Analysis of CFTC Proposed Position Limits on Commodity Index Fund Trading

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Executive Summary

The Dodd-Frank Act mandated the CFTC to implement position limits on a number of commodities exempted from such limits currently. CFTC has proposed establishing position limits on commodity index trading, effectively classifying this group as speculators. At the center of this debate is whether the rise in commodity index trading was responsible for creating a speculative bubble in a number of commodity markets. A central tenet of proponents of a speculative bubble is the apparent close association between the change in commodity index trading and prices, particularly during 2007-2008 when oil prices and other commodity prices rose sharply. As is shown in the study, simple correlation does not imply causation. In fact, upon closer inspection of the theory of commodity markets and the empirical literature, by far the evidence supports the theory that underlying market fundamentals in commodity markets are directly responsible for commodity price effects. The evidence supporting the speculative bubble theory was found to have a number of limitations that call into question the robustness of the results. The paper also outlines empirical findings that deep and active commodity index trading activity promotes price discovery and liquidity in futures markets, thereby enhancing the effectiveness of these markets for hedgers. The implication for public policy is clear; imposing position limits on commodity index trading activity ignores the extensive literature refuting the speculative bubble theory and in so doing would negatively affect commodity markets, investors and hedgers while increasing risk.

Analysis of CFTC Proposed Position Limits on Commodity Index Fund Trading

Clifford V. Rossi, PhD[1]

Proposed imposition of the Commodity Futures Trading Commission (CFTC) position limits on commodity index trading is grounded in faulty economic analysis and has scant empirical support. During 2007-2008, commodity price shocks occurred, with oil markets garnering the most attention among consumers, the media and policymakers. The Dodd-Frank Act (DFA) directed the CFTC to determine whether position limits should be implemented "as appropriate" for derivative instruments on physical commodities. DFA's unprecedented scope on financial market regulation has severely compressed the timeframe Congress and regulatory agencies charged with implementing DFA have to make thorough and well-researched decisions based on sound economic principles and analysis. Labeling commodity index fund traders as speculators ignores the body of empirical and theoretical evidence finding that market fundamentals explain commodity prices and thus poses significant risk to commodity markets, investors and hedgers if implemented.

This study examines the literature relating to commodity futures and spot market pricing with particular interest in understanding how underlying market fundamentals affect markets where significant price shocks have occurred; examining the empirical literature on the impact of speculation on these markets; assessing market data against assertions that commodity index trading has adversely affected market prices; and understanding the unintended consequences of position limits on commodity index trading on the investor public and on commodity markets in general.

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During Congressional hearings on the issue, some proponents of position limits provided a wide-ranging attack on commodity index trading as a primary cause for price shocks across a number of commodities during the period 2007-2008 as a result of the "financialization" of commodities (Masters and White, 2008).[2] This work sparked considerable interest by policymakers, including the CFTC to classify commodity index traders as speculators. Given the importance of this work, it features prominently in the present analysis where each of its arguments supporting position limits is examined with respect to economic theory and empirical evidence.

The primary conclusions from this report are as follows:

- Arguments favoring the speculation theory for commodity price shocks are supported by misleading univariate relationships between the growth and size of commodity index contracts and the commodities prices. Such spurious empirical relationships are not grounded in rigorous statistical methods and data analysis.
- The theoretical requirements for speculation to have occurred in oil; i.e., a zero price elasticity of demand and/or an increase in oil inventories is not supported by the empirical literature.
- Market fundamentals rather than speculation offer the best empirical support to date on explaining the 2007-2008 shock in oil prices.
- Empirical evidence also supports the case that market fundamentals drove up prices in a number of agricultural commodities during the same period
- Extensive rigorous statistical time-series tests of the relationship between commodity index contracts and prices have been performed by leading academics and the CFTC confirming a lack of statistical relationship between these factors; directly refuting the speculation argument.
- A significant amount of commodity market data is inconsistent with the speculation theory of commodity price shocks.

[2] Masters, M.W. and A.K. White, (2008), "The Accidental Hunt Brothers: How Institutional Investors are Driving Up Food and Energy Prices," White Paper.

  - For instance, a number of commodity markets during the 2007-2008 period experienced sharp price increases but these were markets that had no association with commodity index funds.
  - The speculation theory focuses exclusively on the long positions of commodity index funds without calling attention to fundamentals of futures markets that are essentially zero-sum games. The data actually show that the long positions were well matched against short positions; thus offsetting any potential effect from the long side.
- Other claims that commodity index trading could influence spot market prices are specious since indexes and traders do not hold physical stocks of any commodity. Also, the analogy to the Hunt brothers cornering of the silver market made by proponents of the speculation theory is inconsistent with actions by today's commodity index traders.

From these conclusions several important policy recommendations emerge:

- CFTC should not classify commodity index trading organizations as speculators
- CFTC should exempt commodity index trading from compliance with position limits
- CFTC should commission an independent and comprehensive empirical study of the impact of commodity index trading on commodity markets

Review of Policy on Position Limits, Exemptions and Authority to Regulate Commodity Index Trading

The Dodd-Frank Act Title VII, Section 737(a) required the CFTC to establish position limits on 28 commodities currently exempted from such restrictions in reaction to concerns of extensive market turbulence and perceived speculation in commodity markets during 2007-2008 in particular. On January 13, 2011, the CFTC issued a Notice of Proposed Rulemaking that limited positions of traders in futures and option contracts and economically equivalent swap contracts. In addition, the CFTC proposed exemptions for swap dealers. The proposed CFTC rule would impose spot-market limits on an aggregate basis and in addition would impose a set of class and

aggregate single-month and combined months position limits. Section 737 also tightened the definition for "bona fide hedging transactions" which would qualify organizations for an exemption to position limits. Importantly, an exemption would only be permitted if it can be demonstrated that the transactions effectively act as substitutes for physical market transactions. In this case commercial trading activities such as those for hedging physical fuel deliveries in the case of airlines would qualify for an exemption under the provisions. However, commodity index fund trading would not be exempted under these rules given the specific requirement regarding a substitute for physical market transactions.

Commodity Index Fund Structural Features

In some sense the spectacular success of commodity index mutual funds over the last several years has ironically spawned a significant amount of scrutiny by policymakers. As a relatively new market entrant this is not surprising. In the five-year period 2003-2008, the value of these funds rose from $15B to $200B (CFTC, 2008).[3] An array of funds indexed to commodities exists and they seek to provide investors with an ability to track a broad-based well diversified cross-section of commodities using well established trading techniques. These funds operate in a comparable manner as other broad-based index funds such as those tracking the S&P 500 Index, valued on the basis of the components of each commodity weight times its market price of a specific futures contract associated with each commodity. Energy commodities such as oil tend to comprise a large share of these indexes with agricultural commodities usually reflecting the next largest share of the index (US Senate Permanent Subcommittee on Investigations, 2009).[4] The indexes do not actually trade futures contracts, but due to the need to anchor to a particular futures contract for purposes of establishing a consistent valuation framework, the index fund manager needs to periodically "roll" the valuation forward as futures contracts expire. However, this activity triggers actual futures market trading by swap dealers needing to adjust their positions to the index on which they establish a hedge. Again it is critical to realize that the investor in the index does not actually execute on their behalf any futures transaction and can

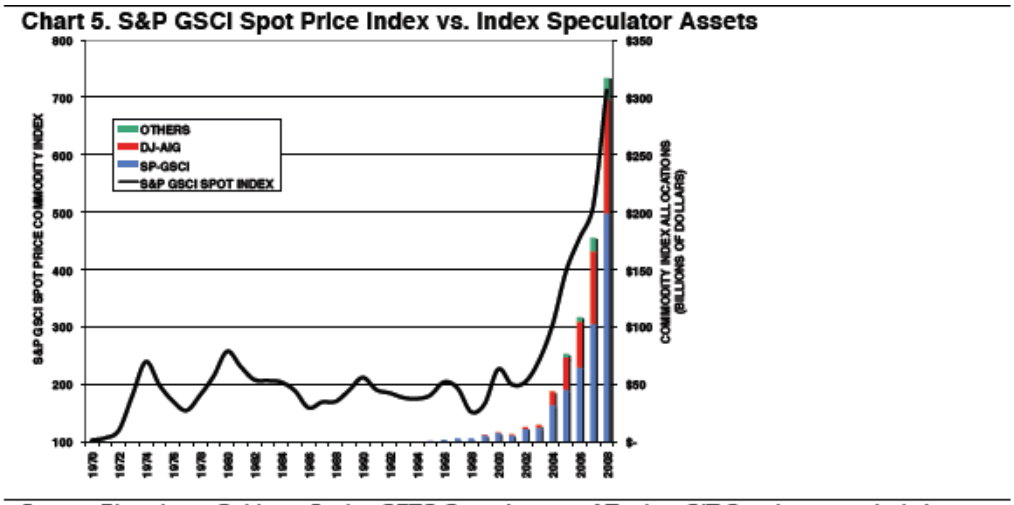
[3] CFTC, *Staff Report on Commodity Swap Dealers & Index Traders with Commission Recommendations*, at p. 3 (preliminary data), September 2008.
[4] US Senate Permanent Subcommittee on Investigations, Excessive Speculation in the Wheat Market, Majority and Minority Staff Report, June 2009.

only take a long position in the index. Finally another important characteristic of the index fund investment is that it is fully collateralized and hence does not impose unlevered risk on the market. An essential point is that commodity index funds and their investors have no direct impact on futures markets as they do not directly take positions in futures markets. It is only their indirect effect on trading by others such as swap dealers that can affect market outcomes and the degree of even this indirect effect is of limited impact on commodity price movements.

A Review of the Evidence Supporting Position Limits

Several studies over the last few years have offered arguments and some limited empirical evidence for speculation as a primary cause for the commodity shocks experienced in 2007-2008. However, the one igniting this side of the debate was by Masters and White (2008).[5] The paper outlined an argument that the "financialization" of commodities, largely by the rapid growth of commodity index fund trading, conspired to artificially inflate demand for commodities and according to this argument led to price spikes across a number of commodities. The Masters and White argument hinges on a simple set of relationships extracted directly from their paper to highlight the point as depicted in Figure 1 below.

Figure 1: Masters and White Graphic Depicting Association of Commodity Prices and Index Assets Over Time



Source: Bloomberg, Goldman Sachs, CFTC Commitments of Traders CIT Supplement, calculations based upon CFTC COT/CIT report (see appendix). 2008 figure is as of July 1, 2008

[5] Masters and White (2008).

Basic statistical theory suggests that extreme care must be taken in drawing inferences of a causal relationship between two factors of interest simply because some correlation exists. There could be other factors that actually explain commodity prices despite a statistically strong correlation with commodity index trading activity. As will be examined in a later section, underlying market fundamentals were not directly considered in the Masters and White arguments beyond a passing reference acknowledging rising demand for commodities such as China in the recent years. The danger in the graph shown above is twofold: it applies faulty logic and poor empiricism first that is magnified by asserting commodity index trading is speculative without offering valid statistical evidence of that speculative activity. More rigorous statistical tests of such relationships in times series analyses such as Granger causality are more appropriate and are discussed in a later section of this paper.

Masters and White proceed to describe how the "Goldman Roll" serves as a way of amplifying the price effects of alleged speculative activity on the part of commodity index traders. The roll phenomenon is a conventional approach used to unwind a position prior to physical settlement using a calendar spread strategy to accomplish the transaction while extending it to the next period (the roll forward). Masters and White, however, contend that the aggregate effect of these transactions together place significant upward pressure on prices. As the trader reduces their position in the nearer term contract and increases their position in the later contract, the expectation is for the spread between these two contracts to increase as the price for the nearer term contract declines and the later contract's price increases. The degree to which this phenomenon takes place is important as Masters and White claim this to be a major reason why commodity prices accelerated. An empirical study by the Interagency Taskforce on Commodity Markets chaired by the CFTC examined this issue in great detail (Interagency Taskforce on Commodity Markets, 2008).[6] Using CFTC Commodity Index Trading (CIT) data over different time periods, the study's authors estimated regression models for wheat, corn and soybeans relating calendar price spreads to the change in CIT contract positions, while controlling for seasonality and contract expiration. The results showed a significant but small price spread from the roll for these commodities. For wheat this effect contributed to a 25% higher spread than

[6] Interagency Taskforce on Commodity Markets, Special Report on Commodity Markets, 2008.

would otherwise be realized, for the other two commodities it was less than 10% of the normal spreads observed. However, the analysis also showed that the sizable and predictable rolling that occurs by traders anticipating the roll of the commodity index actually reduces the volatility of the price spread considerably. The researchers found that during periods when traders were engaged in rolling their positions, the spread actually was between 1/3rd and ½ ***lower*** than during periods where no trader rolling occurred. In other words, the trading activity was found to have a statistically significant countervailing effect on dampening price spread volatility in commodity markets. This empirical finding undermines the Masters and White argument that the Goldman Roll has significant negative price impacts on commodity markets.

As the argument for a speculative bubble in commodity markets gained greater traction, a host of other academic studies were conducted bolstering the original Masters and White thesis. One of these studies was performed by Gilbert on bubbles in nine energy, metals and agricultural commodities during 2006-2008 using a relatively new statistical test for bubbles (Gilbert, 2009).[7] In addition, Gilbert applied a Granger causality test on a composite commodity index he constructed finding limited but significant results between trading activity and prices. However, as Irwin and Sanders maintain, the rejection of the null hypothesis that no association exists between the two factors does not imply causation exists (Irwin and Sanders, 2010).[8] Another limitation of this study cited by Irwin and Sanders is the assumption Gilbert makes that the commodity trader positions in agricultural markets are the same as those in energy and metals; however, there is no information provided as to whether this is a valid assumption. It is thus unclear whether Gilbert's claim of speculative bubbles is sufficiently robust.

Another empirical paper that supports the speculative bubble theory in oil markets during 2007-2008 was done by Einloth investigating the relationship between convenience yields and prices

[7] Christopher L. Gilbert, Speculative Influences on Commodity Futures Prices 2006-2008, Working Paper, University of Trento, 2009.
[8] Scott H. Irwin and Dwight R. Sanders, Index Funds, Financialization and Commodity Futures Markets, *Applied Economics Perspectives and Policy*, 2010.

in futures commodity markets (Einloth, 2009).[9] The approach presents a novel way to measure speculative effects. The theory of storage costs in futures markets absent speculation expects that as inventory levels for a commodity decline, the price on that commodity would rise as would the convenience yield associated with the benefit the commodity holder would derive.[10] If instead, prices and convenience yields were found to move inversely with each other, Einloth suggests this would be a sign of speculative behavior present in the market. In testing this hypothesis, Einloth finds that this inverse relationship did exist during a period when oil prices rose significantly. However, while the general result could be attributed to some speculation at the time in markets, Irwin and Sanders point out that there is no way to determine how much of an impact commodity index trading played if any. It is also not clear that Einloth's use of the inverse relationship between convenience yield and price as a sign of a bubble is sufficiently robust.

It is important to note that while technically oil is a storable commodity, the price dynamics of oil generally reflect a market described by semi-storability, particularly in light of relatively limited temporal oil stocks.[11] For example, from an oil producer perspective, a good portion of oil is refined immediately upon extraction, allowing the producer to avoid storage costs that create a drag on profits. The implications of this semi-storability phenomenon is that at times such as during geopolitical disturbances, market prices can be driven higher purely due to uncertainty over potential shortages. Once the crisis and the perceived danger of a shortage abates, prices would respond accordingly and revert back toward equilibrium levels.

Others such as Routledge, Seppi and Spatt established a relationship between spot commodity prices and convenience yields where the latter could move inversely with prices if the value assigned to an embedded timing option determined by market fundamentals is sufficiently large.

[9] Einloth, James T. 2009. Speculation and Recent Volatility in the Price of Oil. Working Paper, Division of Insurance and Research, Federal Deposit Insurance Corporation, Washington, D.C.

[10] A commodity holder such as a bakery, for example, would find value associated from holding some level of wheat as it provides a buffer in the case of an interruption in flow of wheat to the bakery which could make the plant set idle.

[11] OECD oil stocks, for example have ranged between 50-65 days of supply since 2006 according to the Short-Term Energy Outlook, March 2011.

With this result, it is not clear that a speculative effect could be driving this relationship (Routledge, et al., 2000).[12] Balanced against the analyses reviewed above are a number of empirical studies that find no statistical evidence that oil prices in the 2007-2008 period were a direct result of speculation by commodity index trading. Given their rigorous theoretical and/or empirical foundations, a number of these studies including those by Hamilton (2009), Kilian (2009), and Haigh et al. (2007) are reviewed in more detail later in this paper.[13]

Examples of studies supporting the financialization of commodity markets include one by Tang and Xiong (2010).[14] The main hypothesis of the study is that prior to the emergence of commodity indexes, the relationship between commodity and financial markets was weak. Their study found that correlations between commodities and other financial investments such as stocks, bonds and crude oil rose significantly after 2004 when commodity index growth accelerated. Noting that other market factors could be responsible for the results during the period, the researchers decompose the sample into commodities included in the index and those not. The hypothesis was that if commodities in the index, exhibited a higher correlation with other financial investments than commodities not in the index it would be a sign that commodity index activity affected futures prices of these commodities. It turns out that while the results are statistically significant, the difference in correlation changes is relatively modest between commodities included and excluded from the index.[15]

[12] Bryan R. Routledge, Duane J. Seppi, and Chester S. Spatt, "Equilibrium Forward Curves for Commodities," *Journal of Finance*, Vol 55(3): pp. 1297-1328, 2000.

[13] Lutz Kilian, "Not All Oil Price Shocks Are Alike: Disentangling Demand and Supply Shocks in the Crude Oil Market," *American Economic Review*, Vol. 99(3), 2009, pp. 1053-1069, James D. Hamilton, Causes and Consequences of the Oil Shock of 2007-2008, *Brookings Papers on Economic Activity*, Spring 2009 and Michael S. Haigh, Jeffrey H. Harris, James A. Overdahl, and Michel A. Robe, Market Growth, Trader Participation and Pricing in Energy Futures Markets, CFTC Working Paper, February 2007.

[14] Ke Tang and Wei Xiong, Index Investing and the Financialization of Commodities, Working Paper, Princeton University, 2010.

[15] Irwin and Sanders provide more detail on the nature of these findings.

Another paper supporting the speculative bubble hypothesis was done by Phillips and Yu (2007).[16] This paper represents one of the most rigorous and empirically supportable analyses completed thus far. The authors start with the premise that investors moved over time from bubble to bubble after the collapse of each had occurred. In this way, investors were theorized to have migrated from subprime mortgages and into commodities via the commodity index vehicle. To test this hypothesis empirically, a series of sequential Dickey-Fuller t tests were developed to identify patterns of price anomalies between periods. They concluded that their tests did identify a bubble in the subprime mortgage market that later moved to the crude oil and heating oil sectors. They found no evidence of this in agricultural commodities which does not align with a theory of pervasive and significant index trading driving up commodity prices overall.

The studies reviewed above certainly provide a more scientific approach to measuring the degree of speculation in commodities markets attributable to index trading than that portrayed in the Masters and White study; however, they each have limitations in either data, assumptions and/or analytical approach that cast some doubt on the validity of their findings that speculative bubbles is attributable to commodity index trading. Moreover, a significant body of work exists suggesting that speculative bubbles did not exist in commodity markets and several of these are examined in more detail below. In particular, studies of oil and agricultural commodities provide empirical support that market fundamentals and not speculation drove commodity prices over the last several years.

Further attempts to position the speculation theory as the cause for recent trends in commodity prices also do not hold up under further inspection of the empirical work. For example, in a speech given in March 2011, CFTC Commissioner Chilton cited 10 studies and comments that in his opinion support the position that commodity prices have been subject to speculative activity from index trading in recent years (Chilton, 2011).[17] Five of these citations were comments on

[16] Peter C.B.Phillip and Jun Yu, Explosive Behavior in the 1990s Nasdaq: When did Exuberance Escalate Asset Values? Cowles Foundation Discussion Paper No.1699, Yale University, 2007.
[17] Commissioner Bart Chilton, Opening remarks to the Futures Industry Association's Panel Discussion: Financial Investor's Impact on Commodity Prices, Boca Raton, Florida, March 16, 2011.

commodity speculation and therefore are not considered here as they provide no empirical support for speculative activity as the driving force behind commodity price effects.

Five other studies were cited that deserve some attention in light of Commissioner Chilton's comments. A study conducted by Eckaus (2008) maintained that speculative activity drove oil prices to high levels in 2007-2008 by arguing that fundamental factors such as rising Chinese demand, dollar depreciation, and geopolitical disruptions could not be responsible for oil price dynamics at the time.[18] Eckhaus based his findings on simple summary data rather than on any empirical modeling of underlying relationships in the oil market as conducted by Hamilton (2009) and Kilian (2009) that found support for market fundamentals explaining oil price movements during this period. Consequently, the propositions put forth by Eckhaus are unsubstantiated by any rigorous analysis. Turning to the study by Kahn (2009), while market forces are recognized as a reason for higher oil prices than normal, he maintains that speculation drove spot prices higher at the beginning of 2008 and lower in the second half of that year than what fundamentals alone could support.[19] However, he concedes, "Unfortunately, it is very difficult to measure speculation in any direct way."[20] Khan attempts to provide his own measure of speculation by examining movements of the real prices of gold and oil over time with a strong relationship between both prices as evidence of speculation.[21] This test ignores the issue that simple correlation does not signify any meaningful structural relationship supporting oil speculation. Another study cited by Chilton, performed by Anderson et. al. (2008) claimed that speculative index trading increased volatility in futures markets generally; attributable to the "Goldman Roll" phenomenon.[22] This study, however, offers no empirical support for this finding and ignores the extensive statistical analysis performed by the Interagency Taskforce on Commodity Markets (2008) finding significantly lower price spread volatility as a result of

[18] R. S. Eckaus, "The Oil Price is a Speculative Bubble," MIT Center for Energy and Environmental Policy Research, June 13, 2008.
[19] Mohsin, S. Khan, "The 2008 Oil Price Bubble, "Peter G. Peterson Institute of International Economics, September 19, 2009.
[20] Khan, 2009, p. 4.
[21] Khan maintains that gold is a speculative commodity and thus a high correlation between its price and oil prices would signify oil as a speculative commodity.
[22] David P. Anderson, Joe L. Outlaw, Henry L. Bryant, James W. Richardson, David P. Ernstes, J. Marc Raulston, J. Mark Welch, George M. Knapek, Brian K. Herbst, and Marc S. Allison, The Effects of Ethanol on Texas Food and Feed, Agriculture and Food Policy Center, Texas A&M University, April 10, 2008.

commodity index trading.[23] Commissioner Chilton also cites an IMF (2008) study stating, "…it appears that speculation has played a significant role in the run-up in oil prices…"[24] Once again, no empirical evidence is provided to support this conjecture and in fact the study states, "It is difficult to get a direct measure of speculative activity. Moreover, there is evidence that changes in net long noncommercial positions generally follow price changes rather than lead them. So this line of reasoning would imply that speculation is not the cause of recent increases in oil prices."[25] The study does offer up the identical argument as Khan for speculation that gold and oil prices are highly correlated; however, as discussed earlier that is hardly strong empirical evidence of speculation. Finally, a study by Medlock and Jaffe (2009) maintained that the growth in commodity index trading long positions was highly correlated with oil prices between 2003-2008, offering evidence that there was a speculative bubble during this period. The authors acknowledge that "correlation does not imply causation," without offering any other empirical support based on rigorous statistical analysis.[26]

The body of "evidence" Commissioner Chilton cites as supporting the speculative effects theory for rising commodity prices simply does not withstand close scrutiny based on rigorous empirical analysis. Five of the ten citations were opinions or comments on the subject and so cannot be construed as evidence of speculation. The other five studies as described above offered little analytical support that speculation rather than market fundamentals explain commodity price patterns in recent years.

Building an Empirical Case for Non-speculative Effects on Commodity Prices

A number of academic articles have appeared in recent years refuting the speculative bubble theory and it is these studies to which we turn our attention. As mentioned earlier, the high degree of correlation between commodity index trading activity and commodity prices over time

[23] Interagency Taskforce on Commodity Markets, Special Report on Commodity Markets, 2008.
[24] International Monetary Fund, Regional Economic Outlook: Middle East and Central Asia, May 2008.
[25] IMF, 2008, p. 27.
[26] Kenneth B. Medlock and Amy Myers Jaffe, "Who is In the Oil Futures Market and How Has It Changed?" James A. Baker III Institute for Public Policy, Rice University, August 26, 2009.

does not imply that commodity index trading caused a speculative bubble. To better understand and control for those effects, a number of studies apply a Granger causality statistical technique to infer whether a factor of interest such as commodity index trading Granger-causes commodity price effects. The methodology is in widespread use across science and social science disciplines.

One article on this subject was done by Irwin, Sanders and Merrin (2009).[27] Beyond making an extensive critique of major arguments made by speculation theory proponents, the researchers use CFTC Commitments of Traders (COT) data to conduct Granger-causality tests across a number of commodity markets. Using data from 1995-2006, the tests find in only 16% of the cases studied a statistically significant relationship between the change in commodity prices and changes in trading positions. The data used for this analysis can be called into question due to a high degree of aggregation of contracts and the data's reliance on weekly or monthly reporting. A lack of position matching and granularity at a daily level for positions can render the use of Granger-causality tests of limited value.

A study by the Interagency Taskforce on Commodity Markets (ITCM) conducted a Granger-causality analysis in oil markets using a nonpublic dataset that was a significant improvement over the publicly available COT data since it used daily information on prices and positions. The analysis covered the period 2003-2008 and decomposed trading into commercial and noncommercial categories. In addition, the researchers tested along several subcategories of speculators; noncommercial traders in total, hedge funds, swap dealers, and noncommercial traders combined with swap dealers. Their findings revealed a lack of statistical association between changes in prices and commodity positions over the period and importantly they found this to be the case across all categories of speculators. This data was not without some issues, however. First, the data do not permit assessment of individual traders to determine whether certain traders could affect prices; second the daily data captured end-of-day transactions and so

[27] Scott H. Irwin, Dwight R. Sanders and Robert P. Merrin, "Devil or Angel? The Role of Speculation in the Recent Commodity Price Boom (and Bust)," *Journal of Agricultural and Applied Economics*, Vol. 41(2), 2009, pp. 377-391.

there was no ability to determine whether changes during the day could affect prices and finally the data did not permit analysis of effects within various contract maturities. Despite these more granular issues, if there had been a group of traders impacting prices, the tests on an aggregate basis would have revealed that effect. In sum, this study concludes that market fundamentals and not speculation were responsible for oil prices. The subject of market fundamentals will be revisited in a later section of this paper.

A related analysis conducted by Buyuksahin and Harris (2011) conducted Granger-causality tests in oil markets for two separate periods: 2000-2004 and 2004-2009; the first marking a period of relative stability in the oil market and the latter a period of great volatility.[28] As in the case of the ITCM results, the researchers found no evidence that changing positions of any type of trader affected prices in any other of the two periods. The findings also suggest that the direction of causality is from price changes to position changes implying that traders generally follow trends in the market. This study also assessed the period between 2008-2009 when oil prices dropped sharply from $147/bbl to $40/bbl and analysis of the results from estimates of the Working Speculative Index suggests that the drop in prices was not accompanied by a drop in the speculative index, providing evidence that speculators did not drive the collapse of prices during this period.

Another article on the subject using still different CFTC data was conducted by Irwin and Sanders (Irwin and Sanders, 2010).[29] This analysis leveraged the weekly Supplemental Commodity Index Traders (CIT) reports that disaggregate index trader positions for 12 agricultural commodity markets. The Disaggregated Commitments of Traders (DCOT) report includes information on futures and options positions across markets by trading category: swap dealers, managed money, processors, and merchants and other reporting traders. The data are for the same agricultural markets as the CIT plus some energy and metals commodities. Irwin and Sanders mention that the DCOT swap dealer data is a good representation of index trader positions in agricultural markets. Applying Granger causality tests to the more disaggregated

[28] Bahattin Buyuksahin and Jeffrey Harris, "The Role of Speculators in the Crude Oil Futures Market," *The Energy Journal*, Vol. 32(2), pp. 167-202, 2011.
[29] Scott H. Irwin and Dwight R. Sanders, The Impact of Index and Swap Funds on Commodity Futures Markets, OECD Food, Agriculture and Fisheries Working Papers, No. 27, 2010.

data, the authors once again no statistical evidence that index trading affected commodity prices. This is perhaps the strongest evidence to date given the granularity of the position data used in the analysis.

The Role of Market Fundamentals in Explaining Commodity Prices

The sharp rise in oil prices that occurred between 2007-2008 became a lightning rod for debate over the role of speculation in commodity markets by index traders. Given this focus, it is appropriate to dive deeper into analysis regarding the role market fundamentals played in this phenomenon. A number of important academic studies have examined this issue including work by Kilian (2009) and Hamilton (2009).[30] Kilian's analysis suggests that various demand-side effects and disruptions in oil supply have quite different effects on the timing and size of changes in oil prices. For example, an increase in the amount of oil held in inventory as a precaution against future oil shortages (precautionary demand) tends to have significant, immediate and long-lasting impacts on oil prices. An increase in the aggregate demand for oil will likewise cause a large and persistent impact on oil prices with some lag and an oil disruption such as a natural disaster or political unrest tends to have small and brief impacts on oil prices. The model Kilian develops takes into account changes in global real activity that affects the demand for commodities, oil shocks and shocks to business cycle activity in a simultaneous equations VAR regression framework. Kilian's results suggest that the cause of the rise in oil prices after 2003 are a direct result of heightened demand for oil globally rather than from a specific oil shock or an increase in precautionary demand. Kilian's contribution to the literature thus lends greater credence to a market fundamentals cause for increases in oil prices in 2007-2008 as opposed to speculative activity.

Hamilton also picks up on this theme that market fundamentals drive oil prices and provides a theory on the conditions for which fundamentals should explain these sorts of events. To understand the more recent effects on oil prices, Hamilton reviews a number of important historical oil events to test his hypotheses. Both supply and demand forces are a leading cause of

[30] Kilian, 2009 and Hamilton, 2009.

oil price movements in 2007-2008. On the supply side, Hamilton notes that oil production did not shrink during the period it but neither did it increase between 2005-2007 as existing oil field production levels had been falling off considerably. In addition, the Saudis historically stabilized prices whenever production levels fell, however, their production also dropped in 2007.[31] On the demand side, Hamilton notes the rise in demand by the Chinese during the period and a decline in demand by OECD nations in response to higher oil prices. Over the 2003-2005 period, Hamilton maintains that the fast growth in GDP globally was responsible for a 6% increase in oil demand. In order to moderate the rise in demand for oil, price had to rise from their level in 2005 of $55/bbl to $142/bbl assuming an estimated elasticity of demand for crude oil of .06. Hamilton maintains that a change in the elasticity of demand in 2008 explains the collapse in oil prices to $40/bbl. While Hamilton paints a convincing argument that fundamentals played a significant part in explaining oil price movements in the 2007-2008 period, he leaves the door open for a the possibility of a speculative response due to the bubble-like effect of prices during the period.

Masters and White also contend that the speculative effects from commodity index trading spilled over directly from futures markets to spot markets as well. To understand this issue, Hamilton presents a theoretical argument for what must happen between commodity prices and demand and supply for oil during the period. He shows that under equilibrium for optimal inventory management, a refiner would respond to an increase in price next period by increasing inventories today through purchases of crude oil in the market while decreasing inventories next period. This would tend to dampen oil prices today while reducing prices next period. Introducing storage costs and zero convenience yield into the model, Hamilton shows that prices in the current and next period would tend to be more correlated in order for the equilibrium to be maintained. In fact the futures price next period would provide information to spot market prices directly. Testing this using actual data from 1983-2008, Hamilton finds that the spot and futures market prices for oil did move very closely with each other, at least corroborating the linkage between these markets. However, that does not imply speculative activity transmitted oil price shocks from futures market trading activity to spot markets.

[31] Hamilton, 2009, p. 10.

Speculation could only drive up oil prices in Hamilton's model if the price elasticity of demand for oil is zero. In this case, the price of oil in the next period would rise as a result and in order to maintain equilibrium inventory level would require current period prices to rise as well. If alternatively, the elasticity of demand was positive, this would nullify the speculator argument as the higher crude prices would raise gasoline prices and reduce demand for gasoline. In response to that crude production would fall and inventories begin rising. Over time, this would force crude prices back into equilibrium in accordance with demand and supply relationships. But the timing of this market reaction back to equilibrium could be drawn out. Consequently, Hamilton argues that a low elasticity of demand argument required for speculation as an explanation for oil price shocks is identical to one where market fundamentals explain oil prices. This result then illustrates how difficult it is to assign much if any significance to oil prices to speculation and why many empirical studies reviewed above find no evidence for speculation and rather as Kilian finds, it is based on market fundamentals driving price.

Hamilton provides insight to the other argument proponents of the speculator theory maintain which is supply driven. In this context, oil production is driven by price signals in the market that could be magnified by speculative activity. Hamilton invokes the Hotelling principle here that states that oil producers would suspend production if they believed oil prices would rise in the future. According to this theory, oil producers during the 2007-2008 oil event would have reduced their production levels in response to speculative driven price increases. The data, however; of oil price contracts at the peak in oil prices in July 2008 does not support that theory. Specifically, the later dated futures contracts were moving downward as implied by the futures market in that month. That would indicate that if producers had held off production, they would be selling future oil production at lower prices. The combination then of a low price elasticity of demand and oil production remaining steady in the face of rising worldwide demand rather than speculation is what drove the oil price shocks of that period according to Hamilton.

"I therefore conclude that these two factors, rather than speculation per se, should be construed as the primary cause of the oil shock of 2007-08. Certainly the casual conclusion one might have drawn from glancing at Figure 1 and hearing some of the accounts of speculation— that it was all just a mistake, and

the price should have stayed at $50/barrel throughout the period 2005-08— would be profoundly in error."[32]

In yet another article on the subject of speculation in oil markets during 2007-2008, Kilian and Murphy (2010) conduct a series of statistical tests on the elasticity of demand for oil to determine if Hamilton's hypothesis that a zero elasticity could spark speculative activity in the absence of an increase in inventories.[33] Applying a structural VAR modeling approach that takes into account the effect of oil inventories in explaining prices, the study finds that changes in the business cycle affecting the demand for oil were responsible for oil price shocks in 2007-2008 and that it was not due to speculation or producers reacting to price effects and cutting back on their flow. In their tests of demand elasticity, the results indicated a statistically significant and nonzero value, further supporting a nonspeculative explanation for oil prices during this period.

While oil has garnered a significant amount of attention with respect to the theory of speculative activity, it is worth reviewing studies of market fundamentals versus speculation in other commodity markets. One that is forthcoming by the OECD claims that the rise in prices in a number of agricultural, metals an energy commodities is due to global demand rather than speculation (Di Leo, 2011).[34] Similar to other empirical studies reviewed on the subject, according to sources close to the study, it found no statistical correlation between rising commodity prices and commodity index driven trading activity. The Wall Street Journal reported that French President Sarkozy, a vocal proponent of the speculation theory, criticized a draft version of the study. Subsequently, the discussion of the findings on commodity index trading and prices was deleted.

In agricultural commodities a number of empirical studies have concluded that market fundamentals are behind rising prices of wheat, corn and soybeans, among others. One study by Trostle attributed a variety of market related factors to the acceleration in commodity prices

[32] Hamilton, p.23.
[33] Lutz Kilian and Dan Murphy, The Role of Inventories and Speculative Trading in the Global Market for Crude Oil, Working Paper, 2010.
[34] Luca Di Leo, "OECD: Real Demand Driving Commodities," *Wall Street Journal*, February 28, 2011.

including rising demand for livestock feed, decline in the value of the dollar, and rising energy costs associated with commodity production. One commonly used metric to understand the influence of demand and supply forces on commodity prices is the stocks-to-use ratio. Due to inherent seasonality of agricultural commodities, ending balances of stocks in a production period provide information on the relationship between demand and supply for a commodity. The ratio of stocks-to-use is inversely related to commodity prices. As demand rises (use), the ratio will decline and prices will increase. A number of empirical studies have been conducted using this methodology, most notably, Westcott and Hoffman (1999) showing that market fundamentals continue to explain agricultural commodity prices.[35] A more detailed assessment of specific commodities using this methodology can be found in the Interagency Taskforce on Commodity Markets (2008) study and also corroborates the findings of the Westcott and Hoffman analysis using more recent data.[36]

The Interagency Taskforce also turned its attention to understanding the impact of growth in commercial trading in corn markets on prices of that commodity. Figure 2 from their study clearly illustrates the growth by commercial traders on both long and short positions between 2000-2008. Decomposing this activity further, the study looked at the degree to which specific types of traders had been disproportionately affecting growth in positions over time. By examining the relationship between changes in daily positions and prices for different groups of traders as shown in Figure 3, it is clear that commodity index trader positions show negligible relationship to corn price movements.

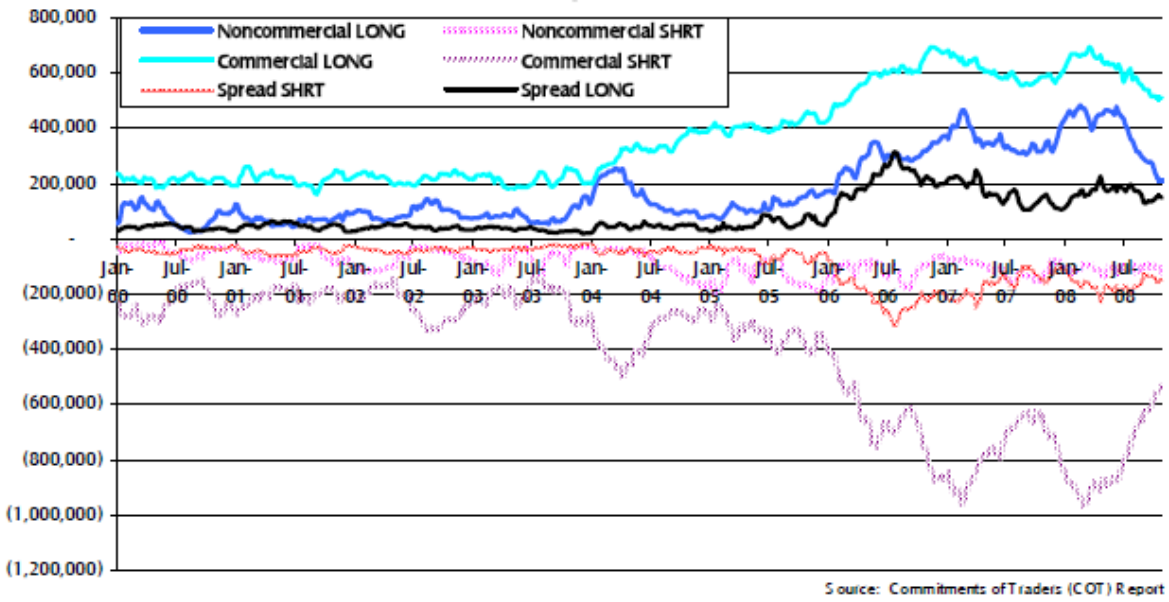
As final confirmation of the effect of commodity index traders on corn prices, Figure 4 from the Interagency Taskforce study shows that across various contract maturities and years the Granger causality tests are statistically insignificant for this group. The empirical results on the role fundamental factors play in determining commodity prices in conjunction with analyses of trading effects on market prices provide a more complete picture of what is driving prices in

[35] Westcott, P., and L. Hoffman. *Price Determination for Corn and Wheat: The Role of Market Factors and Government Programs*, TB-1878, Economic Research Service, U.S. Department of Agriculture, July 1999.
[36] Interagency Taskforce of Commodity Markets, pp.29-105.

these markets. What is clear from the significant amount of work in this area is that market fundamentals rather than speculative activity dominate commodity pricing.

Figure 2[37]

Corn Futures – Long, Short and Spread Open Interest Positions, 2000-2008



Other Market Evidence Against Speculation

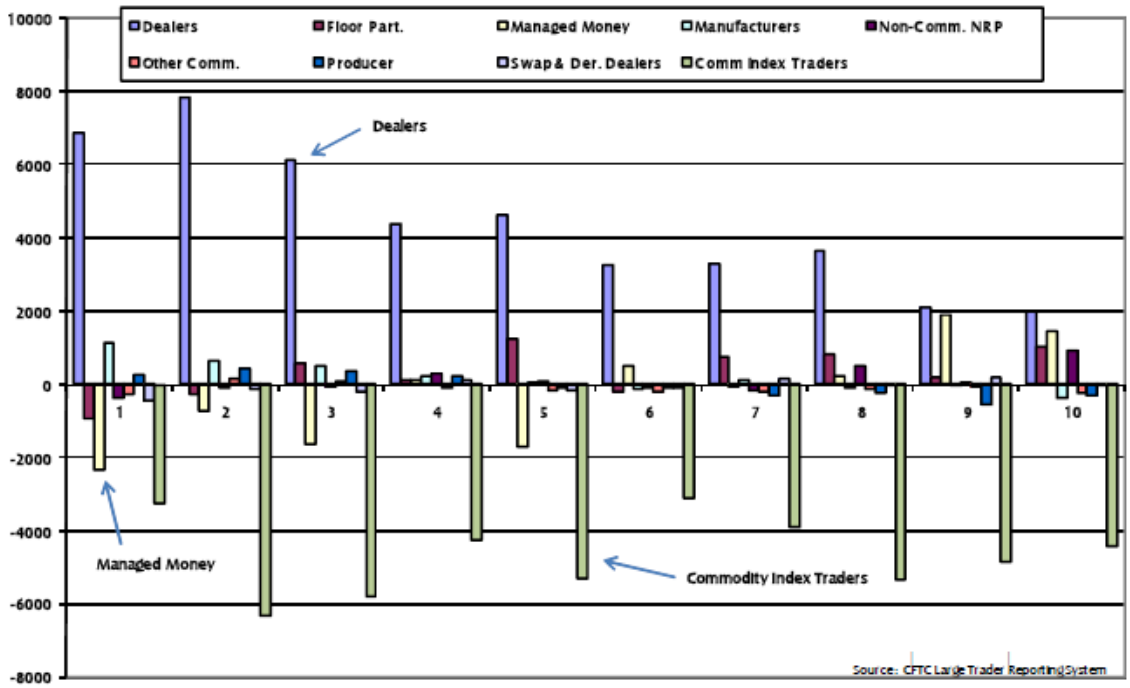
Having reviewed a wide range of empirical analyses on market fundamentals and speculation in commodity markets, it is useful to examine commodity market data to see to what degree specific arguments for speculation are factually supported. Masters and White made the following claim in their study:

> Institutional Investors have poured hundreds of billions of dollars into commodities futures markets as part of a portfolio allocation decision. This titanic wave of money has greatly amplified the current upward trend of commodities futures prices.[38]

[37] From Interagency Taskforce study.
[38] Masters and White, p. 12.

Figure 3[39]

Average Change in CME Corn Net Positions by Decile of Daily Price Changes for all Nearby Contracts 2000-2008



Coupled with this remark, Masters and White (2008) assert that index traders take long positions only. Both points are inherently flawed as they relate to the functioning of futures markets. Irwin and Sanders (2009), for example, make reference to the fact that these are effectively position neutral markets in that for every long position there is an offsetting short position. Looking back at Figure 2, clearly the pattern that emerges is growth of commercial trading on both the long and short side. Furthermore, the number of positions held by a trader does not equate into demand for a commodity in the traditional economic sense of the term. Further evidence that commodity markets are well balanced between long and short positions was found by Irwin and Sanders (2009) in nine commodity futures markets between 2006 and 2008. Table 1 from their study shows clearly that long positions by commodity index trading activity grew

[39] From Interagency Taskforce report.

Figure 4[40]

Granger Causality Test Results for Corn Market Prices and Trading Type

CBOT Corn Futures
P-Values for Bivariate Granger Regressions - Daily Change in Price Explains Change in Net OI
The dependent variable is the daily change in net Open Interest (net OI) for the contract. All values shown are p-values of the t-test that the coefficient of the one-period lag of the change in settlement price of the contract is zero. Net OI is measured daily for each contract using the sample period over which it is nearby and next-to-nearby.

Contract Maturity July

Trdcodes	1	2	3	4	5	6	7	8
Futures Expiration	Dealers	Manufacturers	Other Commercial	Producers	Swap Dealers	Floor Participants	Managed Money	NRP
2003	0.436	0.674	0.477	0.469	0.097	0.284	0.121	0.622
2004	0.044	0.630	0.908	0.371	0.273	0.000	0.835	0.983
2005	0.095	0.079	0.891	0.606	0.173	0.075	0.947	0.495
2006	0.911	0.489	0.203	0.404	0.471	0.693	0.855	0.417
2007	0.064	0.116	0.959	0.065	0.406	0.725	0.186	0.772

Contract Maturity September

Year	Dealers	Manufacturers	Other Commercial	Producers	Swap Dealers	Floor Participants	Managed Money	NRP
2003	0.762	0.525	0.891	0.243	0.445	0.005	0.760	0.070
2004	0.606	0.158	0.724	0.837	0.732	0.000	0.114	0.609
2005	0.704	0.407	0.824	0.572	0.330	0.710	0.007	0.046
2006	0.126	0.175	0.290	0.085	0.424	0.559	0.155	0.756
2007	0.092	0.115	0.288	0.140	0.191	0.394	0.516	0.918

Contract Maturity December

Year	Dealers	Manufacturers	Other Commercial	Producers	Swap Dealers	Floor Participants	Managed Money	NRP
2003	0.520	0.519	0.260	0.912	0.507	0.001	0.320	0.031
2004	0.608	0.548	0.037	0.258	0.220	0.547	0.107	0.000
2005	0.048	0.000	0.093	0.000	0.171	0.073	0.176	0.825
2006	0.412	0.992	0.000	0.001	0.849	0.205	0.387	0.013
2007	0.471	0.387	0.008	0.325	0.238	0.318	0.150	0.438

Contract Maturity March

Year	Dealers	Manufacturers	Other Commercial	Producers	Swap Dealers	Floor Participants	Managed Money	NRP
2003	0.149	0.139	0.265	0.359	0.998	0.100	0.528	0.252
2004	0.544	0.716	0.820	0.728	0.436	0.050	0.358	0.002
2005	0.864	0.758	0.037	0.497	0.633	0.124	0.718	0.678
2006	0.730	0.495	0.442	0.469	0.593	0.841	0.920	0.153
2007	0.067	0.369	0.384	0.051	0.313	0.009	0.307	0.852

Contract Maturity May

Year	Dealers	Manufacturers	Other Commercial	Producers	Swap Dealers	Floor Participants	Managed Money	NRP
2003	0.766	0.138	0.300	0.389	0.572	0.164	0.887	0.243
2004	0.570	0.133	0.295	0.534	0.442	0.275	0.841	0.051
2005	0.800	0.123	0.629	0.476	0.605	0.373	0.529	0.150
2006	0.508	0.690	0.237	0.485	0.559	0.450	0.478	0.349
2007	0.211	0.670	0.065	0.144	0.574	0.039	0.491	0.386

[40] From Interagency Taskforce report.

during that period but was more than offset by commodity hedgers taking short positions. Consequently, these results suggest that only by looking at the market for long and short positions together can an accurate depiction of the effect of market trading be established. And from that view, it is clear that long commodity index trading has facilitated and expanded short hedging opportunities for commodity producers.

Another fact pattern that appears inconsistent with a widespread speculation-based bubble in commodity prices is that the prices in some markets that experienced relatively large index trading activity experienced a drop in prices. Table 2 and Figure 5 from Irwin and Sanders (2009) provides a comparison of price changes between January 2006 and April 2008 for nine agricultural commodities as well as the open interest from index traders over the time period for the various commodity types. Markets that experienced large open interest by commodity index traders such as livestock witnessed price declines over this period. In other words, the market data are not supportive of a rationale that index trader activity was responsible for price shocks in commodity markets at the time.

As mentioned earlier, evidence supporting speculation in commodity markets would be rising inventories as prices rise to levels that cannot absorb supply. Evidence for oil can be seen from Figure 6 where oil stocks were at relatively low levels in the first half of 2008. Irwin and Sanders also note that inventory levels in agricultural commodities between 2005-2007 were declining as well.[41] Again the data do not square with the speculation argument completely.

Important Features of Commodity Index Funds Warranting Policy Attention

To this point, the focus of the paper has been on assessing the empirical facts surrounding commodity market prices and the effect of index trading activity. Designating commodity index

[41] Irwin and Sanders, p. 384.

Table 1

Speculative and Hedging Positions (number of contracts) in Agricultural Futures Markets, First Quarter of 2006 and 2008[42]

Market	HL	HS	SL	SS
Corn				
2006	328,362	654,461	558,600	208,043
2008	598,790	1,179,932	792,368	182,291
Change	270,428	525,471	233,768	−25,752
Soybeans				
2006	126,832	192,218	183,105	107,221
2008	175,973	440,793	351,379	74,844
Change	49,141	248,575	168,274	−32,377
Soybean oil				
2006	66,636	124,134	92,515	35,599
2008	121,196	228,515	128,546	25,844
Change	54,560	104,381	36,032	−9,755
CBOT wheat				
2006	57,942	213,278	251,926	92,148
2008	70,084	240,864	300,880	121,578
Change	12,141	27,585	48,954	29,430
KCBOT wheat				
2006	43,993	110,601	80,158	13,560
2008	46,459	96,556	67,827	15,767
Change	2,466	−14,045	−12,330	2,207
Cotton				
2006	41,582	108,085	86,777	21,824
2008	107,826	296,434	200,773	18,918
Change	66,244	188,349	113,995	−2,906
Live cattle				
2006	54,549	128,951	129,786	45,305
2008	34,970	144,549	198,211	80,303
Change	−19,579	15,599	68,425	34,998
Feeder cattle				
2006	10,707	17,725	20,769	10,632
2008	6,310	13,435	28,284	18,111
Change	−4,397	−4,290	7,515	7,479
Lean hogs				
2006	15,949	65,438	93,522	40,036
2008	36,825	113,971	149,415	69,055
Change	20,876	48,533	55,893	29,019

HL = Hedging, Long; HS = Hedging, Short; SL = Speculating, Long; SS = Speculating, Short; CBOT = Chicago Board of Trade; KCBOT = Kansas City Board of Trade.

The data reflect average positions in the first calendar quarter of 2006 and 2008, respectively. Open interest is aggregated across futures and options, with options open interest delta–adjusted to a futures equivalent basis. Source: Sanders, Irwin, and Merrin (2008a).

[42] Irwin and Sanders, p. 382.

Table 2

Change in Commodity Prices: January 2006 – April 2008

Commodity	January 2006	April 2008	Change
Panel A. Futures Markets Included in Popular Indexes			
Corn	$2.20/bu	$6.06/bu	175%
Soybeans	$6.28/bu	$13.80/bu	120%
Soybean oil	22.96¢/lb	62.52¢/lb	172%
CBOT wheat	$3.46/bu	$8.96/bu	159%
KCBOT wheat	$3.90/bu	$9.50/bu	136%
Cotton	55.24¢/lb	75.23¢/lb	36%
Live cattle	$96.37/cwt	$91.57/cwt	−5%
Feeder cattle	$114.00/cwt	$103.95/cwt	−9%
Lean hogs	$64.65/cwt	$71.65/cwt	11%
Panel B. Futures Markets not Included in Popular Indexes			
Rough rice	$8.27/lb	$22.17/lb	168%
Fluid milk	$12.65/cwt	$17.29/cwt	37%
Panel C. No Futures Markets			
Apples fresh use	$0.26/lb	$0.41/lb	58%
Edible beans	$19.30/cwt	$34.40/cwt	78%

CBOT = Chicago Board of Trade; KCBOT = Kansas City Board of Trade.
All prices refer to the relevant nearby futures price except apples and edible beans, which are monthly prices received by farmers.

Source: Irwin and Sanders, 2010

trading as speculative ignores a number of critical positive aspects of such activity on commodity markets and for investors. Commodity index funds, like other broad-based investment funds such as S&P 500 index mutual funds or total market bond index funds provide retail investors with an ability to access markets not normally available to them based on their scale. Consistent with portfolio theory, a portfolio's diversification benefits accrue from the imperfect correlation across asset classes. In particular then, adding a commodity index fund to a portfolio of equities and fixed income assets would be expected to improve the risk of the portfolio as defined by its volatility assuming the assets are not perfectly correlated.

According to Modern Portfolio Theory, we can establish the following:

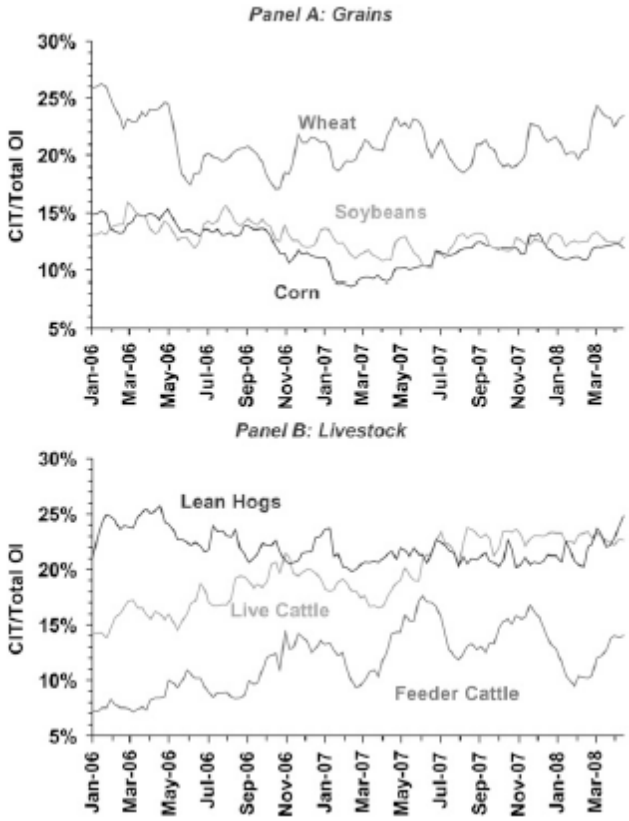
$$E(R_P) = \sum_{i=1}^{n} w_i E(R_i)$$

$$\sigma_P^2 = \sum_{i=1}^{n}\sum_{j=1}^{n} w_i w_j \sigma(R_{i,} R_j)$$

where $E(R_P)$ represents the expected return on the portfolio, $E(R_i)$ is the expected return on asset i, σ^2_P is the portfolio variance, and $\sigma(R_i,R_j)$ is the covariance of asset i's returns with asset j's.

Figure 5

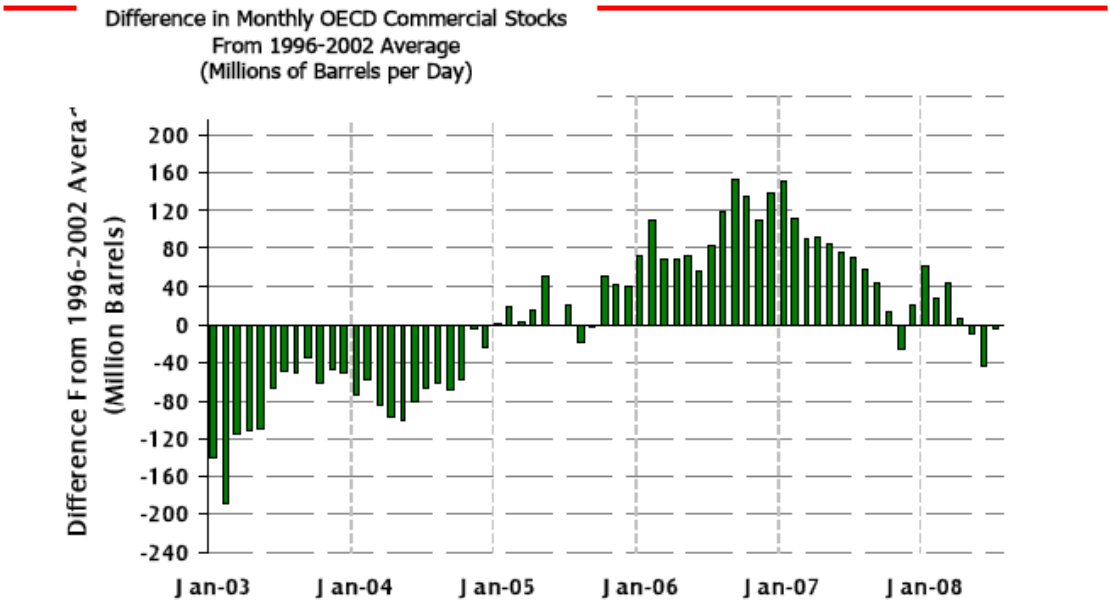
Proportion of Open Interest Held by Commodity Index Traders (CIT) in Grain and Livestock Futures Markets, January 2006 – June 2008



Source: Irwin and Sanders, 2010.

Figure 6

Difference in Monthly OECD Commercial Oil Stocks 1996-2008 (million barrels per day)[43]



Source: Energy Information Administration, *Short-Term Energy Outlook September 2008 and* latest IEA data.

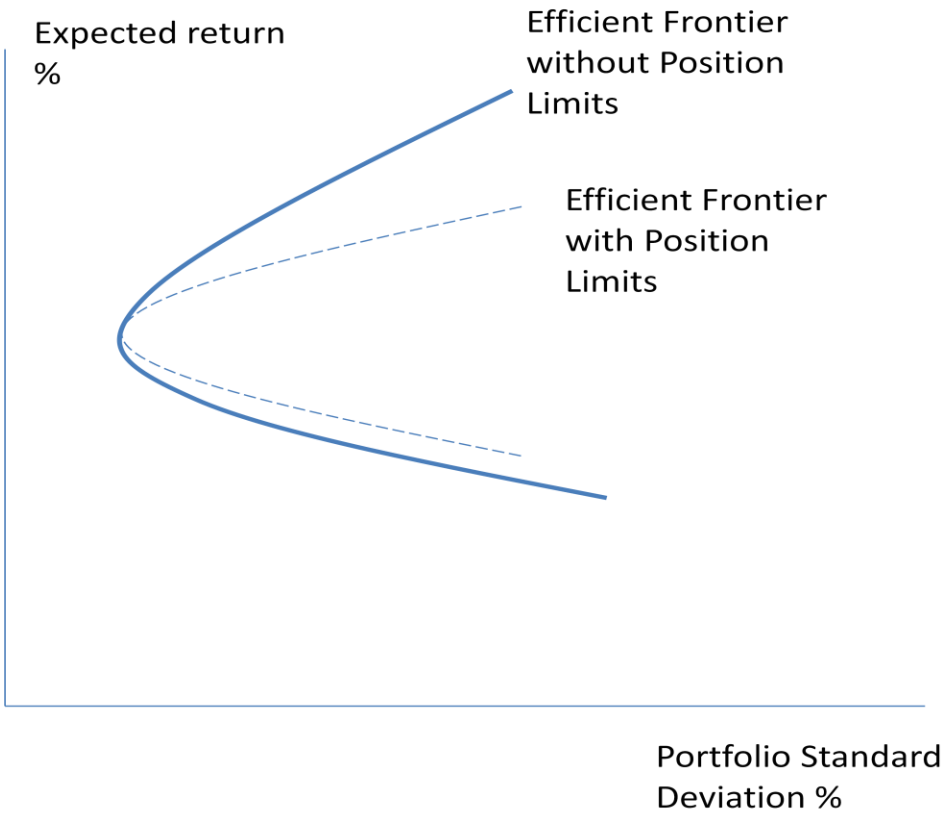
The objective of the investor then is to minimize the risk of the portfolio (σ^2_P) subject to a target return. Graphically, we can represent the combination of optimal returns and portfolio variance by Figure 7 as the heavy shaded curve.

Imposing position limits onto commodity index trading would constrain the size of the investment available allocated to this asset class. This would have the effect of reducing returns to the portfolio for a given level of risk. This can be observed conceptually by comparing the efficient frontiers with and without position limits in Figure 7. Imposing position limits would

[43] Interagency Taskforce, Special Report, p. 21.

Figure 7

How Position Limits Would Diminish Small Investor Portfolio Performance



thus have a deleterious effect on investors, particularly small investors as a result of constraining their access to such markets. It would reduce their ability to diversify their portfolio and hence exposes the investor to greater volatility in their portfolio. While no empirical literature quantifying the potential impact to investors from position limits appears to exist on this subject, the impact can be inferred to be of some importance given that investment flows into commodity index funds has grown to over $250B by 2009 according to Barclays.

Relating to commodity markets specifically, index trading has been determined to improve the price discovery function in markets and also supports the market by increasing liquidity. An advantage of futures markets is their ability to provide an effective hedging vehicle for firms

looking to manage the risk of their underlying positions. However, if futures prices across the spectrum of maturity contracts have limited structural relationship with each other, it can greatly reduce the effectiveness of these markets for hedging. To test whether index trading activity in oil futures markets has affected prices in this market; Haigh et al.(2007) analyzed NYMEX daily pricing an position data on crude oil from 2000-2006 from CFTC's Large Trader Reporting System (LTRS). The authors employ an error correction model technique to test for the stability of short- and long-term price relationships in nearby and later-dated contracts, referred to as the level of co-integration between price series. The more co-integrated the series, the more a relationship between prices exists, suggesting improved price discovery in the market generally, leading to better liquidity and overall improvement in the effectiveness of hedging strategies. Of some significance, the data allowed them to test which class of trader would have the greatest effect on improving the co-integration of oil futures prices. The paper found that oil futures prices became more co-integrated over time as commodity swap dealers increased their positions. The implications of these findings are significant for the current debate over position limits on commodity index trading as imposition of such limits would tend to retard the beneficial effects of improved liquidity and price discovery brought by such trading activity.

Improvements in trading data in recent years have facilitated improved transparency and liquidity in commodity markets. COT data for instance has become more granular over time regarding the extent of specific trading activity. Reporting of commodity index trading positions in particular has vastly improved and along with it informational efficiencies such as on-line ability to retrieve this information and greater frequency (now weekly with a 3-day delay vs monthly). This richer and timelier data promotes enhanced liquidity by increasing trading transparency, thereby allowing more hedge participants to be aware of and take advantage of trends in deepening long positions by noncommercial traders.

Policy Implications and Conclusions

Over the last few years, commodity index trading activity has come under close scrutiny by policymakers in the wake of a sudden and sharp rise in commodity prices that occurred in the

2007-2008 period, most notably in oil. Legislators and regulators have further escalated the debate through proposed position limits on commodity index trading, contending that the growth in commodity index trading led to a speculative bubble in commodities markets. This perspective has been fueled in part by a number of studies focusing on a simple relationship between the growth in commodity index trading and commodity prices. That commodity prices and the growth in index trading did rise sharply together in the 2007-2008 period is indisputable, however, establishing a causal linkage between the two is subject to empirical critique. It is this aspect of the debate that this paper addresses.

The analysis surveyed the literature on both sides of the debate, focusing on the theory and evidence associated with a market fundamentals versus speculation-based theory for commodity prices. The empirical work for establishing a fundamentals-based explanation for commodity prices in both oil and agricultural commodities is extensive and well-researched. From the studies examined, the body of evidence suggests that market fundamentals drove commodity prices rather than speculation-based trading activity. The theoretical requirements for speculation to affect oil prices for instance includes a zero elasticity of demand and/or or an increase in oil inventories. Neither of these conditions was observed in the statistical analysis or actual data. Further supporting the market fundamentals theory for commodity prices are a number of empirical studies on agricultural commodity markets where no evidence of speculative activity affecting prices was observed. The preponderance of Granger causality studies looking at this issue find no statistically significant relationships between commodity index trading and changes in prices. However, a review of a number of studies where such tests indicated a relationship existed between index trading and prices had issues with data or assumptions that call into question the firmness of their results.

Cast against the charges that commodity index trading led to a speculative bubble are the significant benefits such activities bring to commodity markets and investors. First, it was shown that the advent of broad-based commodity index funds offer retail investors (as well as institutional investors such as pension funds) access to markets otherwise difficult to enter based

on a variety of technical and cost constraints. Providing another readily available asset class at relative low cost allows for improved portfolio diversification and risk-return tradeoffs than under a scenario where position limits would constrain fund size and investor choice. As it relates to commodity markets, it was shown that the advent of commodity traders demonstrably improved the price discovery function in oil futures markets, improved market liquidity over time and the effectiveness of hedging in these markets.

In summary, the primary conclusions from this report are as follows:

- Arguments favoring the speculation theory for commodity price shocks are supported by misleading univariate relationships between the growth and size of commodity index contracts and the commodities prices. Such spurious empirical relationships are not grounded in rigorous statistical methods and data analysis.
- The theoretical requirements for speculation to have occurred in oil; i.e., a zero price elasticity of demand and/or an increase in oil inventories is not supported by the empirical literature.
- Market fundamentals rather than speculation offer the best empirical support to date on explaining the 2007-2008 shock in oil prices.
- Empirical evidence also supports the case that market fundamentals drove up prices in a number of agricultural commodities during the same period
- Extensive rigorous statistical time-series tests of the relationship between commodity index contracts and prices have been performed by leading academics and the CFTC confirming a lack of statistical relationship between these factors; directly refuting the speculation argument.
- A significant amount of commodity market data is inconsistent with the speculation theory of commodity price shocks.
    - For instance, a number of commodity markets during the 2007-2008 period experienced sharp price increases but these were markets that had no association with commodity index funds.

    - The speculation theory focuses exclusively on the long positions of commodity index funds without calling attention to fundamentals of futures markets that are essentially zero-sum games. The data actually show that the long positions were well matched against short positions; thus offsetting any potential effect from the long side.
- Other claims that commodity index trading could influence spot market prices are specious since indexes and traders do not hold physical stocks of any commodity. Also, the analogy to the Hunt brothers cornering of the silver market made by proponents of the speculation theory is inconsistent with actions by today's commodity index traders.

From these conclusions several important policy recommendations emerge:

- CFTC should not classify commodity index trading organizations as speculators
- CFTC should exempt commodity index trading from compliance with position limits
- CFTC should commission an independent and comprehensive empirical study of the impact of commodity index trading on commodity markets

Based on the results of this analysis, it is difficult to imagine why position limits on commodity index trading would be implemented. Clearly this activity should be exempted from position limit requirements based on the empirical evidence. Introducing critical public policy based on overly simplistic relationships without understanding the complexity of market forces shaping commodity markets favors expediency over fact that surely imperils the liquidity, efficiency, and price discovery of commodity and financial markets.

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