for hedging volatile food price risk with appropriate commodity derivatives contracts.

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The work presented herein is a detailed summary of academic research conducted by EDHEC-Risk Institute. The opinions expressed are those of the author. EDHEC-Risk Institute declines all responsibility for any errors or omissions.

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Introduction

On the 22nd and 23rd of June this year, France hosted a meeting of the G20 agricultural ministers, which focused attention on the damaging effect of soaring food prices on the world's most vulnerable, particularly in Africa. Figure 1, for example (see appendix), shows how explosive the recent rise in the price of corn has been, relative to the last sixty years. This topic was a departure from the past priorities of the G20, which had previously focused on responding to the global financial crisis. The G20 is an assembly of nineteen top developed and developing countries and also includes the European Union as a member. The G20's presidency rotates each year amongst its members, and this year the leader of the forum is France.

It is fitting that food security and food price volatility would be a topic that France, in its role as G20 president, would bring forth as an urgent agenda item. Each country has its own "hard-won lessons of historical experience." Professor David Hackett Fischer notes in his 1996 book, *The Great Wave: Price Revolutions and the Rhythm of History*, that: "Most historians in the United States are familiar only with one great [price] wave, the price-revolution of the sixteenth century. *Its successor, the inflation of the eighteenth century, has been much discussed by French scholars in relation to the [French] revolution in 1789, but it is little known in America or Britain where its effects were less dramatic.*" (P. 6.)

Figure 2 shows the price of grain in Western Europe from the past eight centuries (through 1960). According to Fischer, "This wave-pattern is familiar to European scholars, but it is not well known in the English-speaking world." (P. 5.)

One could argue that France's hard-won lessons from eighteenth-century history

provide the country's authorities with a keen (and appropriate) sensitivity to the potential consequences of food riots in the developing world. This sensitivity informs the urgency of the action plan that was agreed to at the June G20 agricultural meeting in Paris.

Correspondingly, in the U.S., there is a rich historical experience with controversies over agricultural futures trading that date to the founding of the Chicago Board of Trade in the nineteenth century, as presented in Till (2011). The appendix includes a summary of U.S. legislation and regulatory action that sought to curb and monitor speculative activity in the commodity markets since 1921, drawing from Lewis (2009).

From 1884 through 1953 alone, there were at least 330 bills introduced in the U.S. Congress that sought to "limit, obstruct, or prohibit futures trading," according to Jacks (2007). More recently, "U.S. and international commodity markets experienced a period of rapid increases from 1972-1975, setting new all-time highs across a broad range of markets," noted Sanders *et al.* (2008). These price increases were "blamed on speculative behavior associated with the 'tremendous expansion of trading in futures in a wide range of commodities,'" according to Cooper and Lawrence (1975) and as cited by Sanders *et al.* (2008).

As a result, a review of U.S. history provides valuable lessons in figuring out what is necessary for agricultural futures trading to continue and prosper during times of political pressure. These lessons are particularly helpful in knowing how to respond to some of the criticisms of agricultural futures trading that were levied by the French president in the lead-up to the June G20 meeting.

Introduction

This position paper will briefly cover the issues that led to the June G20 agricultural meeting, and will note how the meeting's proposed action plan responded to these issues. This action plan will be submitted to the leaders of the G20 at a summit that will take place in November of this year.

This paper will then conclude with a brief discussion of the criticism of agricultural futures trading that occurred during the run-up to the June G20 meeting, and will note how one responds to this criticism, largely based on empirical studies.



1. Lead-Up to G20 Meeting

Food price volatility has spiked to levels last seen in the 1970s. Figure 3 shows real food price volatility from 1875 to 2009, as calculated by Roache (2010) in an International Monetary Fund (IMF) working paper.

According to Lewis (2011), "the world would exhaust global corn inventories in just 47 days on current consumption patterns. This is the most precarious level of corn inventories since 1974." See Figure 4, which shows the global corn inventory-to-use ratios since 1965.

"Meanwhile global inventory-to-use ratios for wheat and soybeans are close to their long-run historical averages," continues Lewis (2011).

Professor Scott Irwin of the University of Illinois explained the situation with corn prices to White (2011): "We are in the part of the [corn] price curve that, in 'economist-speak,' is highly non-linear."

The current "bull market rally, following so soon after the 2007-08 rally, seems similar to the early-mid 1970s series of rallies," recorded White (2011) in his interview with Irwin.

This comparison is apparent from Figure 1's price series.

As noted by the *Financial Times* (2011), a key "reason for price rises [in commodities] is largely benign: surging demand in emerging economies such as China and India is a [natural] corollary of rising living standards."

But there is an added element in the demand mix: bio-fuel mandates.

Continues Irwin in White (2011):

"... the true spike or boom phase will probably last longer in this episode because of the bio-fuels mandates and high fuel prices working together."

Because of governmental policies mandating ethanol use, price may not function effectively to ration corn demand, a constraint that did not exist in the 1970s.

Arezki and Brückner (2010) studied the consequences of increases in international food prices in an IMF working paper. The researchers examined over 120 countries from the period, 1970 to 2007. They find that:

"... for the Low Income Countries[,] increases in ... international food prices significantly increase the incidence of anti-government demonstrations, riots, and civil conflicts."

While for High Income Countries:

"... increases in international food prices did not have a significant effect on intra-state stability."

This IMF study was particularly timely, as it followed the 2007-2008 food riots in some developing countries, and preceded the Arab Spring revolts, which in turn may have been fueled by the fresh food price spikes that occurred at the beginning of this year. The latter point is according to AFP (2011).

In the face of these challenges, timely and accurate information on crops from *all* producer nations would be very helpful, as noted in De La Hamaide and Maitre (2011), during the lead-up to the June G20 meeting.

The 2007-2008 food crisis may have been accentuated by the "export restraints implemented by [some] major grain

1. Lead-Up to G20 Meeting

exporting countries," notes Dollive (2008). "The impact of export restraints ... suggests that governments should use them cautiously." This was another area of discussion in the lead-up to the G20 meeting.

In addition to the current problems with food insecurity, long-range forecasts on world population provide a further reason for elevating agricultural policy within the G20 agenda. The Food and Agriculture Organization (FAO) of the United Nations (2009) has predicted that the world's population may grow to 9 billion by 2050, which would require food production (net of what is used for bio-fuels) to grow by 70%.

At a conference co-organized by the French Embassy in London on June 1st, Dr. Pierre Jacquet, Chief Economist of the Agence Française de Développement, noted that in examining over a century of commodity price volatility, there are periods of high volatility and periods of low volatility (which, in turn, we can see from Figure 3.) "So it seems that it is a reoccurrent phenomenon." Therefore, Jacquet stated that:

"... we should not delude ourselves in thinking that if we address ... [the fundamental] causes [of the recent spike in volatility that] volatility will be something of the past. ... I think it is vital to focus also on the way to manage volatility rather than to think we can erase volatility."

Jacquet stated that a number of market-based solutions could potentially help developing countries better manage commodity price volatility, including increasing access to risk-hedging instruments.

Regarding market-based solutions, the World Bank announced on June 21st

that they would take "the rare step of encouraging companies in developing countries to buy insurance in the derivatives markets against sudden changes in food prices," reported Blas (2011). This deal, which was arranged with JP Morgan, would allow developing nations to potentially hedge \$4 billion worth of commodities.

Explained Blas (2011):

"The World Bank will underwrite \$200 million in credit risk under the initiative while JP Morgan will take on a similar amount. ... this should enable countries to gain up to \$4 billion in price protection. The institution said that other banks were likely to join later."

"Robert Zoellick, the World Bank president, said ... [this] 'agriculture price risk management tool' showed what 'sensible financial engineering' could do," continued Blas' report.

The French-embassy-sponsored June 1st conference in London also addressed bio-fuel mandates. Richard Gower, who is a policy advisor for Oxfam UK, noted that developed countries should consider introducing "a price trigger so that when food prices are high, you divert those stocks of grains from fuel to food." This proposal would address Irwin's concern that at least for corn prices, price might not serve its normal function of rationing demand in the face of current mandates.

A further issue discussed in the run-up to the G20 agricultural meeting is the chronic failure to raise yields in some parts of the world, including in Africa. Professor Tony Venables, Director of the Oxford Centre for the Analysis of Resource Rich Economies, noted at the London June 1st conference that in "some places in Africa [the yields] are the same now as they were in Europe during Roman times."

2. The G20 Action Plan on Food Price Volatility and Agriculture

On the 23rd of June, the G20 agricultural ministers agreed to an action plan that will be carried forward at the G20 Cannes Summit in November. Essentially, this plan includes the following items: (1) coordinating further agronomic research, (2) extending access to risk-management hedging tools to companies in developing countries, (3) creating an international database of agricultural production, consumption, and inventories to enhance the quality of global food balance sheets, (4) instituting a rapid response international forum for dealing urgently with emerging food crises, (5) agreeing that export restrictions should not apply to humanitarian food aid; (6) creating targeted food safety nets for vulnerable populations; (7) researching the impact of bio-fuel mandates on food prices; (8) setting up regional emergency humanitarian food reserves; (9) strengthening the open and rules-based global trade system for agricultural products; (10) fostering "innovation in plant breeding, including by strengthening internationally agreed legal mechanisms for plant varieties;" (11) encouraging "efforts to establish proper investment environments, including through [the] improvement of law[s] and regulations" in developing countries; and (12) supporting appropriate regulation of agricultural derivatives trading, including enhancing the transparency of over-the-counter derivatives trading and where appropriate, requiring the establishment of position limits.

The action plan also documented the large number of multilateral organizations that contributed to its formulation and who would also be involved in carrying out the plan's recommendations.

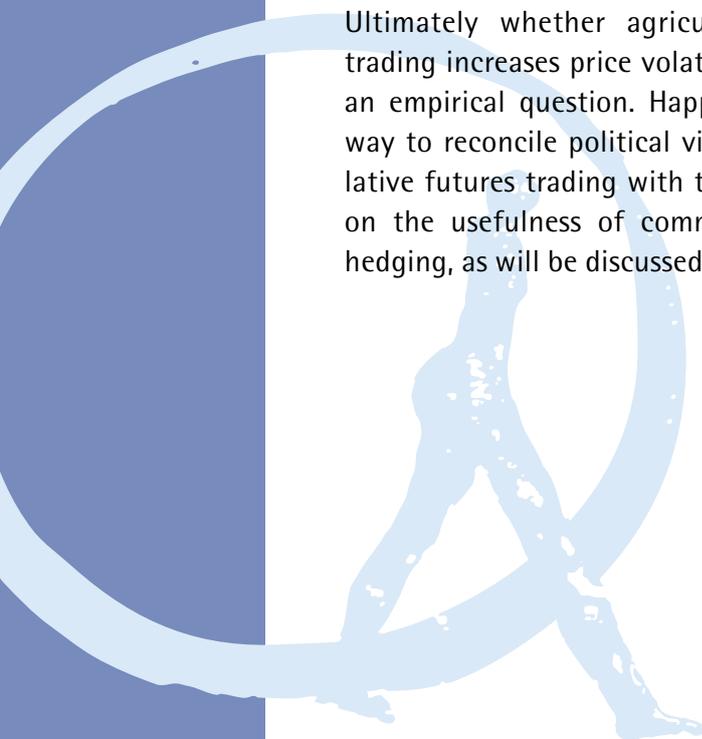
Interestingly, the communiqué essentially embraced commodity derivatives trading because of the potentially valuable service that derivatives hedging can provide in managing price risk.

3. Criticism of Commodity Derivatives Trading

In contrast to the benign view of commodity derivatives trading, French President Nicolas Sarkozy stated at the opening of the G20 meeting that "the financialization of agriculture markets ... is a contributory factor in price volatility ..." and that this was a priority issue for regulators to address.

The following section of the position paper will address that criticism.

Ultimately whether agricultural futures trading increases price volatility (or not) is an empirical question. Happily, there is a way to reconcile political views on speculative futures trading with technical views on the usefulness of commodity futures hedging, as will be discussed further below.



4. Academic Response to Criticism of Commodity Trading

Essentially, the historical lessons from past challenges to futures trading in the United States are as follows:

1. Constantly revisit the economic usefulness of commodity futures trading.
2. Insist upon transparency in market-participation and position data in a sufficiently disaggregated fashion as to be useful, but also in a sufficiently aggregated fashion as to not violate individual privacy.
3. Carry out empirical studies to confirm or challenge the benefits and/or burdens of futures trading.

With each of these elements addressed, futures trading in the U.S. has survived and prospered despite numerous challenges.

In an EDHEC-Risk position paper, Till (2009) discusses how potentially useful the Working T index is in evaluating the excessiveness or inadequacy of speculative participation in a commodity futures market. In order to be able to calculate this statistic, though, one needs complete transparency of prices, and one must be able to classify why a trader is involved in a market: is it for commercial hedging purposes or otherwise?

The T index was created by the Stanford University economist, Holbrook Working, and is described in Working (1960). The idea behind the T index is that the economic function of commodity futures markets is for hedging and fulfilling risk-management needs. Even when commodity futures markets are viewed as "hedging" markets, there is still a vital role for speculators because there will not always be an even balance of short hedgers and long hedgers at any one time. Therefore, speculators are needed to balance the market. Historically, in the agricultural

futures markets, there actually was an *inadequacy* of speculation to provide for commercial hedging needs.

The question confronting us is whether there is an overabundance of speculation, including index investment, relative to commercial hedging needs in the agricultural markets. Quite simply, if there is more speculation than is required for commercial hedging needs, then the futures markets become one of speculators trading with other speculators, and the century-long question concerning the economic usefulness of futures markets would need to be addressed yet again.

Sanders *et al.* (2008) define the Working T index as follows:

$$T = 1 + SS / (HL + HS) \text{ if } (HS \geq HL)$$

or

$$T = 1 + SL / (HL + HS) \text{ if } (HL > HS)$$

where open interest held by speculators (non-commercials) and hedgers (commercials) is denoted as follows:

SS = Speculation, Short
HL = Hedging, Long
SL = Speculation, Long
HS = Hedging, Short"

Some explanation is in order to make this statistic (hopefully) intuitive. The denominator is the total amount of futures open interest due to hedging activity. If the amount of short hedging is greater than the amount of long hedging, then speculative longs are needed to balance the market; and technically, speculative shorts are not required by hedgers. Any surplus of speculative short positions would thereby need to be balanced by additional speculative long positions. Technically, then the speculative short positions would be superfluous or perhaps even "excessive."

4. Academic Response to Criticism of Commodity Trading

The Speculative T index measures the excess of speculative positions beyond what is technically needed to balance commercial needs, and this excess is measured relative to commercial open interest.

Sanders *et al.* (2008) write that:

"Working is careful to point out that what may be 'technically an excess of speculation is economically necessary' for a well-functioning market."

In summary, levels of the T index can tell us whether speculative derivatives trading is excessive (or not) relative to commercial hedging needs, provided that we have the required transparency in market-participation and position data. This statistic enables us to reconcile the disparate views on whether speculative trading is excessive, or whether it is beneficial by providing liquidity for commercial hedgers.

Irwin and Sanders (2011) note that:

"Utilizing Working's speculative T index, ... the level of speculation in nine agricultural futures markets from 2006-2008 (adjusting for index fund positions) *was not excessive* ... [and was] within the realm of historical norms." [Italics added]

See Figure 5 for a comparison of recent T index levels to levels that have prevailed since 1947.

Ironically, from a theoretical standpoint, we would actually expect futures trading (and speculation) to *lessen* price volatility.

How could that be the case?

In addition to transparent price discovery, one crucial economic function of commodity futures markets is to enable the hedging of prohibitively expensive inventories, with the assumed result that

more inventories would be privately held than otherwise would be the case.

More inventories, than otherwise would be the case, would lessen the possibility of commodity price spikes. The more speculators there are, the more opportunity there is for commercial hedgers to find a natural other side for hedging prohibitively expensive inventories. This in turn means that more inventories can be economically held. Then with more inventories, if there is unexpected demand, then one can draw from inventories to meet demand, rather than have prices spike higher to ration demand.

There is some empirical evidence to support the theory that speculative involvement actually reduces prices volatility.

Brunetti *et al.* (2011) examined five markets, including corn, over the period 2005 to 2009 and found that:

"... speculative trading activity largely reacts to market conditions and *reduces* volatility levels, consistent with the hypothesis that speculators provide valuable liquidity to the market." [Italics added]

In addition, Professor David Jacks of Simon Fraser University in Canada examined what happened to commodity-price volatility, across countries and commodities, before and after specific commodity-contract trading has been prohibited in the past. Jacks (2007) also examined commodity-price volatility before and after the establishment of futures markets, across time and across countries. Jacks' study included data from 1854 through 1990.

He generally, but not always, found that commodity-price volatility was greater when there were *not* futures markets than when they existed, over 1-year, 3-year, and 5-year timeframes.

4. Academic Response to Criticism of Commodity Trading

More recently, Irwin and Sanders (2011) note that “[commodity] index positions led to lower volatility in a statistical sense,” when examining 12 agriculture markets and 2 energy futures markets from June 2006 to December 2009. Specifically:

“... there is *mild* evidence of a negative relationship between index fund positions and the volatility of commodity futures prices, consistent with the traditional view that speculators reduce risk in the futures markets and therefore lower the cost of hedging.” [Italics added]

In the above, we have briefly reviewed evidence that futures trading, speculation, and commodity index investment may have had a largely benign effect on price volatility. An interesting follow-up question to ask is: what *did* cause the periodic bouts of high volatility shown in Figure 3 in Roache (2010)?

Roache (2010) writes that there have been four episodes of “increases in long-run food-price volatility” since 1885:

“The first two occur during periods when global trade was impeded (the First World War and the inter-war years immediately following and the Second World War) ... The next rise in volatility followed the breakdown of the Bretton Woods exchange rate regime in the early 1970s ...”

We are currently in the midst of the fourth episode of a notable increase in volatility.

Roache (2010) finds that the following two variables “explain a relatively large part of the rise in [low frequency] volatility since the mid-1990s”: (1) the variation in U.S. inflation and (2) the U.S. dollar exchange rate.

Not only can we review empirical studies to provide us with an answer on what

the impact of futures trading has been on price volatility, but we can also examine empirical studies on what the impact of position limits has been on price volatility.

For example, one answer may be found in the U.S. Commodity Futures Trading Commission (CFTC) documents that were obtained by the *Wall Street Journal* through a Freedom of Information Act request in May 2010, according to Lynch (2010). A CFTC economist memorandum from 21st August 2009 stated that:

“In our analysis of the impact of position limits, we find little evidence to suggest that changes from a position limit regime to an accountability level regime or changes in the levels of position limits impact price volatility in either energy or agricultural markets. Our results are consistent with those found in the existing literature on position limits.”

One fact to emphasize is that some U.S. agricultural futures markets currently do operate under a position-limit regime defined by the CFTC, so one has to be careful in arguing that position limits are a particularly onerous constraint on market participants, at least under current rules. The disadvantage in focusing on position limits was noted by CFTC Commissioner Michael Dunn in an article by Loder and Brush (2011) on the energy markets:

“My fear is that, at best, position limits are a cure for a disease that does not exist. Or at worst, a placebo for one that does.”

A 2010 policy brief from the FAO provides a note of caution, regarding making position limits too onerous:

“Efforts to reduce speculation in futures markets might ...have unintended consequences. Mechanisms to intervene in futures markets, if the futures price diverges

4. Academic Response to Criticism of Commodity Trading

from an equilibrium level determined by market fundamentals (a level which in itself will be difficult to determine), might divert speculators from trading and thus lower the liquidity in the market available for hedging purposes."

The FAO policy brief also reinforces the importance of appropriate regulatory measures, including "increasing transparency and the amount of available information on futures trading."



Conclusion

Although the developed world's focus in the last three years has been on the unfolding global financial crisis, the June G20 agricultural meeting in Paris appropriately brought much-needed attention to the damaging impact of food insecurity and food price volatility on developing countries. The meeting's communiqué largely bypassed the controversy surrounding agricultural futures trading, and instead embraced market-based solutions in dealing with food price volatility, amongst its many action items. This position paper notes that whether speculative derivatives trading has been excessive and has led to increased price volatility are empirical questions, which can be readily addressed whenever trading and market-participant data is publicly available.

In conclusion, we would agree with the World Bank president, who stated in Zoellick (2011): "the answer to food price volatility is not to prosecute or block markets, but to use them better."

Appendix

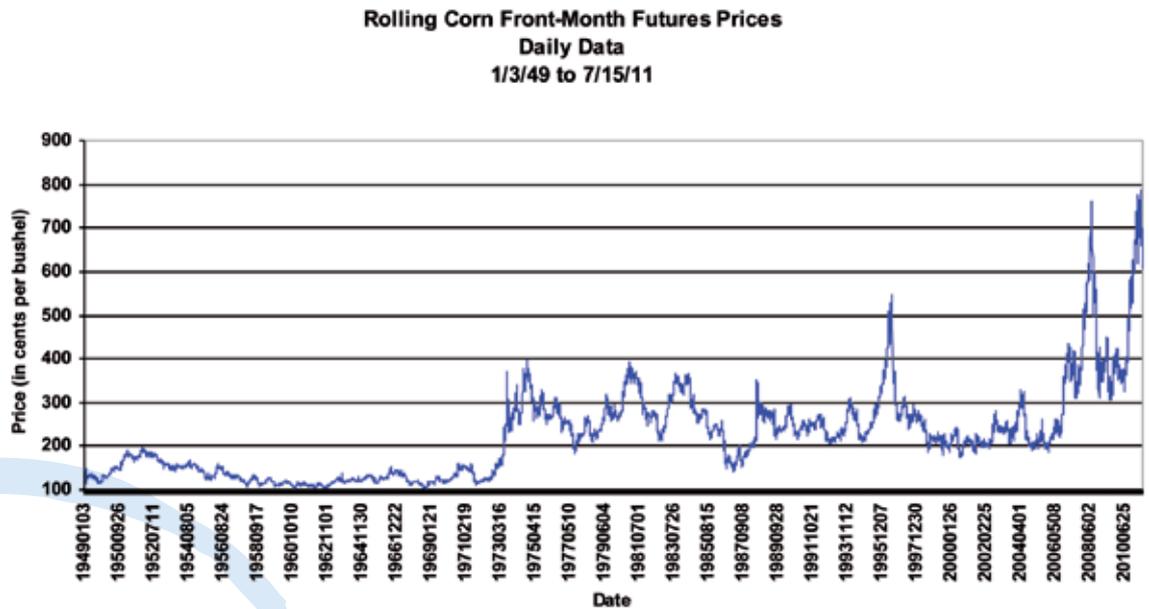
U.S. Legislation and Regulatory Action to Curb and Monitor Speculative Activity in the Commodity Markets

Date	Regulation	Action
September 1921	Futures Trading Act	The Act provides for the regulation of futures trading in grains, such as corn, wheat, oats and rye. The Act empowers the US Secretary of Agriculture to designate exchanges that meet certain requirements as "contract markets" in grain futures. The aim was to prevent market manipulation by the exchanges' members, firms and employees. The Act also imposed a prohibitive US\$20 per bushel tax on all options trades and on grain futures trades that were not executed on a designated contract market as specified by the Federal Government.
September 1922	Grain Futures Act	The 1921 Futures Trading Act is declared unconstitutional. Instead of taxing futures and options trading, the 1922 Act bans off-contract-market futures trading.
June 1923		The Grain Futures Exchange implements a larger trader reporting system. It requires each clearing member to report on a daily basis the market positions of each trader exceeding a specified size.
February 1927		The Secretary of Agriculture suspends until November 1927 larger trader reporting requirements. This follows complaints that the requirements were preventing large bullish speculators from entering the market, thus allegedly depressing grain prices. Following the suspension, the Grain Futures Administration determines that larger trader reporting requirement did not discourage bullish speculators.
June 1936	Commodity Exchange Act	Following the collapse in grain and cotton prices during the 1930s, the Commodity Exchange Commission (CEC) was established. The 1936 Act extends and strengthens the government's regulatory powers to a longer list of commodities. The act provided for the adoption of position and trading limits to restrict the number of futures contracts that could be held by large individual speculators. It also prohibits the trading of options on commodities traded on futures exchanges.
December 1947	Amendment to the 1936 Commodity Exchange Act	The Commodity Exchange Authority replaces the CEC. Following a rise in commodity prices after WWII, the Act allows the publication of the names and addresses and market positions of large traders. In its first declaration, the Secretary of Agriculture publishes the names of 35,000 traders. President Truman orders the CEA to require futures exchanges to raise margin requirements to 33% on all speculative positions.
August 1958	Onion Futures Act	Trading in the Golden Globe onion futures contract on the Chicago Mercantile Exchange is banned. This followed excessive moves in the onion price during 1955.
October 1974	Commodity Futures Trading Commission Act	The Commodity Futures Trading Commission (CFTC) is established. It extends the jurisdiction of the CFTC from agricultural commodities to futures trading in all commodities, which becomes effective in April 1975.
August 1977		The CFTC requests the US district Court in Chicago to instruct the Hunt family of Dallas to liquidate positions that exceed three million bushel speculative position limit for soybean futures on the CBOT.
March 1979		The CFTC votes to prohibit trading in the CBOT March wheat futures contract. This is the first time the Commission has ordered a market to close in the interest of preventing price manipulation.
March 1980		After careful consideration, the CFTC votes not to use its emergency powers to order suspension of trading in silver futures as prices plummet.
October 1981	Regulation 1.61	The CFTC requires exchanges to establish speculative position limits in all futures contracts.
January 1991		The CFTC reports to Congress that it finds no evidence that the sharp rise in energy prices has been caused by manipulation or excessive speculation.
August 2004		After a seven-month investigation, the CFTC concludes that there is no evidence that any entity or individual attempts to distort natural gas prices in late 2003.
Summer 2009		The CFTC holds three public hearings to discuss speculative position limits and exemptions in energy markets.

Source: Lewis (2009).

Appendix

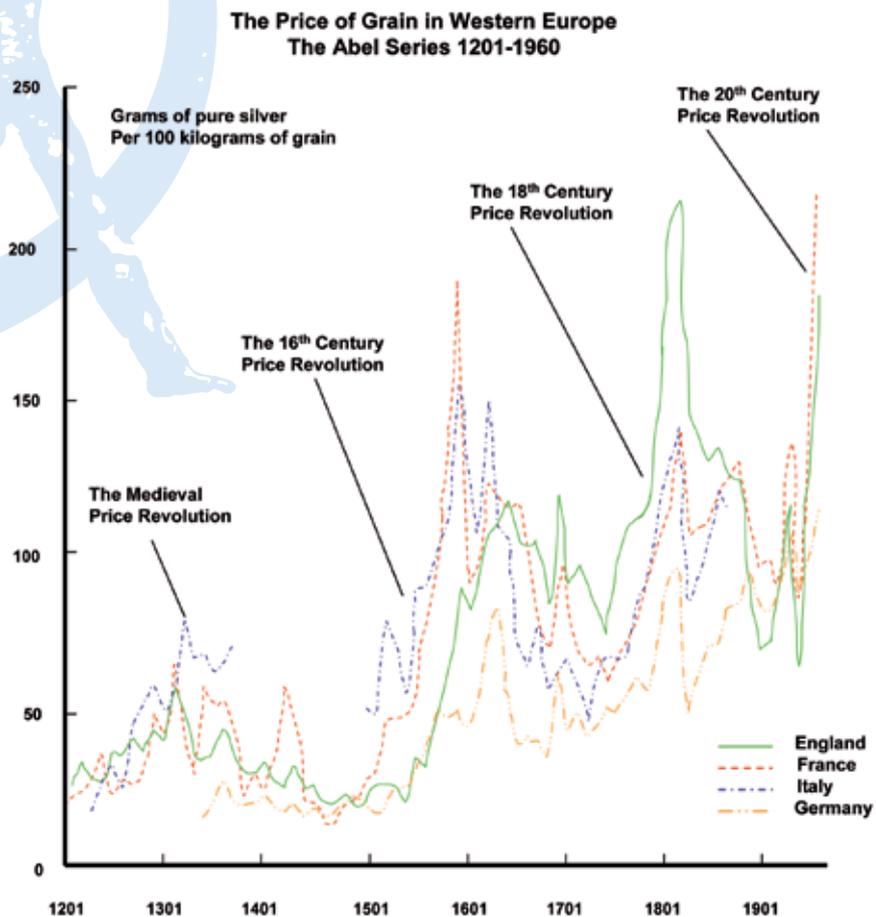
Figure 1:



Updated graph from Till (2007), Figure 2.

Data Sources: Commodity Systems Incorporated, Commodity Research Bureau, and Bloomberg.

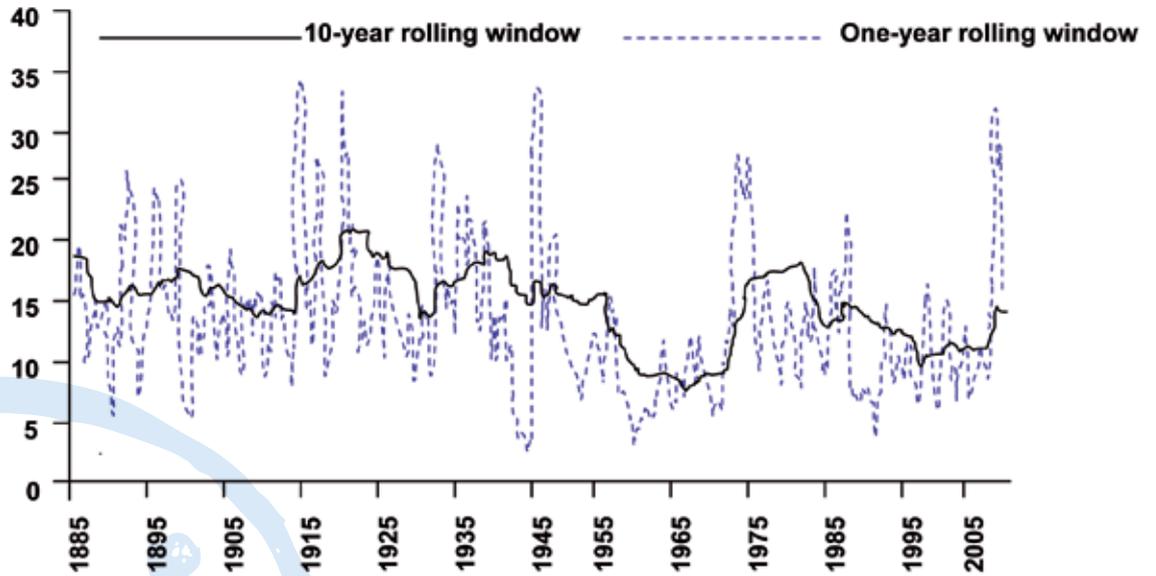
Figure 2:



Graph based on Fischer (1996), Figure 0.02. According to Fischer, this figure "represents decennial movements in the price of grain ... from 1201 to 1960. It includes wheat in England, France, and Italy; and rye ... in Germany. Prices are decennial means, converted to silver equivalents (grams of pure silver per 100 kilograms of grain). The source [of this data, in turn] is [from] Wilhelm Abel, *Agrarkrisen und Agrarkonjunktur: Eine Geschichte der Land- und Ernährungswirtschaft Mitteleuropas seit dem hohen Mittelalter* (1935; Hamburg and Berlin, 1966)."

Appendix

Figure 3:
Real Food Price Volatility 1875 to 2009
(Annualized Standard Deviation Percent)

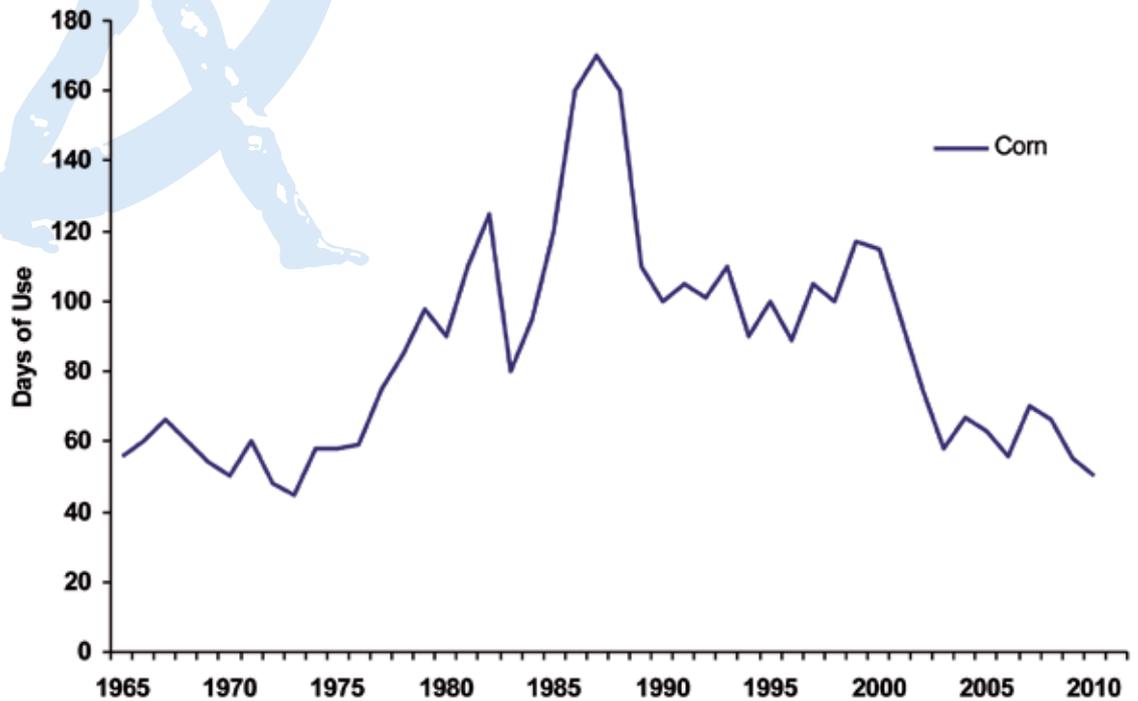


Graph based on Roache (2010), Figure 1.

Author's Data Sources: Global Financial Data; IMF; and author's calculations.

"Equally-weighted index of 6 commodities, including corn, palm oil, rice, soybeans, and wheat. These U.S. dollar denominated price series are deflated by the U.S. consumer price index."

Figure 4: Inventory-to-Use Ratio for Corn
Total Available Stocks Divided by Daily Consumption



Graph based on Lewis (2011), Figure 1.

Author's Data Sources: Deutsche Bank and USDA.

Appendix

Figure 5: Calculations of Working's Speculative T Index from 1947 through 2008 for the U.S. Agricultural Futures Markets

Market	Working ^a	Labys & Granger ^b	Peck ^c	Peck ^c	Leuthold ^d	CIT Adjusted ^e
	1954-1958	1950-1965	1947-1971	1972-1977	1969-1980	2006-08
Corn	1.16	1.19	1.263-1.609	1.045-1.204		1.06-1.34
Soybeans	1.28	1.31	1.329-1.946	1.061-1.310		1.10-1.45
Soybean Oil	1.14	1.18				1.07-1.15
CBOT Wheat	1.22	1.19	1.355-1.891	1.094-1.323		1.19-1.49
KCBOT Wheat			1.081-1.264	1.009-1.045		1.05-1.36
Cotton	1.27					1.16-1.27
Live Cattle				1.568-2.173	1.05-2.34	1.13-1.60
Feeder Cattle					1.08-3.80	1.14-2.61
Lean Hogs					1.10-8.69	1.18-1.68
Average	1.21	1.22	1.26-1.68	1.155-1.411	1.08-4.94	1.12-1.55

Source: Sanders et al. (2008), Table 10.

CIT stands for Commodity Index Traders report.

Sources of prior calculations of Working's Speculative T index along with notes on their calculation, as drawn from Sanders et al. (2008):

a - Working, H., 1960, "Speculation on Hedging Markets," Food Research Institute Studies 1, pp. 185-220.

"Non-reporting traders are allocated to hedging or speculating based on the levels of hedging and speculating in reported positions."

b - Labys, W. and C. Granger, 1970, *Speculation, Hedging and Commodity Price Forecasts*, Lexington, MA: Heath Lexington Books. "Non-reporting traders are allocated to hedging or speculating based on the levels of hedging and speculating in reported positions following the method of Working (1960)."

c - Peck, A., 1980, "The Role of Economic Analysis in Futures Market Regulation," American Journal of Agricultural Economics 62, p. 1037-1043.

"Peck estimates an upper (lower) bound by assuming all non-reporting traders are speculators (hedgers). The date range represents the most inclusive time period over which the index was calculated across the markets."

d - Leuthold, R., 1983, "Commercial Use and Speculative Measures of Livestock Commodity Futures Markets," Journal of Futures Markets 3, pp. 113-135.

"Leuthold estimates an upper (lower) bound by assuming all non-reporting traders are speculators (hedgers). The date range represents the most inclusive time period over which the index was calculated across the markets."

e - "Upper (lower) range results from assuming that non-reporting traders are speculators (hedgers)."

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