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OECD Food, Agriculture and Fisheries Working Papers No. 27

The Impact of Index and Swap Funds on Commodity Futures Markets

PRELIMINARY RESULTS

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Executive Summary

The report was prepared for the OECD by Professors Scott Irwin and Dwight Sanders. It represents a preliminary study which aims to clarify the role of index and swap funds in agricultural and energy commodity futures markets. The full report including the econometric analysis is available in the Annex to this report.

While the increased participation of index fund investments in commodity markets represents a significant structural change, this has not generated increased price volatility, implied or realised, in agricultural futures markets. Based on new data and empirical analysis, the study finds that index funds did *not* cause a bubble in commodity futures prices. There is no statistically significant relationship indicating that changes in index and swap fund positions have increased market volatility. The evidence presented here is strongest for the agricultural futures markets because the data on index trader positions are measured with reasonable accuracy. The evidence is not as strong in the two energy markets studied here because of considerable uncertainty about the degree to which the available data actually reflect index trader positions in these markets.

An unexpected finding was a negative relationship between index and swap fund positions and market volatility. That is, there is some evidence that increases in index trader positions are followed by lower market volatility. This result must be interpreted with considerable caution. The possibility still exists that trader positions are correlated with some third variable that is actually causing market volatility to decline. Nonetheless, this finding is contrary to popular notions about the market impact of index funds, but is not so surprising in light of the traditional problem in commodity futures markets of the lack of sufficient liquidity to meet hedging needs and to transfer risk.

The empirical evidence presented in this preliminary study does not appear at present to warrant extensive changes in the regulation of index funds participation in agricultural commodity markets; any such changes require careful consideration so as to avoid unintended negative impacts. For example, limiting the participation of index fund investors could unintentionally deprive commodity futures markets of an important source of liquidity and risk-absorption capacity at times when both are in high demand.

Lack of convergence between spot and futures prices in certain markets, however, does raise a number of issues about the functioning of these markets and possible role of index funds. Further research is needed to understand better these recent structural changes in futures marks and how they may impact on the dynamics of price formation. But at this time, the weight of evidence clearly suggests that increased index fund activity in 2006-08 did *not* cause a bubble in commodity futures prices.

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THE IMPACT OF INDEX AND SWAP FUNDS ON COMMODITY FUTURES MARKETS: PRELIMINARY RESULTS

1. Introduction

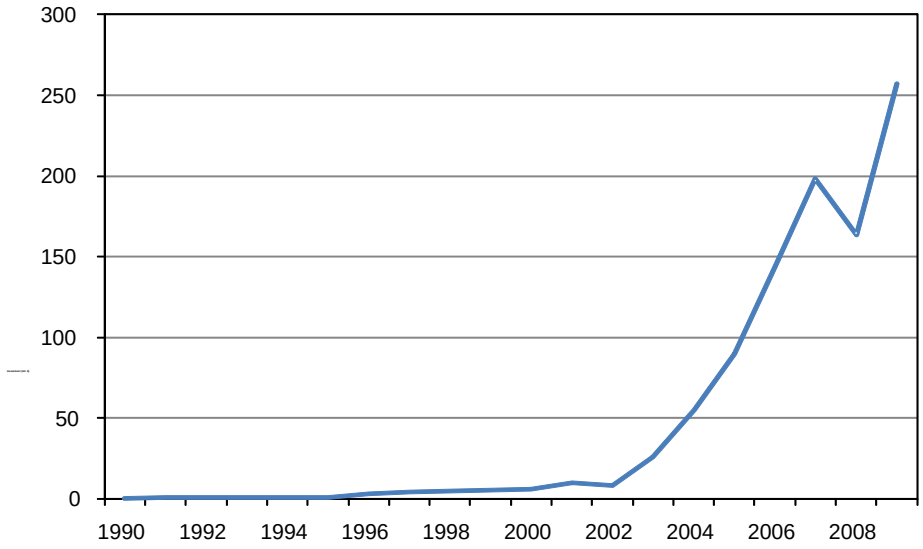
1. The financial industry has developed new products that allow institutions and individuals to invest in commodities through long-only index funds, over-the-counter (OTC) swap agreements, exchange traded funds, and other structured products.[1] Box 1 provides key definitions used in the discussion; see the glossary for a complete set of definitions. Regardless of form, these instruments have a common goal: to provide investors with buy-side exposure to returns from a particular index of commodity prices. The S&P GSCI Index™ (Standard's and Poor's Goldman Sachs Commodity Index) is one of the most widely tracked indexes and is generally considered an industry benchmark. It is computed as a production-weighted average of the prices from 24 commodity futures markets.

2. Several influential studies in recent years purport that investors can capture substantial risk premiums and reduce portfolio risk through relatively modest investment in long-only commodity index funds. Combined with the availability of deep and liquid exchange-traded futures contracts, this evidence fuelled a dramatic surge in index fund investment. Some describe this surge and its attendant impacts as the "financialization" of commodity futures markets. Given the size and scope of commodity index funds, it should probably not come as a surprise that a world-wide debate has ensued about their role in commodity markets. The debate has important ramifications from a policy and regulatory perspective as well as practical implications for the efficient pricing of commodity products.

3. There are a few indisputable facts about the behaviour of commodity futures markets over 2006-08, the period associated with the most controversy regarding the impact of money inflows from commodity index funds. First, inflows into long-only commodity index funds did increase rather substantially throughout 2006-08 (see Figure 1). According to the most widely-quoted industry source (Barclays) index fund investment increased from USD 90 billion at the beginning of 2006 to a peak of just under USD 200 billion at the end of 2007. Second, commodity prices have also increased rather dramatically - 71% as measured by the Commodity Research Bureau index - from January 2006 through June of 2008 (see Figure 2). Third, prices declined almost equally dramatically from June 2008 through early 2009 (see Figure 2). These facts are clear and not in dispute. It's the interpretation of the interaction among these facts that is so controversial.

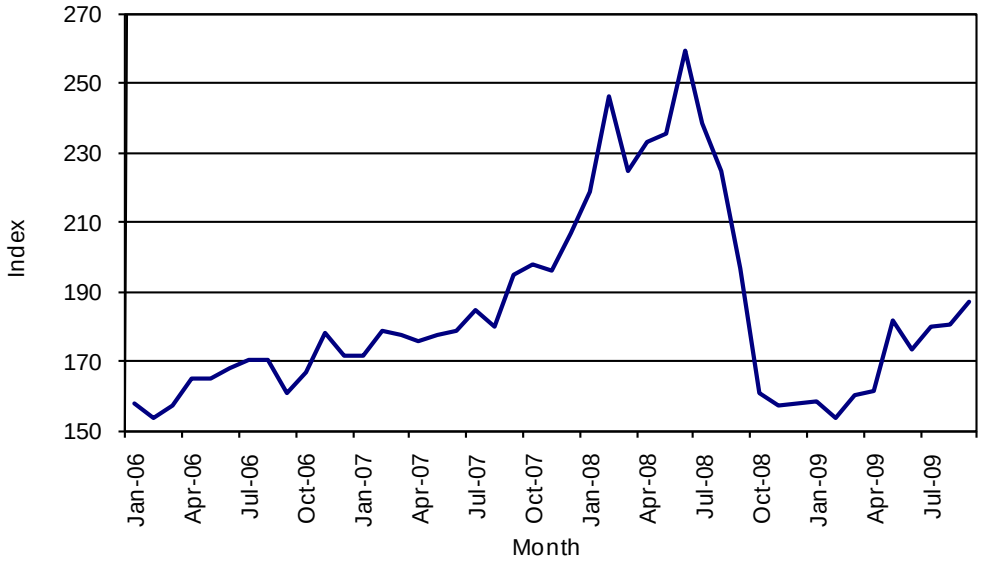
[1] In the remainder of this report, the term "commodity index fund" or "index fund" is used generically to refer to all of the varied long-only commodity investment instruments.

Figure 1. Commodity index fund investment (year end), 1990 – 2009



Source: Barclays

Figure 2. CRB Commodity index, January 2006 - September 2009



4. On one side, some hedge fund managers, commodity end-users, and policy-makers assert that speculative buying by index funds on such a wide scale created a "bubble," with the result that commodity futures prices far exceeded fundamental values during the boom. This view has led to new regulatory initiatives to limit speculative positions in commodity futures markets. On the other side, a number of economists have expressed scepticism about the bubble argument. These economists argue that commodity markets were driven by fundamental factors that pushed prices higher. For example, the main factors cited as driving the price of crude oil include strong demand from China, India, and other developing nations, a levelling out of crude oil production, a decrease in the responsiveness of consumers to price increases, and U.S. monetary policy. In the grain markets, the diversion of row crops to biofuel production and weather-

related production shortfalls are cited, as well as demand growth from developing nations and U.S. monetary policy.

Box 1. Key definitions

Speculator: In commodity futures, a trader who does not hedge, but who trades with the objective of achieving profits through the successful anticipation of price movements

Hedger: A trader who enters into positions in a futures market opposite to positions held in the cash market to minimize the risk of financial loss from an adverse price change; or who purchases or sells futures as a temporary substitute for a cash transaction that will occur later. One can hedge either a long cash market position (e.g., one owns the cash commodity) or a short cash market position (e.g., one plans on buying the cash commodity in the future).

Swap: In general, the exchange of one asset or liability for a similar asset or liability for the purpose of lengthening or shortening maturities, or otherwise shifting risks. This may entail selling one securities issue and buying another in foreign currency; it may entail buying a currency on the spot market and simultaneously selling it forward. Swaps also may involve exchanging income flows; for example, exchanging the fixed rate coupon stream of a bond for a variable rate payment stream, or vice versa, while not swapping the principal component of the bond. Swaps are generally traded over-the-counter.

Swap Dealer (AS): An entity such as a bank or investment bank that markets swaps to end users. Swap dealers often hedge their swap positions in futures markets.

Commodity Index Funds: Financial product whose value is based on an index of commodity futures prices.

Over-the-Counter (OTC): The trading of commodities, contracts, or other instruments not listed on any exchange. OTC transactions can occur electronically or over the telephone.

Speculative Bubble: A rapid run-up in prices caused by excessive buying that is unrelated to any of the basic, underlying factors affecting the supply or demand for a commodity or other asset. Speculative bubbles are usually associated with a "bandwagon" effect in which speculators rush to buy the commodity (in the case of futures, "to take positions") before the price trend ends, and an even greater rush to sell the commodity (unwind positions) when prices reverse.

Long: (1) One who has bought a futures contract to establish a market position; (2) a market position that obligates the holder to take delivery; (3) one who owns an inventory of commodities.

Long Hedge: Hedging transaction in which futures contracts are bought to protect against possible increases in the cost of commodities.

Short: (1) The selling side of an open futures contract; (2) a trader whose net position in the futures market shows an excess of open sales over open purchases. See Long.

Short Hedge: Selling futures contracts to protect against possible decreased prices of commodities.

Open Interest: The total number of futures contracts long or short in a delivery month or market that has been entered into and not yet liquidated by an offsetting transaction or fulfilled by delivery.

Excessive Speculation: Amount of speculation beyond that which is necessary or normal relative to hedging needs, as measured by Working's T. A large part of technically excess speculation is economically necessary for a well functioning market. The ratio of the amount of speculation to hedging needs must thus be greater than 1 for futures markets to have sufficient liquidity to fulfill their economic role. For Working's T-values of 1.15 or less markets are considered to have insufficient liquidity though there is an excess of speculation, technically speaking.

5. Even though almost two years have passed since the 2008 peak in commodity prices, the controversy surrounding index funds continues unabated. We contend that a detailed and dispassionate synthesis of the arguments and latest research will be of great utility to market observers and policymakers

given the strident nature of the debate. Policy makers need to have a full picture of the current state of scientific knowledge on the impact of commodity index funds before imposing costly new regulations. In this paper, we provide an overview of the arguments concerning the impact of index funds in commodity futures markets as well as an assessment of the latest research on the subject. We also summarise some new empirical evidence on the market impact of commodity index funds.

2. It was a Bubble

6. Masters (2008) has interwoven investment and price data to create the most widely-cited bubble argument, painting the activity of index funds as akin to the infamous Hunt brothers' cornering of the silver market. He blames the rapid increase in overall commodity prices from 2006-08 on institutional investors' embrace of commodities as an investable asset class. As noted in the introduction, it is clear that considerable dollars flowed into commodity index funds over this time period. However, the evidence provided by Masters is limited to anecdotes and the temporal correlation between money flows and prices. Masters and White (2008) recommend specific regulatory steps to address the alleged problems created by index fund investment in commodity futures markets, including the re-establishment of speculative position limits for all speculators in all commodity futures markets and the elimination or severe restriction of index speculation.

7. A similar position was taken by the U.S. Senate Permanent Subcommittee on Investigations in its examination of the performance of the Chicago Board of Trade's (CBOT) wheat futures contract (USS/PSI, 2009, p. 2):

> "This Report finds that there is significant and persuasive evidence to conclude that these commodity index traders, in the aggregate, were one of the major causes of "unwarranted changes"—here, increases—in the price of wheat futures contracts relative to the price of wheat in the cash market. The resulting unusual, persistent and large disparities between wheat futures and cash prices impaired the ability of participants in the grain market to use the futures market to price their crops and hedge their price risks over time, and therefore constituted an undue burden on interstate commerce. Accordingly, the Report finds that the activities of commodity index traders, in the aggregate, constituted "excessive speculation" in the wheat market under the Commodity Exchange Act."

8. Based on these findings, the Subcommittee recommended: 1) phasing out of existing position limit waivers for index traders in wheat, 2) if necessary, imposition of additional restrictions on index traders, such as a position limit of 5 000 contracts per trader, 3) investigation of index trading in other agricultural markets, and 4) strengthening of data collection on index trading in non-agricultural markets.

9. One of the limitations of the bubble argument made by Masters and others is that the link between money inflows from index funds and commodity futures prices is not well developed. This allows critics to assert that bubble proponents make the classical statistical mistake of confusing correlation with causation. In other words, simply observing that large investments have flowed into the long side of commodity futures markets at the same time that prices have risen substantially does not necessarily prove anything without a logical and causal link between the two. One attempt to establish this linkage is found in Petzel's (2009, pp. 8-9) testimony at a CFTC hearing on position limits in energy futures markets:

> "Seasoned observers of commodity markets know that as non-commercial participants enter a market, the opposite side is usually taken by a short-term liquidity provider, but the ultimate counterparty is likely to be a commercial. In the case of commodity index buyers, evidence suggests that the sellers are not typically other investors or leveraged speculators. Instead, they are owners of the physical commodity who are willing to sell into the futures market and either deliver

> at expiration or roll their hedge forward if the spread allows them to profit from continued storage. This activity is effectively creating "synthetic" long positions in the commodity for the index investor, matched against real inventories held by the shorts. We have seen high spot prices along with large inventories and strong positive carry relationships as a result of the expanded index activity over the last few years."

10. In essence, Petzel argues that unleveraged futures positions of index funds are effectively synthetic long positions in physical commodities, and hence represent new demand. If the magnitude of index fund demand is large enough relative to physically-constrained supplies in the short-run, prices and price volatility can increase sharply. The bottom-line is that the size of index fund investment is "too big" for the current size of commodity futures markets.

11. Hamilton (2009) provides a more formal theoretical treatment of the issues. He begins by noting that the key challenge is reconciling a speculative bubble in crude oil prices with changes in the physical quantities of crude oil. A standard argument is that a price bubble will inevitably lead to a rise in inventories as the quantity supplied at the "bubble price" exceeds the quantity demanded. Hamilton's theoretical model shows the conditions that must occur for index fund speculation to lead to a bubble in a storable commodity market such as crude oil. First, index fund positions in the futures market must have a positive relationship to the level of futures prices. Otherwise there is no mechanism for the flow of index fund investment to initiate the bubble that starts in the futures market. Second, the elasticity of demand for the commodity (or the final product, gasoline in the case of crude oil) must be zero or very close to zero. This allows the bubble-related increase in the futures price to be fully passed on to consumers. Third, inventories of the commodity must not increase. These conditions provide an important theoretical framework on which to base empirical tests for the potential of price bubbles in storable commodity futures prices.

3. It was not a Bubble

12. A number of economists have expressed scepticism about the bubble argument. These economists cite several contrary facts and argue that commodity markets were driven by fundamental factors that pushed prices higher. Irwin, Sanders, and Merrin (2009) present a useful summary of the counter arguments made by these economists. Specifically, they note three logical inconsistencies in the arguments made by bubble proponents as well as five instances where the bubble story is not consistent with observed facts. Here, we review these points as well as some additional arguments made by both pro- and anti-bubble proponents in response.

13. The first possible logical inconsistency within the bubble argument is equating money inflows to commodity futures markets with demand. With equally informed market participants, there is no limit to the number of futures contracts that can be created at a given price level. Index fund buying in this situation is no more "new demand" than the corresponding selling is "new supply". Combined with the observation that commodity futures markets are zero-sum games, this implies that money flows in and of themselves do not necessarily impact prices. Prices will only change if new information emerges that causes market participants to revise their estimates of physical supply and/or demand.

14. What happens when market participants are not equally informed? When this is the case, it is rational for participants to condition demands on both their own information and information about other participants' demands that can be inferred ("inverted") from the futures price. The trades of uninformed participants can impact prices in this more realistic model if informed traders mistakenly believe that trades by uninformed participants reflect valuable information. Hence, it is possible that other traders in commodity futures markets interpreted the large order flow of index funds on the long side of the market as a reflection of valuable private information about commodity price prospects, which would have had the

effect of driving prices higher as these traders revised their own demands upward. Of course, this would have required a large number of sophisticated and experienced traders in commodity futures markets to reach a conclusion that index fund investors possessed valuable information that they themselves did not possess.

15. The second possible logical inconsistency is to argue that index fund investors artificially raised both futures and cash commodity prices when they only participated in futures markets. Futures contracts are financial transactions that only rarely involve the actual delivery of physical commodities. In order to impact the equilibrium price of commodities in the cash market, index investors would have to take delivery and/or buy quantities in the cash market and hold these inventories off the market. Index investors are purely involved in a financial transaction using futures markets; they do not engage in the purchase or hoarding of the cash commodity and any causal linkages between their futures market activity and cash prices is unclear at best. Hence, it is wrong to draw a parallel between index fund positions and past efforts to "corner" commodity markets, such as the Hunt brothers' effort to manipulate the silver market in 1979-80.

16. A third possible logical inconsistency is a blanket categorization of speculators, in particular, index funds, as wrongdoers and hedgers as victims of their actions. In reality, the "bad guy" is not so easily identified since hedgers sometimes speculate and some speculators also hedge. For example, large commercial firms may have valuable information gleaned from their far-flung cash market operations and trade based on that information. The following passage from a recent article on Cargill, Inc. (Davis, 2009) nicely illustrates the point:

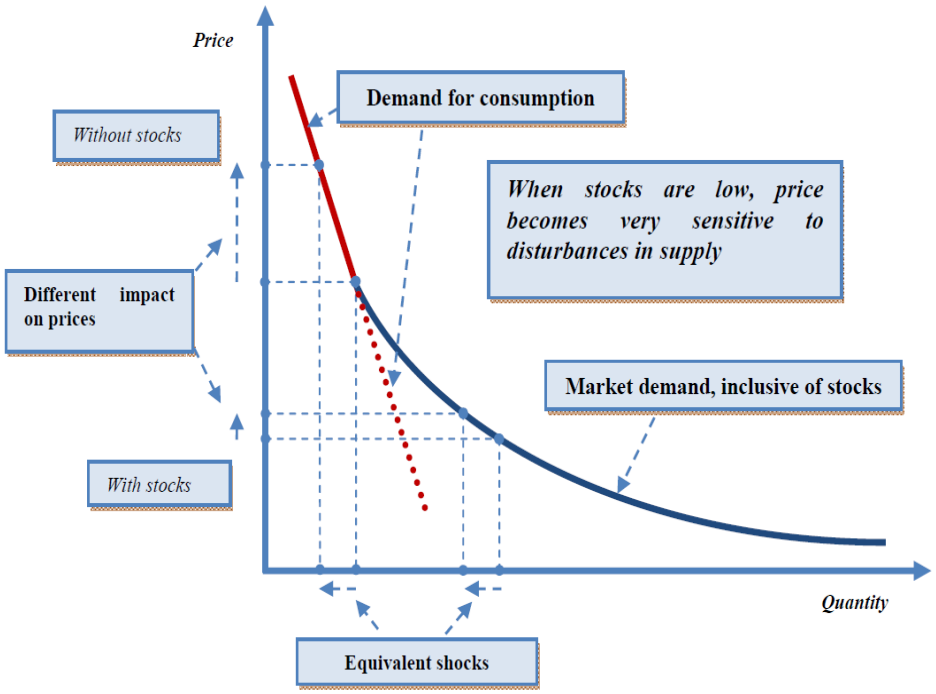
> Wearing multiple hats gives Cargill an unusually detailed view of the industries it bets on, as well as the ability to trade on its knowledge in ways few others can match. Cargill freely acknowledges it strives to profit from that information. "When we do a good job of assimilating all those seemingly unrelated facts," says Greg Page, Cargill's chief executive, in a rare interview, "it provides us an opportunity to make money...without necessarily having to make directional trades, *i.e.*, outguess the weather, outguess individual governments."

17. The implication is that the interplay between varied market participants is more complex than a standard textbook description of pure risk-avoiding hedgers and pure risk-seeking speculators. The reality is that market dynamics are ever changing and it can be difficult to understand the motivations and market implications of trading, especially in real-time.

18. In addition to the logical inconsistencies, there are several ways the bubble story is not consistent with the observed facts. First, as Krugman (2008) asserts, if a bubble raises the market price of a storable commodity above the true equilibrium price, then stocks of that commodity should increase (much like a government imposed price floor can create a surplus). Stocks were declining, not building, in most commodity markets over 2006-08, which is inconsistent with the depiction of a price bubble in these markets.

19. Second, the relationship between prices and inventories for storable commodities is highly convex. Figure 3, drawn from Wright (2009), illustrates this point. Note that a given reduction in quantity due a to supply and/or demand shock will have a much larger impact on price when starting with a low quantity (inventories) compared to when starting with a high quantity. It also implies that relatively minor reductions in quantity can result in very large increases in price when the market supply/demand balance is especially tight. Smith (2009) argues that it is plausible that a series of seemingly small supply disruptions in the spring and summer of 2008 could explain the large increase in crude oil prices during this time period in view of the extreme convexity of the pricing function for crude oil in the short-run.

Figure 3. Hypothetical example of a convex pricing function for a storable commodity



20. Third, theoretical models that show uninformed or noise traders impacting market prices rely on the unpredictable trading patterns of these traders to make arbitrage risky. Because the arbitrage - needed to drive prices to fundamental value - is not riskless, noise traders can drive a wedge between market prices and fundamental values. Importantly, index fund buying is very predictable. That is, index funds widely publish their portfolio (market) weights and roll-over periods. Thus, it seems highly unlikely that other large and rational traders would hesitate to trade against an index fund if they were driving prices away from fundamental values.

21. Fourth, if index fund buying drove commodity prices higher then markets without index fund investment should not have seen prices advance. Again, the observed facts are inconsistent with this notion. Irwin, Sanders, Merrin (2009) show that markets without index fund participation (fluid milk and rice futures) and commodities without futures markets (apples and edible beans) also showed price increases over the 2006-2008 period. Stoll and Whaley (2009) report that returns for Chicago Board of Trade (CBOT) wheat, Kansas City Board of Trade (KCBOT) wheat, and Minneapolis Grain Exchange (MGEX) wheat are all highly positively correlated over 2006-09, yet only CBOT wheat is used heavily by index investors. In a similar fashion, Commodity Exchange (COMEX) gold, COMEX silver, New York Mercantile (NYMEX) palladium, and NYMEX platinum futures prices are highly correlated over the same time period but only gold and silver are included in popular commodity indexes. Headey and Fan (2008) cite the rapid increases in the prices for "non-financialized" commodities such as rubber, onions, and iron ore as evidence that rapid price inflation occurred in commodities without futures markets. While certainly instructive, the limits of these kinds of comparisons also need to be kept in mind. Bubble proponents have pointed out that commodity markets selected for the development of futures contracts may be naturally more volatile than those commodities without futures markets.

22. Fifth, speculation was not excessive when correctly compared to hedging demands. The statistics on long-only index fund trading reported in the media and discussed at hearings tend to view speculation in a vacuum - focusing on absolute position size and activity. Working (1960) argued that speculation must be gauged relative to hedging needs. In particular, speculation can only be considered 'excessive' relative to the level of hedging activity in the market. Utilizing Working's speculative "T-index", Sanders, Irwin, and Merrin (2010) demonstrate that the level of speculation in nine agricultural futures markets from 2006-08 (adjusting for index fund positions) was not excessive. Indeed, the levels of speculation in all markets examined were within the realm of historical norms. Across most markets, the rise in index buying was more than offset by commercial (hedger) selling. Buyuksahin and Harris (2009) use daily data from the CFTC's internal large trader database to show that Working's T-index in the crude oil futures market increased in parallel with crude oil prices over 2004-09 but the peak of the index was still well within historical norms. Till (2009) reports similar results for crude oil, heating oil, and gasoline futures over 2006-2009 using recently available data in the CFTC's *Disaggregated Commitments of Traders* report.

23. The sixth observable fact revolves around the impact of index funds across markets. A priori, there is no reason to expect index funds to have a differential impact across markets given similar position sizes. That is, if index funds can inflate prices, they should have a uniform impact across markets for the same relative position size. It is therefore difficult to rationalize why index fund speculation would impact one market but not another. Further, one would expect markets with the highest concentration of index fund positions to show the largest price increases. Irwin, Sanders, and Merrin (2009) find just the opposite when comparing grain and livestock futures markets. The highest concentration of index fund positions was often in livestock markets, which had smallest price increases through the spring of 2008. This is difficult to reconcile with the assertion that index buying represents demand.

4. Evidence to date

24. Not surprisingly, a flurry of studies has been completed recently in an attempt to sort out which side of the debate is correct. Some studies find evidence that commodity index funds have impacted commodity futures prices (Gilbert, 2009; Einloth, 2009; Tang and Xiong, 2010). Results in these studies negate the argument that *no* evidence exists of a relationship between index fund trading and movements in commodity futures prices. However, the evidence is weak because the data and methods used in most of these studies are subject to a number of important criticisms. Hamilton's (2009) study, while not definitive in terms of empirics, is the most important of this group because his theoretical model shows the conditions that must occur for index fund speculation to lead to bubble impacts in a storable commodity market such as crude oil.

25. A number of studies find little evidence of a relationship between index fund positions and movements in commodity futures prices (Stoll and Whaley, 2009; Buyuksahin and Harris, 2009; Sanders and Irwin, 2010a, 2010b; Aulerich, Irwin, and Garcia, 2010). This constitutes a rejection of the first theoretical requirement for speculative impacts. The most recent evidence in crude oil markets (Kilian and Murphy, 2010) also indicates a rejection of the second theoretical requirement for speculative impacts - a zero or near zero price elasticity of demand. In sum, the weight of the evidence at this point in time clearly tilts in favor of the argument that index funds did not cause a bubble in commodity futures prices.[2]

26. There is still a need for further research on the market impact of commodity index funds. The first reason is that direct tests of the relationship between index fund positions and price movements in energy futures markets have been hampered by the lack of publically-available data on positions of index funds in these markets. The second reason is ongoing concerns about the power of time-series statistical

[2] Annex I of this paper contains detailed reviews of the studies cited in this section. See also Irwin and Sanders (2010).

tests used in the studies that fail to find evidence of a relationship between index fund positions and movements in commodity futures prices. The time-series tests may lack statistical power to reject the null hypothesis because the dependent variable - the change in futures price - is extremely volatile. In the empirical analysis summarized in the following section, we attempt to address both of these deficiencies.

5. New evidence

27. Our empirical analysis relies on two related data sets compiled by the U.S. Commodity Futures Trading Commission (CFTC). The CFTC has long provided the breakdown of each Tuesday's open interest for U.S. markets in the *Commitments of Traders* (COT) report. Open interest for a given market is aggregated across all contract expiration months in the weekly report. The traditional COT categories include: commercials (hedgers), non-commercials (speculators), and non-reporting (all traders with position sizes below the reporting level).

28. Starting in 2007 - in response to complaints by traditional traders about the rapid increase in long-only index money flowing into the market - the CFTC began releasing the weekly *Supplemental Commodity Index Traders* (CIT) reports, which break out the positions of index traders for 12 agricultural markets. According to the CFTC, the index trader positions reflect both pension funds that would have previously been classified as non-commercials as well as swap dealers who would have previously been classified as commercials hedging OTC transactions involving commodity indices. The *CIT* data are generally considered the best glimpse of index trader activity in the 12 agricultural markets covered by the report.

29. While the *CIT* data represent an improvement over the traditional *COT* data, concerns were expressed almost immediately that the data did not extend to other markets, particularly energy and metals futures. In response to requests for more information about the composition of open interest in a broader set of markets, the CFTC began publishing the weekly *Disaggregated Commitments of Traders* (DCOT) report in September 2009 and ultimately provided historical data back to June of 2006. The *DCOT* data are available for the same 12 agricultural markets covered by the *CIT* report plus a number of energy and metal futures markets. Like the *CIT* report, the positions in the *DCOT* report represent the combined futures and delta-adjusted options positions aggregated across all contracts for a particular market. Reporting traders are classified into four categories: swap dealers, managed money, processors and merchants, and other reporting traders.

30. An important question, especially for the energy futures markets, is the degree to which the *DCOT* swap dealers category represents index fund positions. One can infer from comparisons found in the CFTC's September 2008 report on swap dealer positions (CFTC, 2008) that *DCOT* swap dealer positions in agricultural futures markets correspond reasonably closely to index trader positions. Since swap dealers operating in agricultural markets conduct a limited amount of non-index long or short swap transactions there is little error in attributing the net long position of swap dealers in these markets to index funds. However, swap dealers in energy futures markets conduct a substantial amount of non-index swap transactions on both the long and short side of the market, which creates uncertainty about how well the net long position of swap dealers in energy markets represent index fund positions.[3] For example, the CFTC estimates that only 41% of long swap dealer positions in crude oil futures on three dates in 2007 and 2008 were linked to long-only index fund positions (CFTC, 2008). Despite this limitation, swap dealers are used in the present study as the best available proxy for index positions in the energy futures markets.

31. The *CIT* data are available weekly from January 3, 2006 through December 29, 2009 and the *DCOT* data are available at the same frequency starting on June 13, 2006. To facilitate the comparison of

[3] This was precisely the reason that the CFTC excluded energy futures markets from the *CIT* report.

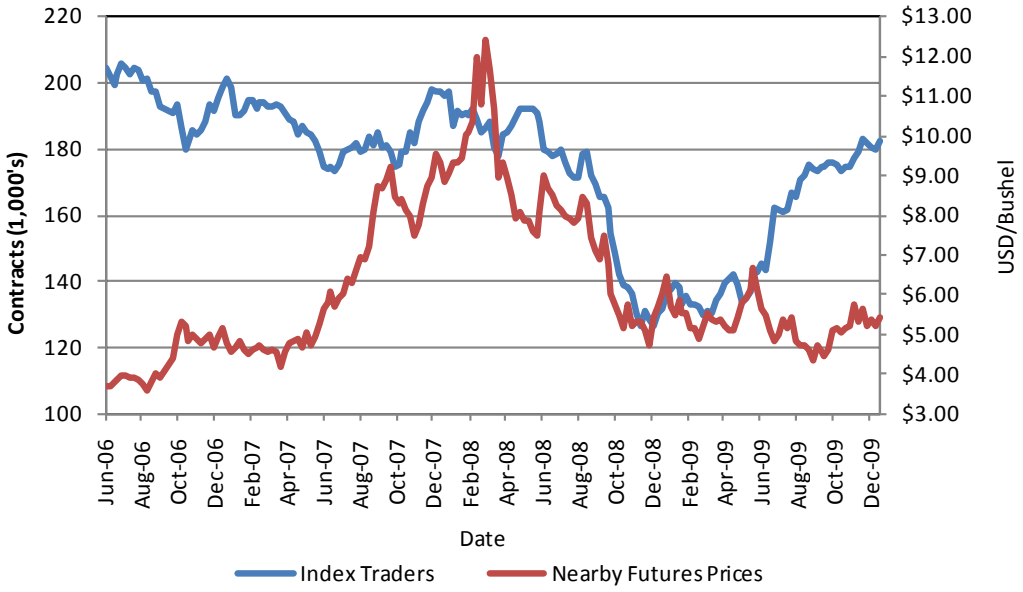
the data sets and results, a common sample starting on June 13, 2006 containing 186 weekly observations through December 29, 2009 was used in all empirical work.

32. Index trader positions are collected for the 12 *CIT* agricultural markets: Chicago Board of Trade (CBOT) corn, CBOT soybeans, CBOT soybean oil, CBOT wheat, Kansas City Board of Trade (KCBOT) wheat, New York Board of Trade (NYBOT) cotton, Chicago Mercantile Exchange (CME) live cattle, CME feeder cattle, CME lean hogs, NYBOT coffee, NYBOT sugar, and NYBOT cocoa. Corresponding *DCOT* data are collected for these 12 *CIT* markets along with the *DCOT* data for New York Mercantile Exchange (NYMEX) crude oil and natural gas. The focus in the *DCOT* data will be on swap dealer positions because of their potential link to index fund positions.

33. For the above markets, weekly futures returns (price changes) are calculated using nearby futures contracts, appropriately adjusting for contract roll-overs. In order to test for index trader impact on market variability, two measures of volatility are computed: implied volatility from the options markets and realized volatility as measured by Parkinson's (1980) extreme value estimator. It is important to establish whether or not index trader positions impact these market characteristics (returns, implied volatility, and realized volatility). Here, causal linkages are directly tested using Granger causality tests.

34. A simple graphical analysis of index trader positions and market prices can be misleading. As shown in Figure 4 for CBOT wheat, there are periods of time - such as mid-2007 through late 2008 - where there appears to be a close correspondence between index trader positions and price levels. Conversely, there are periods, such as most of 2009, where any relationship seems remote at best. This type of graphical inspection is commonly presented as establishing an "obvious" link between index positions and prices. However, it is fraught with statistical complications and begs for a more rigorous test of the linkages, if any.

Figure 4. Index trader net long positions in CBOT wheat and nearby futures prices, June 2006-December 2009

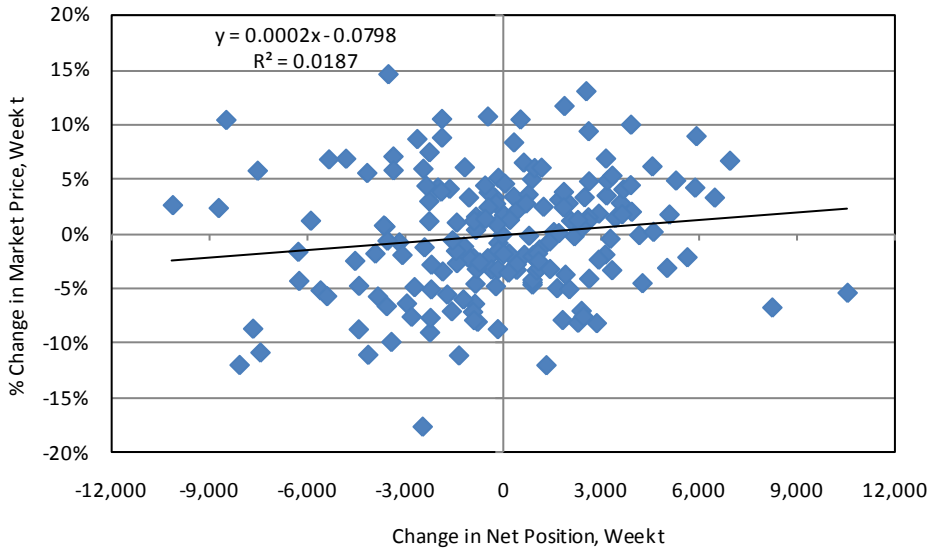


35. Granger causality is a standard statistical technique for determining whether one time series is useful in forecasting another. It is important to bear in mind that the term causality is used in a statistical sense, and not in a philosophical one of structural causation. More precisely a variable A is said to Granger cause B if knowing the time paths of B and A together improve the forecast of B based on its own time

path, thus providing a measure of incremental predictability. In our case the time series of interest are market measures of returns, implied volatility, and realized volatility, or variable B. The causal variables, or variable A, are measures of trader positions and speculation, including net long positions held by index funds, the percent of long positions held in each market by index funds, and Working's speculative index.

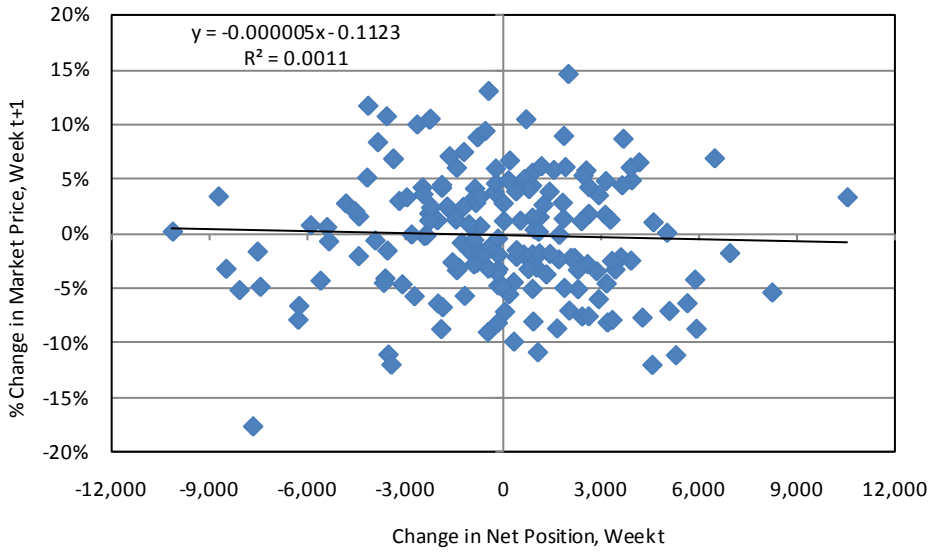
36. Simply put, Granger's test asks the question: Can past values of trader positions be used to predict either market returns or volatility? This is a much more demanding hurdle than simply looking for a contemporaneous correlation or association between variables. As shown in Figure 5, there is a positive contemporaneous association between changes in net positions held by index traders and price changes (returns) in the CBOT wheat market. The simple correlation coefficient is relatively low at 0.14; but, the relationship is statistically significant at the 10% level. However, the magnitude of the impact is quite low since a 3 000 contract increase in index traders' long position is associated with just a 0.6% increase in prices during the same week. More importantly, this contemporaneous analysis cannot distinguish between the increase in index traders' positions and other correlated shifts in fundamentals: correlation does not imply causation. Evidence of this point is found in Figure 6, which is the same as Figure 5 except there is a one week time lag between the change in index fund positions and the change in the futures price. As clearly shown in Figure 6, increases in net index fund positions are actually followed by small (statistically insignificant) declines in prices the subsequent week. In this example, there is no evidence that changes in index traders' net long positions lead to higher (or lower) market prices.

Figure 5. Contemporaneous relationship, CBOT wheat returns (price change) and index trader net long positions, June 2006-December 2009



Note: The slope of the regression line is positive and statistically different from zero at the 10% significance level. The simple correlation coefficient is 0.14.

Figure 6. Causal relationship, CBOT wheat returns (price change) and index trader net long positions, June 2006-December 2009



Note: The slope of the regression line is negative and not statistically different from zero at the 10% significance level. The simple correlation coefficient is -0.03.

37. More formal Granger causality tests are conducted for a number of combinations of causal variables (position measures) and market characteristics. A systems approach is used to test lead-lag dynamics. This improves the power of statistical tests by taking into account the contemporaneous correlation of model residuals across markets. The system test results are summarized in Table 1. The formal testing failed to find any reasonably consistent causal links between trader positions and returns. The only statistically significant finding was a negative relationship between positions and market volatility. That is, there is some consistent evidence that increases in index trader positions are followed by lower market volatility. Even these results for market volatility must be interpreted with caution. The possibility still exists that trader positions are correlated with some third variable that is actually causing market volatility to decline.

Table 1. Causal relationships estimated for market system, June 2006 - December 2009

	Causal Variable		
	Net Long Position in Contracts	**Percent of Long Positions**	**Working's Speculative Index**
Panel A: Index Traders			
Returns	No (negative)	No (positive)	NA
Implied Volatility	No (negative)	Yes (negative)	No (positive)
Realized Volatility	Yes (negative)	No (positive)	No (positive)
Panel B: Swap Dealers			
Returns	No (positive)	No (positive)	NA
Implied Volatility	No (negative)	Yes (negative)	NA
Realized Volatility	Yes (negative)	No (positive)	NA

Notes: A "Yes" indicates a statistically significant (5% level) causal relationship running from the causal variables (column headings) to the market factors (row headings) for the overall system test. A "No" indicates that no relationship was found. The direction of the causal relationship is indicated by "positive" or "negative" in parenthesis, regardless of whether the impact was statistically significant or not.

38. A simple statistical description of data on net positions of index traders and swap dealers is shown in Table 2, while Table 3 provides information on the total open interest contracts held by different players. The main characteristics of these data can be summarized as follows:

- The overlap between index trader positions (CIT data set) and those held by swap dealers (DCOT data set) is quite large for the traditional grain and livestock markets. It appears to be a somewhat weaker correspondence for the coffee, sugar, and cocoa markets. It is clear that the swap dealer positions for the energy markets contain many traders other than index funds. Swap dealer positions are at best an imperfect proxy for index fund positions in the energy markets.

- This is clearly seen in Table 2, which shows the net position (in contracts) held by index traders (Panel A) and swap dealers (Panel B) over the sample period. In Panel A, the minimum net long position held by index traders is never negative (short); whereas, in Panel B the minimum net long position for sugar, cocoa, crude oil, and natural gas is negative. In these markets, swap dealers clearly hold positions other than those representing long-only index investments.

Table 2. Summary statistics, net long positions held by index traders and swap dealers (# of contracts) June 2006-December 2009

Panel A: Index Traders

Market	Mean	Maximum	Minimum	St. Dev.
Corn	354 043	452 568	223 985	64 877
Soybeans	140 651	198 707	89 731	26 004
Soybean Oil	66 011	77 752	36 630	10 192
CBOT Wheat	174 677	205 585	126 545	21 769
KCBOT Wheat	28 654	46 527	16 293	6 011
Cotton	84 985	122 555	57 841	15 209
Live Cattle	110 006	156 752	80 276	20 632
Feeder Cattle	7 479	10 889	4 972	1 456
Lean Hogs	80 616	127 379	46 004	18 538
Coffee	44 451	67 021	30 572	9 697
Sugar	231 756	392 740	135 745	74 836
Cocoa	18 910	31 883	5 117	5 830

Panel B: Swap Dealers

Market	Mean	Maximum	Minimum	St. Dev.
Corn	313 172	430 100	163 606	77 941
Soybeans	121 557	193 888	73 898	27 892
Soybean Oil	61 453	89 502	27 442	16 234
CBOT Wheat	142 550	189 217	91 681	25 373
KCBOT Wheat	22 073	33 863	9 952	6 906
Cotton	72 092	118 380	42 637	16 797
Live Cattle	88 844	128 967	65 368	16 351
Feeder Cattle	4 161	6 723	1 730	1 194
Lean Hogs	69 149	114 377	36 326	16 858
Coffee	37 179	56 959	21 667	8 718
Sugar	132 099	271 255	-32 149	81 371
Cocoa	8 380	16 474	-5 103	4 763
Crude Oil	40 912	106 176	-10 534	27 504
Natural Gas	49 018	253 500	-67 553	78 063

Note: Net positions are simply calculated as long positions - short positions.

- Index fund and swap dealer positions are large. In an absolute sense, the largest average position sizes held in nearly every market is by long index funds or swap dealers. In some markets, such as CBOT wheat, the average position size for these traders is in excess of the speculative position limits. In a relative sense, index and swap dealer positions can also be quite large. Index traders often hold as much as 40% of the long positions in a market and the swap dealer category frequently holds over 30% of the long positions in a given market.

- Despite the large average position size, th*e* total size of index funds within a given market is not overwhelming. Table 3 shows the percent of the market that is compris*e*d of each trader category in the *CIT* (Panel A) and *DCOT* (Panel B) data.[4] In each market, the largest participant is a category *o*ther than index funds or swap dealers. In fact, in the *CIT* categories, index *tr*aders are the smallest category in 4 of the 12 markets and the second smallest in the other 8 markets. The exception is swap dealers in the crude oil market who account for 37% of the open interest. Again, this inconsistency indicates that the link

[4] The denominator in these calculations is the sum of total long and short open interest, or two times either the long or short total open interest.

between swap dealer positions and index traders may be weak in the energy markets.

Table 3. Percent of total open interest held by CIT and DCOT categories, June 2006-December 2009

Panel A: *CIT* Categories

Market	Non-Commercial	Commercial	Index	Non-Reporting
Corn	39%	35%	13%	14%
Soybeans	40%	33%	14%	14%
Soybean Oil	35%	44%	12%	8%
CBOT Wheat	41%	26%	23%	10%
KCBOT Wheat	28%	39%	12%	20%
Cotton	39%	38%	17%	6%
Live Cattle	38%	28%	20%	14%
Feeder Cattle	38%	17%	14%	31%
Lean Hogs	39%	25%	21%	14%
Coffee	43%	39%	13%	5%
Sugar	31%	44%	17%	8%
Cocoa	33%	54%	7%	6%

Panel B: DCOT Categories

Market	Managed Money	Producers & Merchants	Swap Dealers	Other Reporting	Non-Reporting
Corn	16%	32%	13%	25%	14%
Soybeans	19%	31%	13%	23%	14%
Soybean Oil	17%	42%	14%	18%	8%
CBOT Wheat	22%	23%	22%	22%	10%
KCBOT Wheat	19%	38%	10%	13%	20%
Cotton	16%	35%	18%	25%	%
Live Cattle	25%	27%	18%	16%	14%
Feeder Cattle	23%	17%	9%	20%	31%
Lean Hogs	23%	25%	19%	19%	14%
Coffee	20%	37%	14%	25%	5%
Sugar	16%	39%	19%	18%	8%
Cocoa	26%	48%	12%	9%	6%
Crude Oil	18%	18%	37%	23%	3%
Natural Gas	43%	12%	28%	11%	5%

39. The empirical results of the analysis are shown in Tables 4 through 7 and can be summarised by following general findings and representative results.

- There is no convincing evidence that positions held by index traders or swap dealers impact market returns. Except for a few instances in individual markets, Granger-style causality tests fail to reject the null hypothesis that that trader positions do not lead market returns.

- The full results for testing if CIT index traders lead market returns are shown in Table 4. In the individual markets, the null hypothesis of no causality can be rejected in cotton and corn at the 5% level (with 95% confidence). This is shown by the *p*-values for the null hypothesis that $\beta_j=0$, $\forall$j. Importantly, however, the directional impact for corn is negative while it is positive for cotton. This makes very little sense in the context of the current debate. Not surprisingly, the system-wide impact, which takes into account the opposing directional findings across markets, is negative (-0.4010) and indistinguishable from zero.

Table 4. Granger causality test results for CIT net positions do not lead returns, June 2006-December 2009

$$R_{t,k} = \alpha_k + \sum_{i=1}^{m} \gamma_{i,k} R_{t-i,k} + \sum_{j=1}^{n} \beta_{j,k} \Delta NET_{t-j,k} + \varepsilon_{t,k}$$ for each market, *k*, and time, *t*.

Market, k	*m,n*	*p*-value β_j=0, ∀j	Estimate $\sum \beta_j$	*p*-value $\sum \beta_j$=0
Corn	1,1	0.0002	-0.1210	
Soybeans	1,1	0.4206	-0.0444	
Soybean Oil	1,1	0.2922	0.0874	
CBOT Wheat	1,1	0.3629	0.0319	
KCBOT Wheat	1,1	0.1261	-0.1460	
Cotton	1,1	0.0018	0.3590	
Live Cattle	2,2	0.1812	0.0008	0.9861
Feeder Cattle	2,1	0.1300	-0.3730	
Lean Hogs	1,1	0.2078	-0.1320	
Coffee	1,1	0.3348	-0.1730	
Sugar	1,1	0.2647	-0.0520	
Cocoa	1,1	0.4591	0.1610	
		p-value $\beta_{j,k}$=0, ∀*j,k*	Estimate $\sum\sum \beta_{j,k}$	*p*-value $\sum\sum \beta_{j,k}$=0
System		0.0001	-0.4010	0.3836

Note: $\sum \beta_j$ values are taken to the 10^5 power.

Technical Note: The models are estimated across the *K* markets as an SUR system. Wald tests could not reject the following cross-market coefficient restrictions: $\alpha_1 = \alpha_2 = ... = \alpha_K$; $\gamma_{1,1} = \gamma_{1,2} = ... = \gamma_{1,K}$; and $\gamma_{2,1} = \gamma_{2,2} = ... = \gamma_{2,K}$ for all *K* markets. These restrictions are imposed on the system and the common coefficients are estimated as a single pooled parameter across all *K* markets.

- Larger long positions by index traders and swap dealers lead to lower market volatility in a Granger sense. There is a consistent tendency across a number of position and volatility measures to reject the null hypothesis that index trader positions do not lead market volatility. The direction of the impact is routinely negative. While index positions lead to lower volatility in a statistical sense, it is possible that trader positions coincide with some other fundamental variable that is actually causing the lower market volatility. Still, this result is contrary to popular notions about index traders increasing market volatility.

- These general conclusions apply to both the volatility implied in the options markets and realized volatility. As a representative example, consider the Granger causality test of the null hypothesis that *DCOT* swap dealers' net positions do not lead realised market volatility. The system estimation results are presented in Table 5. The null hypothesis is rejected at the 5% level in soybeans and cocoa. In both of these markets, the directional impact is negative: increases in net long positions held by swap dealers predict lower market volatility in the subsequent week. More convincing than the individual market results, the system results show that the aggregate directional impact is statistically negative (-36.1) with nearly 99% confidence (1 - 0.0131).

Table 5. Granger causality test results for DCOT swap dealer net positions do not lead realized volatility, June 2006-December 2009

$$RV_{t,k} = \alpha_k + \sum_{i=1}^{m} \gamma_{i,k} RV_{t-i,k} + \sum_{j=1}^{n} \beta_{j,k} \Delta NET_{t-j,k} + \varepsilon_{t,k} \text{ for each market, } k, \text{ and time, } t.$$

Market	*m,n*	*p*-value β_j=0, ∀j	Estimate $\sum \beta_j$	*p*-value $\sum \beta_j$=0
Corn	2,1	0.8258	0.2000	
Soybeans	4,1	0.0242	-3.3700	
Soybean Oil	2,1	0.5347	-0.9500	
CBOT Wheat	2,1	0.6975	0.4370	
KCBOT Wheat	3,1	0.1308	-5.5000	
Cotton	3,1	0.9358	0.2340	
Live Cattle	3,1	0.0600	-2.4600	
Feeder Cattle	3,1	0.5317	-5.8200	
Lean Hogs	3,1	0.1531	3.7900	
Coffee	1,2	0.1568	-11.8200	0.0581
Sugar	3,1	0.8018	-0.3200	
Cocoa	4,1	0.0420	-12.0300	
Crude Oil	3,1	0.0889	1.0500	
Natural Gas	1,1	0.5975	0.4610	
		p-value $\beta_{j,k}$=0, ∀*j,k*	Estimate $\sum\sum \beta_{j,k}$	*p*-value $\sum\sum \beta_{j,k}$=0
System		0.0408	-36.1000	0.0131

Note: $\sum \beta_j$ values are taken to the 10^5 power.

Technical Note: The models are estimated across the *K* markets as an SUR system. Wald tests could not reject the following cross-market coefficient restrictions: $\gamma_{3,1} = \gamma_{3,2} = ... = \gamma_{23,K}$ for all *K* markets. These restrictions are imposed on the system and the common coefficients are estimated as a single pooled parameter across all *K* markets.

- Excessive speculation - as measured by Working's T-index - is associated with greater subsequent variability in a few markets. These results conflict with negative relationships found between index trader positions and market volatility. The contrasting results suggests that excessive speculation is broader than just index fund activity and may be better measured with Working's T-index, which measures excessive speculation relative to hedging demands.

- Table 6 shows the summary statistics for Working's T-index adjusted for index trader positions. For example, the average T-index for corn is 1.15 - indicating speculation in the corn market is 15% greater than that needed to meet hedging needs. Historically, this would have been considered a potentially inadequate amount of speculation to efficiently meet hedging demands and facilitate the transfer of risk. Notably, some of the markets with high T-values (livestock and CBOT wheat) are also those markets with a relatively high portion of index traders (see Table 3, Panel A). Still, even in these markets, the maximums are not beyond those recorded by prior researchers, the average values are near historic norms, and the minimums could be considered inadequate.

Table 6. Summary statistics, working's speculative T-Index, adjusted for index trader positions, June 2006-December 2009

Market	Mean	Maximum	Minimum	St. Dev.
Corn	1.15	1.34	1.07	0.06
Soybeans	1.17	1.53	1.09	0.09
Soybean Oil	1.12	1.36	1.04	0.07
CBOT Wheat	1.44	1.87	1.19	0.16
KCBOT Wheat	1.18	1.34	1.08	0.06
Cotton	1.16	1.48	1.03	0.11
Live Cattle	1.33	1.50	1.15	0.07
Feeder Cattle	1.86	3.28	1.32	0.38
Lean Hogs	1.43	2.01	1.17	0.19
Coffee	1.17	1.41	1.04	0.08
Sugar	1.15	1.26	1.06	0.04
Cocoa	1.14	1.28	1.06	0.05

Technical Note: Working's speculative "T" index is easily calculated using the traditional COT trader categories:

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

or

$T = 1 + SL / (HL + HS)$ if $(HL > HS)$

where open interest held by speculators (non-commercials) and hedgers (commercials) is denoted as follows: SS = Speculation, Short; SL = Speculation, Long; HL = Hedging, Long; and HS = Hedging, Short.

- Working's T-index is silent on the direction of speculation (long versus short). Instead, the amount of speculation is gauged relative to what is needed to balance hedging positions. Because it is directionless Working's T-index is only tested as a causal variable for market volatility. Table 7 shows the results for testing if the T-index Granger causes realized market volatility. Granger causality is found in 4 markets at the 95% confidence level. In all 4 markets, the directional impact is positive - higher levels of excessive speculation as measured by Working's T are followed by greater realized market volatility. For example, if the speculative index in lean hogs increases by 0.10, then actual volatility the following week increases by 1.18%. These individual market results are notable in comparison to the negative directional impacts found when simply measuring speculation with net index fund positions (Table 5). Still, the impact is not pervasive across markets as no system impact is found at even a modest confidence level.

Table 7. Granger causality test results for T-Index does not lead realized volatility, June 2006-December 2009

$$RV_{t,k} = \alpha_k + \sum_{i=1}^{m} \gamma_{i,k} RV_{t-i,k} + \sum_{j=1}^{n} \beta_{j,k} TIndex_{t-j,k} + \varepsilon_{t,k}$$ for each market, *k*, and time, *t*.

Market	*m,n*	*p*-value β_j=0, ∀j	Estimate $\sum \beta_j$	*p*-value $\sum \beta_j$=0
Corn	1,1	0.0470	24.8261	
Soybeans	4,1	0.6982	-2.5196	
Soybean Oil	2,1	0.7590	2.3205	
CBOT Wheat	2,1	0.5745	-1.7284	
KCBOT Wheat	3,1	0.7993	-1.8937	
Cotton	3,1	0.4823	-4.7687	
Live Cattle	3,1	0.3602	3.2854	
Feeder Cattle	3,1	0.0208	1.8090	
Lean Hogs	3,1	0.0003	11.7991	
Coffee	1,1	0.6234	-4.0321	
Sugar	4,1	0.2101	-30.5000	
Cocoa	4,1	0.0308	34.0968	
		p-value $\beta_{j,k}$=0, ∀*j,k*	Estimate $\sum\sum \beta_{j,k}$	*p*-value $\sum\sum \beta_{j,k}$=0
System		0.0028	32.6945	0.3844

Technical Note: The models are estimated across the *K* markets as an SUR system. Wald tests could not reject the following cross-market coefficient restrictions: $\gamma_{2,1} = \gamma_{2,2} = ... = \gamma_{2,K}$; $\gamma_{3,1} = \gamma_{3,2} = ... = \gamma_{3,K}$ for all *K* markets. These restrictions are imposed on the system and the common coefficients are estimated as a single pooled parameter across all *K* markets.

40. In sum, our results tilt the weight of the evidence even further in favour of the argument that index funds did *not* cause a bubble in commodity futures prices.[5] The evidence in our study is strongest for the agricultural futures markets because the data on index trader positions are measured with reasonable accuracy. The evidence is not as strong in the two energy markets studied because of considerable uncertainty about the degree to which the available data actually reflect index trader positions in these markets. Perhaps the most surprising result is the consistent tendency for increasing index fund positions to be associated with *declining* volatility. Caution must be exercised in interpreting this finding as a third factor common to all markets may be in fact be generating the decline in volatility. Nonetheless, this result is contrary to popular notions about the market impact of index funds, but is not so surprising in light of the traditional problem in commodity futures markets of the *inadequacy* of speculation (see Sanders, Irwin, and Merrin, 2010). These results imply that more research in this area is needed to understand the present role of speculation in futures markets.

6. Policy Conclusions

41. The empirical evidence presented in this preliminary study does not appear at present to warrant extensive changes in the regulation of index funds participation in agricultural commodity markets; any such changes require careful consideration so as to avoid unintended negative impacts. For example, limiting the participation of index fund investors could unintentionally deprive commodity futures markets of an important source of liquidity and risk-absorption capacity at times when both are in high demand.

[5] Annex I of this paper contains a detailed presentation of all statistical test results. See also Irwin and Sanders (2010).

This could make commodity futures markets less efficient mechanisms for transferring risk from parties who do not want to bear it to those that do, creating added costs that ultimately are passed back to producers in the form of lower prices and to consumers as higher prices.

42. These conclusions do not imply that commodity futures markets have functioned flawlessly during the last several years. In particular, the lack of consistently acceptable convergence performance for CBOT corn, soybean, and wheat contracts since late 2005 has been widely discussed (e.g., Henriques, 2008). The failure of cash and futures prices to convergence at contract expiration has existed for extended and varied periods. Performance has been consistently weakest in wheat, with delivery location basis at times exceeding one dollar per bushel, a level of disconnect between cash and futures not previously experienced in grain futures markets. The possible role of index funds in contributing to convergence problems has also been widely discussed (USS/PSI, 2009). Further research is needed to better understand the impact of index fund trading on this aspect of commodity market performance as well as the fundamental role of speculation in these markets.

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GLOSSARY OF TERMS[6]

Arbitrage: A strategy involving the simultaneous purchase and sale of identical or equivalent commodity futures contracts or other instruments across two or more markets in order to benefit from a discrepancy in their price relationship. In a theoretical efficient market, there is a lack of opportunity for profitable arbitrage.

Back Months: Futures delivery months other than the spot or front month (also called deferred months).

Bear: One who expects a decline in prices. The opposite of a bull. A news item is considered bearish if it is expected to result in lower prices.

Bear Market: A market in which prices generally are declining over a period of months or years. The opposite of bull market.

Board of Trade: Any organized exchange or other trading facility for the trading of futures and/or option contracts.

Bull: One who expects a rise in prices. The opposite of bear. A news item is considered bullish if it is expected to result in higher prices.

Bull Market: A market in which prices generally are rising over a period of months or years. Opposite of bear market.

Buyer: A market participant who takes a long futures position or buys an option. An option buyer is also called a taker, holder, or owner.

Cash Commodity: The physical or actual commodity as distinguished from the futures contract, sometimes called spot commodity or actuals.

Cash Price: The price in the marketplace for actual cash or spot commodities to be delivered via customary market channels.

CFTC Form 40: The form used by large traders to report their futures and option positions and the purposes of those positions.

Closing Price: The price recorded during trading that takes place in the final period of a trading session's activity that is officially designated as the "close."

Commercial: An entity involved in the production, processing, or merchandising of a commodity.

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[6] The terms and definitions used in the glossary are taken primarily from the Commodity Futures Trading Commission's "A Guide to the Language of the Futures Industry" which can be accessed online at http://www.cftc.gov/ConsumerProtection/EducationCenter/CFTCGlossary/index.htm.

Commitments of Traders Report (COT): A weekly report from the CFTC providing a breakdown of each Tuesday's open interest for markets in which 20 or more traders hold positions equal to or above the reporting levels established by the CFTC. Open interest is broken down by aggregate commercial, non-commercial, and non-reportable holdings.

Commodity Futures Trading Commission (CFTC): The Federal regulatory agency established by the Commodity Futures Trading Act of 1974 to administer the Commodity Exchange Act.

Commodity Index: An index of a specified set of (physical) commodity prices or commodity futures prices.

Commodity Index Fund: An investment fund that enters into futures or commodity swap positions for the purpose of replicating the return of an index of commodity prices or commodity futures prices.

Commodity Index Swap: A swap whose cash flows are intended to replicate a commodity index.

Commodity Index Trader: An entity that conducts futures trades on behalf of a commodity index fund or to hedge commodity index swap positions.

Commodity-Linked Bond: A bond in which payment to the investor is dependent to a certain extent on the price level of a commodity, such as crude oil, gold, or silver, at maturity.

Commodity Pool: An investment trust, syndicate, or similar form of enterprise operated for the purpose of trading commodity futures or option contracts. Typically thought of as an enterprise engaged in the business of investing the collective or "pooled" funds of multiple participants in trading commodity futures or options, where participants share in profits and losses on a pro rata basis.

Commodity Pool Operator (CPO): A person engaged in a business similar to an investment trust or a syndicate and who solicits or accepts funds, securities, or property for the purpose of trading commodity futures contracts or commodity options. The commodity pool operator either itself makes trading decisions on behalf of the pool or engages a commodity trading advisor to do so.

Commodity Trading Advisor (CTA): A person who, for pay, regularly engages in the business of advising others as to the value of commodity futures or options or the advisability of trading in commodity futures or options, or issues analyses or reports concerning commodity futures or options.

Commodity Swap: A swap in which the payout to at least one counterparty is based on the price of a commodity or the level of a commodity index.

Corner: (1) Securing such relative control of a commodity that its price can be manipulated, that is, can be controlled by the creator of the corner; or (2) in the extreme situation, obtaining contracts requiring the delivery of more commodities than are available for delivery.

Counterparty: The opposite party in a bilateral agreement, contract, or transaction, such as a swap.

Delivery: The tender and receipt of the actual commodity, the cash value of the commodity, or of a delivery instrument covering the commodity (e.g., warehouse receipts or shipping

Disaggregated Commitments of Traders Report (DCOT): A weekly report from the CFTC providing a breakdown of each Tuesday's open interest for markets in which 20 or more traders hold positions equal to or above the reporting levels established by the CFTC. Open interest is broken down by

managed money, swap dealers, producers and merchants, other reporting traders, and non-reporting traders.

Efficient Market: In economic theory, an efficient market is one in which market prices adjust rapidly to reflect new information. The degree to which the market is efficient depends on the quality of information reflected in market prices. In an efficient market, profitable arbitrage opportunities do not exist and traders cannot expect to consistently outperform the market unless they have lower-cost access to information that is reflected in market prices or unless they have access to information before it is reflected in market prices.

Exchange Traded Fund (ETF): An investment vehicle holding a commodity or other asset that issues shares that are traded like a stock on a securities exchange.

Front Month: The spot or nearby delivery month, the nearest traded contract month.

Fund of Funds: A commodity pool that invests in other commodity pools rather than directly in futures and options contracts.

Futures Commission Merchant (FCM): Individuals, associations, partnerships, corporations, and trusts that solicit or accept orders for the purchase or sale of any commodity for future delivery on or subject to the rules of any exchange and that accept payment from or extend credit to those whose orders are accepted.

Futures Contract: An agreement to purchase or sell a commodity for delivery in the future: (1) at a price that is determined at initiation of the contract; (2) that obligates each party to the contract to fulfill the contract at the specified price; (3) that is used to assume or shift price risk; and (4) that may be satisfied by delivery or offset.

Futures-equivalent: A term frequently used with reference to speculative position limits for options on futures contracts. The futures-equivalent of an option position is the number of options multiplied by the previous day's risk factor or delta for the option series. For example, ten deep out-of-money options with a delta of 0.20 would be considered two futures-equivalent contracts. The delta or risk factor used for this purpose is the same as that used in delta-based margining and risk analysis systems.

Futures Option: An option on a futures contract.

Futures Price: (1) Commonly held to mean the price of a commodity for future delivery that is traded on a futures exchange; (2) the price of any futures contract.

Hedge Exemption: An exemption from speculative position limits for bona fide hedgers and certain other persons who meet the requirements of exchange and CFTC rules.

Hedge Fund: A private investment fund or pool that trades and invests in various assets such as securities, commodities, currency, and derivatives on behalf of its clients, typically wealthy individuals. Some commodity pool operators operate hedge funds.

Hedger: A trader who enters into positions in a futures market opposite to positions held in the cash market to minimize the risk of financial loss from an adverse price change; or who purchases or sells futures as a temporary substitute for a cash transaction that will occur later. One can hedge either a long cash market position (e.g., one owns the cash commodity) or a short cash market position (e.g., one plans on buying the cash commodity in the future).

Historical Volatility: A statistical measure (specifically, the annualized standard deviation) of the volatility of a futures contract, security, or other instrument over a specified number of past trading days.

Implied Volatility: The volatility of a futures contract, security, or other instrument as implied by the prices of an option on that instrument, calculated using an option pricing model.

Large Traders: A large trader is one who holds or controls a position in any one future or in any one option expiration series of a commodity on any one exchange equaling or exceeding the exchange or CFTC-specified reporting level.

Long: (1) One who has bought a futures contract to establish a market position; (2) a market position that obligates the holder to take delivery; (3) one who owns an inventory of commodities.

Long Hedge: Hedging transaction in which futures contracts are bought to protect against possible increases in the cost of commodities.

Managed Money Traders (MMTs): Futures market participants who engage in futures trades on behalf of investment funds or clients. While MMTs are commonly equated with **hedge funds**, they may include **Commodity Pool Operators** and other managed accounts as well as hedge funds. While CFTC Form 40 does not provide a place to declare oneself a Managed Money Trader, a large trader can declare itself a "Hedge Fund (H)" or "Managed Accounts and Commodity Pools."

Manipulation: Any planned operation, transaction, or practice that causes or maintains an artificial price. Specific types include corners and squeezes as well as unusually large purchases or sales of a commodity or security in a short period of time in order to distort prices, and putting out false information in order to distort prices.

Nearby Delivery Month: The month of the futures contract closest to maturity; the front month or lead month.

Offset: Liquidating a purchase of futures contracts through the sale of an equal number of contracts of the same delivery month, or liquidating a short sale of futures through the purchase of an equal number of contracts of the same delivery month.

Open Interest: The total number of futures contracts long or short in a delivery month or market that has been entered into and not yet liquidated by an offsetting transaction or fulfilled by delivery.

Option: A contract that gives the buyer the right, but not the obligation, to buy or sell a specified quantity of a commodity or other instrument at a specific price within a specified period of time, regardless of the market price of that instrument. Also see Put and Call.

Over-the-Counter (OTC): The trading of commodities, contracts, or other instruments not listed on any exchange. OTC transactions can occur electronically or over the telephone. Also referred to as Off-Exchange.

Physical Delivery: A provision in a futures contract or other derivative for delivery of the actual commodity to satisfy the contract.

Position: An interest in the market, either long or short, in the form of one or more open contracts.

Price Discovery: The process of determining the price level for a commodity based on supply and demand conditions. Price discovery may occur in a futures market or cash market.

Reporting Level: Sizes of positions set by the exchanges and/or the CFTC at or above which commodity traders or brokers who carry these accounts must make daily reports about the size of the position by commodity, by delivery month, and whether the position is controlled by a commercial or non-commercial trader.

Rolling Futures Positions: The lifting a near futures position and re-establishing it in a more deferred delivery month.

Short: (1) The selling side of an open futures contract; (2) a trader whose net position in the futures market shows an excess of open sales over open purchases. See Long.

Short Hedge: Selling futures contracts to protect against possible decreased prices of commodities.

Small Traders: Traders who hold or control positions in futures or options that are below the reporting level specified by the exchange or the CFTC.

Speculative Bubble: A rapid run-up in prices caused by excessive buying that is unrelated to any of the basic, underlying factors affecting the supply or demand for a commodity or other asset. Speculative bubbles are usually associated with a "bandwagon" effect in which speculators rush to buy the commodity (in the case of futures, "to take positions") before the price trend ends, and an even greater rush to sell the commodity (unwind positions) when prices reverse.

Speculative Position Limit: The maximum position, either net long or net short, in one commodity future (or option) or in all futures (or options) of one commodity combined that may be held or controlled by one person (other than a person eligible for a hedge exemption) as prescribed by an exchange and/or by the CFTC.

Speculator: In commodity futures, a trader who does not hedge, but who trades with the objective of achieving profits through the successful anticipation of price movements.

Spread: The purchase of one futures delivery month against the sale of another futures delivery month of the same commodity; the purchase of one delivery month of one commodity against the sale of that same delivery month of a different commodity; or the purchase of one commodity in one market against the sale of the commodity in another market, to take advantage of a profit from a change in price relationships. The term spread is also used to refer to the difference between the price of a futures month and the price of another month of the same commodity. A spread can also apply to options.

Squeeze: A market situation in which the lack of supplies tends to force shorts to cover their positions by offset at higher prices.

Supplemental Commodity Index Traders (CIT): A weekly report from the CFTC providing a breakdown of each Tuesday's open interest for markets in which 20 or more traders hold positions equal to or above the reporting levels established by the CFTC. Open interest is broken down by commercial, non-commercial, index traders, and non-reportable holdings.

Swap: In general, the exchange of one asset or liability for a similar asset or liability for the purpose of lengthening or shortening maturities, or otherwise shifting risks. This may entail selling one securities issue and buying another in foreign currency; it may entail buying a currency on the spot

market and simultaneously selling it forward. Swaps also may involve exchanging income flows; for example, exchanging the fixed rate coupon stream of a bond for a variable rate payment stream, or vice versa, while not swapping the principal component of the bond. Swaps are generally traded over-the-counter.

Swap Dealer (AS): An entity such as a bank or investment bank that markets swaps to end users. Swap dealers often hedge their swap positions in futures markets. Alternatively, an entity that declares itself a "Swap/Derivatives Dealer" on CFTC Form 40.

Underlying Commodity: The cash commodity underlying a futures contract. Also, the commodity or futures contract on which a commodity option is based, and which must be accepted or delivered if the option is exercised.

Volatility: A statistical measurement (the annualized standard deviation of returns) of the rate of price change of a futures contract, security, or other instrument underlying an option. See Historical Volatility, Implied Volatility.

Volume: The number of contracts traded during a specified period of time. It is most commonly quoted as the number of contracts traded, but for some physical commodities may be quoted as the total of physical units, such as bales, bushels, or barrels.