Statement on the Commodity Futures Trading Commission Position Limits Literature Review
Chairman K. Michael Conaway
June 28, 2016

Mr. Speaker, I rise today to submit into the Congressional Record an important document related to the ongoing work to finalize a position limits rulemaking at the U.S. Commodity Futures Trading Commission (CFTC). The document, an unpublished draft literature review prepared by the CFTC's Office of the Chief Economist (OCE), is titled "Analysis of the Various Economic Studies Cited in Comment Letters in the Position Limits Rulemaking."

The House Committee on Agriculture (Committee) conducted oversight of research practices at OCE based on a report published by the CFTC's Office of Inspector General (CFTC OIG). As part of this oversight initiative, the Committee requested, obtained, and reviewed documents and information related to the CFTC OIG's report. As a result of its oversight efforts, the Committee obtained a literature review on position limits that was never finalized or circulated to the full commission.

Having reviewed the draft literature review prepared by the CFTC's own economists, I believe it presents a comprehensive overview of the current state of economic research on excessive speculation and an objective analysis of the potential utility of position limits. The document discusses in detail the ongoing and vigorous debate among economists about what constitutes excessive speculation and what, if any, impact it might have on prices and volatility in the commodity futures markets. In addition, the document summarizes and provides a brief analysis of many of the most important academic studies cited by commenters and utilized by CFTC staff in drafting the proposed rule.

On June 14, 2016, I requested that CFTC Chairman Massad make this document public because I believe the insights and information contained in this report will benefit the general public's understanding of and ability to comment on the proposed rule. On June 17, 2016, Chairman Massad declined on the grounds that (i) the document was a summary of studies submitted during the comment period and, (ii) it was never intended to be public.

The document, however, is much more than a summary of studies submitted during the comment period; it also is a wide-ranging examination of how to define excessive speculation, how to measure it, and how it may impact markets.

For reference, I have included the entirety of the conclusion section here:

> Economists debate whether "excessive speculation," meaning a link between large speculation positions and unwarranted price changes or price volatility, exists in these regulated markets, and if so to what degree. The question presented is a surprisingly difficult one to answer. All the empirical studies on this question have drawbacks, and none is conclusive. This inconclusivity is not surprising. It is inevitable, given the economic uncertainties that inhere in the data and the complexity of the question. There are many theoretical and empirical assumptions, and often multiple leaps of faith, that are needed to transform and interpret raw market data into meaningful and persuasive results. There is no decisive statistical method for establishing evidence for or against position limits in the commodity.
>
> Those that use Granger causality methodology tend to conclude that there is no evidence of excessive speculation or its consequences on price returns and price volatility, and many industry commenters opposed to position limits used this methodology. But that

methodology is peculiarly sensitive to model design choices, and above we have analyzed designed modelling decisions that may have affected the ultimate conclusions of these studies. Moreover, there are countervailing Granger studies showing a link between large speculative positions and price volatility. And studies such as Cheng, Kirilenko, and Xiong, Convective Risk Flows in Commodity Futures Markets (working paper 2012), indicate that some Granger studies may mask the impact of excessive speculation in times of financial stress.

Those that use comovement and cointegration methods tend to conclude there is evidence of deleterious effects of "excessive speculation." Yet comovement just tests for correlation, not causation, and a correlation between large financial trading in the commodity markets and price changes and volatility could be driven by a common causal agent such as macroeconomic factors.

Those studies that use models of fundamental supply and demand reach a whole host of divergent opinions on the subject, each opinion only as strong as the many modelling choices.

In this way, the economic literature is inconclusive. Even clearly written, well-respected papers often contain nuances. It is telling that Hamilton, Causes and Consequences of the Oil Shock of 2007-2008, Brookings Paper on Economic Activity (2009), has been cited by both proponents and opponents of position limits.

What can be said with certainty is summarized in the Commission's NPRM: that large speculative positions and outsized market power pose risks to a well-functioning marketplace. These risks may very well differ depending on commodity market structure, but can in some markets cause real-world price impacts through a higher risk premium as a component of total price. There are also economic studies indicating some correlation between increased speculation and price volatility in times of financial stress, but this correlation does not imply causation. There are studies indicating that in certain markets, such as crude oil, or certain time periods, such as times of financial stress, the impact of excessive speculation may be greater. These findings are all exceptions to the general rule that increased participation of speculators should generally be expected to lead to better price discovery and less unwarranted price volatility.

Comment letters on either side declaring that the matter is settled in their favor among respectable economists are simply incorrect. The best economists on both sides of the debate concede that there is a legitimate debate afoot. This analysis paper documents that the academic debate amongst economists about the magnitude, prevalence, and pervasiveness of the risk of outsized market positions has reputable and legitimate standard-bearers for opposing positions.

While I have my own opinion about the utility of a position limits regime, my push to make this document public has nothing to do with a disagreement over the outcome of this specific policy debate. I believe that to make informed decisions it is important that lawmakers, policy makers, and the public have access to the best available information. This literature review, much like other whitepapers, studies, and analyses published by OCE, provides such information in a manner that is clear and understandable.

It is my hope that this information will be used to continue to improve our understanding of derivatives markets and the regulatory rules we enact to govern them. For this reason, I am making this report public prior to the July 13 closing date of the comment period for the CFTC's position limits rulemaking.

The cover memo, full literature review, and all of the correspondence between the CFTC and the Committee regarding this document are available on the Committee's website at http://agriculture.house.gov/uploadedfiles/position_limits_analysis.pdf.

U.S. House of Representatives
Committee on Agriculture
Room 1301, Longworth House Office Building
Washington, DC 20515–6001
(202) 225–2171

June 14, 2016

The Honorable Timothy G. Massad
Chairman
U.S. Commodity Futures Trading Commission
1155 21st Street, NW
Washington, DC 20581

Dear Chairman Massad:

The House Committee on Agriculture is conducting oversight of research practices at the U.S. Commodity Futures Trading Commission's (CFTC) Office of the Chief Economist (OCE) based on a report published by the agency's Office of Inspector General (OIG). As part of this oversight initiative, the Committee requested documents and information related to the OIG's report and discovered the existence of a draft literature review on position limits that was never finalized or circulated to the full commission. I write to request that you direct CFTC staff to finalize and make public this report for use in the Commission's ongoing work on the position limits rulemaking.

On February 18, 2016, the OIG published a report following up on a 2014 review of OCE research programs. After interviewing OCE economists, the OIG decided to expand its review of OCE to include research topic selection due to allegations that the Chief Economist has refused to permit research on topics relevant to the agency's mission, including position limits, and economists have begun limiting their research proposals to non-controversial topics based on a perception that the Chief Economist will not permit research that may conflict with the official positions of the CFTC.

The OIG's findings were deeply troubling, and the Committee requested documents and communications related to the OIG's investigation for additional oversight. Among the documents the Committee received was a draft literature review summarizing and analyzing economic studies cited in comment letters on the position limits rulemaking that was sent to your office on June 30, 2015.[1] The version we have seen is labeled draft number 20, but does not appear to have been submitted for final review within OCE after it was shared with your office.

[1] "Analysis of the Various Economic Studies Cited in Comment Letters in the Position Limits Rulemaking," Unpublished draft internal analysis, U.S. Commodity Futures Trading Commission, Office of the Chief Economist.

I have reviewed the document, and I believe it presents a comprehensive overview of the current state of economic research on excessive speculation and an objective analysis of the potential utility of position limits. The report discusses in detail the ongoing and vigorous debate among economists about what constitutes excessive speculation and what, if any, impact it might have on prices and volatility in the commodity futures markets. The authors of this report raise important questions about whether position limits are an effective tool for limiting the effects of excessive speculation. They also highlight the market stabilizing effects of speculative activity and suggest that suppressing such activity may carry unintended risks, such as disruptions to liquidity and price discovery.

I appreciate your work on the recent supplement to the proposed position limits rulemaking. Your proposal takes steps towards addressing several of the concerns that have been raised before both this Committee and your agency. As stakeholders and market participants review the new language and file their comments, this report, which puts the best economic literature in context, may help clarify what can and cannot be accomplished in the final rule.

Position limits are a complex regulatory tool and their impact on markets is uncertain. Given the sweeping nature of this rulemaking and the intense debate it has provoked since its inception, this even-handed report prepared by the Commission's own economists should serve as an invaluable resource for the Commission and the public. Therefore, the Committee requests that you finalize this report before continuing with the next steps in the rulemaking process.

The Committee on Agriculture is the principal authorizing committee for all matters related to agriculture and commodity exchanges in the House of Representatives and "shall have general oversight responsibilities" as set forth in House Rule X.

Please respond to this request in writing on or before June 24, 2016. Your response should specify the date by which the literature review will be finalized and made public. If you have any questions about this request, please contact Emily Wong or Paul Balzano of the majority staff at 202-225-2171.

Sincerely,

K. Michael Conaway
Chairman

cc: The Honorable Collin Peterson, Ranking Minority Member

U.S. COMMODITY FUTURES TRADING COMMISSION
Three Lafayette Centre
1155 21st Street, NW, Washington, DC 20581
Telephone: (202) 418-5000
Facsimile: (202) 418-5521
www.cftc.gov

Office of the Chairman

Timothy G. Massad
Chairman

June 17, 2016

The Honorable K. Michael Conaway
Chairman
Committee on Agriculture
U.S. House of Representatives
Washington, DC 20515

Dear Mr. Chairman:

I am writing in response to your letter of June 14, 2016 regarding the U.S. Commodity Futures Trading Commission's ("CFTC" or "Commission") rulemaking concerning position limits on derivatives.

As you note in your letter, the position limits rulemaking ("proposal" or "rule") is a very important one. As with all rulemakings, the Commission is following a transparent and thorough process. No current Commissioner was in office when the initial position limits rule was proposed, and therefore we have taken the time to listen to market participants and consider the proposal very carefully. The Commission has made extensive efforts to ensure the public has ample opportunity to comment on the proposal and has extended the public comment period multiple times.

As part of any rulemaking process, all comment letters are made publicly available on the Commission's website. Commission staff routinely summarize these comments, which can be helpful to Commissioners and staff because comments are often voluminous in detail. In the case of this rule, some of the comment letters referenced studies regarding position limits or related matters conducted by third parties, including academic researchers, economists and trade organizations. The draft document you mention in your letter is a summary of studies submitted during the rulemaking comment periods. A majority of these studies were submitted prior to the publication of the proposed rule in December 2013 and were summarized and listed in that 2013 proposal.

While staff summaries of public comments (or material referred to in the comments) are internal Commission documents and not themselves published as part of the final rule, I can assure you that, consistent with normal practice, any final rule will summarize the comments we receive,

including those comments that refer to third party studies, just as was done for the proposed rule published in December 2013.

I appreciate the complexity of the issues surrounding the position limits rule, and the importance of thoroughly and fully considering public comments. I have made it a priority to finalize a position limits rule this calendar year and believe we are making good progress toward that goal.

If you have further questions, please contact me or Cory Claussen at 202-418-5383.

Sincerely,

cc: The Honorable Collin C. Peterson, Ranking Member

U.S. COMMODITY FUTURES TRADING COMMISSION
Three Lafayette Centre
1155 21st Street, NW, Washington, DC 20581
Telephone: (202) 418-5000
Facsimile: (202) 418-5521
www.cftc.gov

Office of the Chief Economist

-- DATE –
DRAFT

TO: [redacted]
Senior Economist, DMO
Position Limits Team Lead

FROM: [redacted]
Research Economist, [redacted]
Team Lead, Position Limit Economic Studies

[redacted]
Ass't Gen. Counsel, OGC, [redacted]
Position Limit Economic Studies Team Member

[redacted]
Surveillance Analyst, DMO, [redacted]
Position Limit Economic Studies Team Member

CC: [redacted]
Chief Economist, [redacted]

[redacted]
Supervisory Economist, OCE, [redacted]

SUBJECT: Analysis of the Various Economic Studies Cited in Comment Letters in the Position Limits Rulemaking

Enclosed please find our draft analysis various economic studies cited in the position limits comment letters. Please observe that this is a draft. It has gone through initial, but not final, review within the Office of Chief Economist and is not at this time the official view of the Office of Chief Economist.

This document includes both detailed analysis of the various studies as well as both introductory and summary comments. It is written to be of use to both a general audience as well as economists. We hope it may help to guide the path of the rulemaking.

Also attached for your convenience are appendices with a copy of the Marcus Henn comment letter submitted by Better Markets which cites to and discusses many studies; a copy of a recent ISDA/SIFMA comment letter which discusses several studies and attaches economic analysis; and an Excel spreadsheet categorizing and sourcing to the administrative record all the economic studies cited herein.

We welcome any comments on how this document can be of further use to you in your rulemaking efforts. We stand ready to answer any questions you may have.

Attachments:

Analysis Memorandum
Appendix A (Henn Letter)
Appendix B (ISDA/SIFMA Letter)
Appendix C (Excel Spreadsheet Categorizing Studies by Method)

TABLE OF CONTENTS

Introduction

There are various statistical techniques for testing various hypotheses about position limits and related matter. Many of these techniques are deployed to determine whether speculative positions influence price, price changes, or volatility. As a part of its work on the position limits rule, the Office of Chief Economist has engaged in a comprehensive review and analysis of various economic studies and papers in the administrative record.

These economic studies bearing on the proposed rule arrived in the administrative record in various ways. We analyze below economic studies cited in the Commission's notice of proposed rulemaking; studies substantially relied upon in comment letters; and studies mentioned in a list submitted by commenter Markus Henn ("Henn Letter").[1] Those studies that were submitted formally for the record receive focused discussion in Section IV below.

As a group, these studies do not represent a general trend in favor of or against position limits. Many studies limited themselves to subsidiary questions did not direct address the desirability or utility of position limits themselves. The quality of the studies varies. Some studies are written by esteemed economics and published in academic, peer-reviewed journals. For other studies, that is not the case. Those studies that did at least touch on position limits had disparate conclusions on the ability economists to use market fundamentals to explain commodity prices; the existence of "excessive speculation" in various futures markets; and the utility of position limits. At the conclusion of this paper, we digest matters for which there is economic consensus and we identify the best studies for the Commission's consideration.

[1] February 10, 2014, comment letter by Markus Henn of World Economic, Ecology & Development, including an attachment a November 26, 2013 list entitled "Evidence on the Negative Impact of Commodity Speculation by Academics, Analysis and Public Institutions."

Preliminary Matters

I. Defining "Speculation" and Use of Proxies to Measure Speculation.

The word "speculation" is difficult to define.[2] There can be difficulty of identifying with satisfaction (meaning, wide consensus among economists) the existence of speculation. There is the further philosophical difficulty of distinguishing between ordinary speculation that is permitted and desirable (because it facilitates the transfer of risk and provides liquidity for hedgers) and harmful or "excessive" speculation. Ideally, speculation may better align prices with market fundamentals.[3] Speculators in the commodity futures market can generally enhance liquidity and reduce a hedger's cost for searching for a counterparty who wants to take an opposition position. Speculators facilitate the needs of hedgers to transfer price risk and increase overall trading volume, all of which can generally contribute to the well-being of a marketplace.[4] Congress has found "excessive speculation" in futures contracts to be "an undue and unnecessary burden on interstate commerce." 7 U.S.C. § 6a(a)(1). Congress provided for position limits in order to "diminish, eliminate, or prevent such burden." To assess economic studies on how position limits can diminish unreasonable price fluctuations and changes, we begin with an economist's view of if, when, how, and why speculation becomes harmful or burdensome.

A. "Excess Speculation" and Volatility

Price volatility, in itself, is not evidence of "excess speculation." Volatility may be an indicator of excess speculation, Congress has determined. 7 U.S.C. § 6a(a)(1) (referring to

---

[2] Bessinbinder, Kilian, and Mahadeva, *The Role of Speculation in Oil Markets: What Have We Learned So Far?Z*, at pp.3-4 (working paper 2012).

[3] Speculation is a natural market phenomenon in a market with differing investor expectations. Harrison and Kreps, *Speculative Investor Behavior in a Stock Market with Heterogeneous Expectations*, Quarterly Journal of Economics (Oxford University Press 1978).

[4] Bahattin Büyükşahin and Jeffrey H. Harris, *The Role of Speculators in the Crude Oil Futures Market*, at p.3 (working paper 2009).

excessive speculating in futures contracts as "causing sudden or unreasonable fluctuations or unwarranted changes in the price of" the underlying commodity). Changes in fundamentals of supply and demand can create substantial volatility, and some commodities are, based on their nature, more prone to price volatility. Changes in these fundamentals may induce disagreement between market participants on the appropriate price, causing some measure of price volatility, but this does not imply the existence of excess speculation, either.

One of the main functions of the swaps and futures markets is to permit parties with structural exposure to price risk (hedgers such as buyers or sellers of commodity-related products) to manage price changes or price volatility by transferring price risk to others. Speculators in these markets often, in effect, shield hedgers from some forms of price volatility by accepting this price risk. The nation's futures and swaps markets helps producers and suppliers of these commodities, and the customers they serve, hedge price risk to avoid price uncertainty when desired.

In this way, volatility and speculation are not *per se* unwelcome phenomena in these markets. They are natural events in these markets. It is the nature of markets to fluctuate. Those familiar Bloomberg price graphs reflect a well-functioning marketplace even though they portray "wobbly" price lines in both small and large time frames.[5]

Just as volatility is not a *per se* harmful or unexpected event in the commodity futures market, speculation in those markets is welcome and will often actually reduce volatility. A

[5] What may be "natural" volatility in one commodity futures market may be unexpected in another. Some critics of the proposed rule emphasize that different commodity markets behave differently, and that not all of the commodity markets referenced in the rule are likely to behave as the crude oil markets did in the 2006-2009 time period. On the other hand, some economic studies suggest there can be "spillovers" or transmission of volatility from one commodity market to the next. *E.g.*, Du, Yu, and Hayes, *Speculation and Volatility Spillover in the Crude Oil and Agricultural Commodity Markets: A Bayesian Analysis*, Energy Economics (2012).

well-reasoned 2009 economic study (by economists who were then CFTC employees) concluded that speculative trading in the futures market is not, in and of itself, destabilizing. Brunetti and Büyükşahin, *Is Speculation Destabilizing?* (working paper 2009).[6] This frequently cited study concludes that normal speculative trading activity actually reduces volatility levels, as a general rule, while acknowledging that there are limited empirical studies on the subject. "The limited nature of the previous literature on the market impact of speculators can be attributed to the difficulty of obtaining data on their trading activities." *Id*. at 3. There is, however, substantial theoretical literature that predicts that profitable speculation has a stabilizing effect, "since speculators buy when the price is low, therefore, increasing depressed prices, and sell when the price is high, therefore, decreasing inflated prices." *Id.* at 5.

Some economic studies attempt to distinguish between normal and helpful speculative activity and excessive speculation: between normal volatility and, in the words of the Commodity Exchange Act, "unreasonable fluctuations" in price (7 U.S.C. § 6a(a)(1)). Part of the research task before any economist studying markets for excessive speculation is to model and interpret excessive speculation and unwanted volatility in a sufficiently precise and sophisticated manner so as to distinguish between unwanted phenomena and the proper workings of a well-functioning market.

B. Working's Speculative T Index

While there is no well-established economic definition of "excess speculation," many economists studying commodity futures marketplace have used a proxy for speculation in commodity futures marketplace known in the economic literature as the Working's speculative T

[6] The Commission cited this study in particular in its NPRM. In addition, a copy of this economic study was formally submitted by the CME Group , Inc., as part of the administrative record in a March 28, 2011 comment.

index. Economist Holbrook Working devised in 1960 a ratio to measure the adequacy or "excess" speculation. As applied to commodity futures positions, the speculative T index is used to assess the amount of speculative positions in the marketplace beyond the minimum amount of speculative positions necessary to offset hedging positions.[7] It is calculated by computing the ratio of long and short positions for all trades in the commodity market, including those of hedgers and those of speculators.[8] A high ratio indicates many speculators are holding commodity futures positions. When this speculative T-index is included as an economic variable in economist's models to explain prices, economists may interpret the T index to be a proxy for the relative amount of speculation in the marketplace.

A high Working T index is one way to quantify excess speculation in technical terms, but even then that may not translate into excessive speculation in "economic terms."[9] Additional economic analysis or historical comparisons are useful to understand the meaning and impact of a relatively high number of speculators in a market place.[10]

---

[7] The Working's speculative T index is calculated as follows:

$$T = \begin{cases} 1 + \frac{SS}{HL+HS} & if\ HS \geq HL \\ 1 + \frac{SL}{HL+HS} & if\ HL \geq HS \end{cases}$$

where SS is short speculator (non-commercial) positions, SL is long speculator positions, HS is short hedge (commercials) positions and HL is long hedge positions. Bahattin Büyükşahin and Jeffrey H. Harris, *The Role of Speculators in the Crude Oil Futures Market*, at p. 9 n.7, pp.10-11 & 24 (working paper 2009) (employing this technique).

[8] The Working speculative index is "predicated on the fact that long and short hedgers do not always trade simultaneously or in the same quantity, so that speculators fill the role of satisfying unmet hedging demand in the marketplace. Bahattin Büyükşahin and Jeffrey H. Harris, *The Role of Speculators in the Crude Oil Futures Market*, at p.1 (working paper 2009).

[9] *Id*. at 10.

[10] *See id.* at 9-10 (a speculative index of 1.41 for crude oil futures contracts in 2008 meant that share of speculation beyond what was minimally necessary to meeting short and long hedging needs, was 41 percent: while such a percentage may seem on its face "potentially alarming," it is comparable historically with agricultural commodity markets).

C. Absence of Consensus on "Price Bubbles"

There are several published studies on the effect of speculation on prices and price volatility, as well as studies on speculation generally. These studies employ various statistical methodologies. Some of these find the existence of "price bubbles," meaning somehow artificially high prices that last longer than they should. These studies are analyzed below, but we observe at the outset that there is also no academic consensus on what a "price bubble" is and how it can be detected. One has to view the interpretations given by the authors of price bubble studies with a grain of salt because many of the proffered interpretations are not the only plausible explanation for their statistical findings.

As further detailed below, there is no broad academic consensus on the economic definition of "excess speculation" or "price bubble" in commodity futures market. There is also no broad academic consensus on the best statistical model to test for the existence of excess speculation. There is open skepticism in many economic quarters that there can even exist a significant "price bubble" in commodity futures markets.[11]

A large measure of the difficulty stems from the difficulties of second-guessing the market's determination of the price of a commodity contract:

> Experts may express opinions about what the fundamental price should be, given current supply and demand conditions, but a basic axiom of classical economics is that free markets do a better job of weighing information and determining prices that any group of experts.[12]

---

[11] Sanders, Irwin, and Merrin, *A Speculative Bubble in Commodity Futures Prices? Cross-Sectional Evidence*, at pp.2-4 (Agricultural Economics 2010) (arguing that while "bubble" explanations "are deceptively appealing, they do not generally withstand close examination"). Because commodity index fund buying is very predictable, it seems highly unlikely that in ordinary market environment traders would fail to trade against an index fund if the fund were driving prices away from fundamental values. *Id.* at 3.

[12] Jickling and Austin, *Hedge Fund Speculation and Oil Prices*, at p.17, Congressional Research Service R41902 (June 29, 2011).

Nonetheless, there are statistical techniques, and theoretical models, that economists have employed to attempt to discern whether recent behavior in the nation's commodity futures market has deviated from what can be reasonably ascribed to fundamentals of supply and demand.

D. The Project: Studying Whether Speculative Positions Causing Unwarranted Price Moves

How to test for the presence of speculation that is "excessive"? In many of these economic studies, the author looks to whether the existence of substantial positions by speculative traders causes price volatility or a semi-permanent change in price. The idea here is that if the presence of sufficiently large positions can induce such price behavior, it is "excessive." Economists use various statistical tools, including correlation analysis, to attempt to divine if there is price behavior caused by speculative positions that is "unwarranted." That is, that is not price movements associated with fundamentals of supply and demand, the inherent volatility of market prices, or other factors independent of position.

In these studies, economics discuss whether positions have caused movements in price. Technically, economists will study "price returns" for a class of commodity, rather than just "price" (the nominal price level). Price return gives one the change in price over time, divided by price.[13] Price return measures price changes over the scale of the underlying price. That is, different commodities may have entirely different scales for prices; by dividing by the underlying price, price returns puts different commodity classes on the same percentage scale for comparison purposes.

[13] A price return is $\frac{P_{t+1}-P_t}{P_t}$. P is price and t is a particular time, with t+1 being the point in time that is one fixed increment away over which the return is being computed.

Does excessive speculation cause unwarranted price behavior in the commodities market? Given the importance of the question, one might wonder why a group of economists have not committed sufficient time and resources to definitively resolve the question. The conclusions of these various economic analyses, discussed in detail in Section III below, have achieved a reasonable measure of academic consensus on some subsidiary matters bearing on the ultimate question of whether excessive speculation has had an impact on the commodity futures markets. However, there is no academic consensus on the ultimate question of the extent and breadth of the impact and there is no singular economic study of compelling persuasiveness.

To develop the reader's intuition on how very difficult a definitive economic analysis would be, we first discuss below in Section II the limitations that inhere in empirical analysis of this complex question.

II. Dearth of Compelling Empirical Studies on the Effect of Position Limits on Prices or Price Volatility

Finally, at the outset, is important to pause and reflect on why this analysis of economic papers bearing on position limits does not identify many papers quantifying the impact and effectiveness of position limits in commodity futures markets. For several reasons, there are not many compelling, peer-reviewed economic studies engaging in quantitative, empirical analysis of the impact of position limits on prices or price volatility.

A. Trader Identity and Role: Incomplete Data

As many economic researchers observe in their studies, there is no decisive accounting on whether a particular trade or set of trades is speculative or hedging. In practice, researches often use a rough proxy based on the nature of the trader: whether they are commercial or non-commercial. However, in both practice and theory, this proxy may fail: commercials may speculate and non-commercials may well hedge. An example of a commercial speculating

would be someone taking an outsize position in a commodity, on the belief that the price will go up and down, a position "outsized" in the sense that it exceeds the hedging business need of the commercial. "[T]raders sometimes may be misclassified between commercial and noncommercial positions, and some traders classified as commercial may have speculative motives."[14] The publicly available data also aggregates trader's positions across maturity dates for futures contracts, while the price for any given commodity futures contract is not aggregated by maturity.[15]

Section 8 of the Commodity Exchange limits the distribution of detailed trade positon data to academic researchers. The identity of individual traders for specific trades, and their position in the market at the time of name, is not disseminated publicly to economic researchers.[16] Thus, even when a position limit breach occurs, it is difficult to measure the impact on individual participants in the marketplace.

Even when an economic research can find detailed information on specific trades and the nature of the traders, that might not be sufficient to characterize an individual trade as hedging or speculative. A non-commercial market participant, such as a hedge fund, may try to hedge their stock portfolio by diversifying with commodity futures, based on their belief that there is generally a relative low correlation between equity and commodity price returns or that commodity futures provide a hedge against inflation or fixed income risk.[17] Or the hedge fund

---

[14] Antoshin, Canetti, and Miyajima, *IMF Global Financial Stability Report: Financial Stress and Deleveraging: Macrofinancial Implications and Policy*, Annex 1.2, Financial Investment in Commodities Markets, at p.65 (October 2008) (footnote and citation omitted).

[15] *Id.*

[16] Chevallier, *Price Relationships in Crude oil Futures: New Evidence from CFTC Disaggregated Data*, at p.135, Environmental Economics and Policy Studies (2012).

[17] Basu and Miffre, *Capturing the Risk Premium of Commodity Futures: The Role of Hedging Pressure*, Journal of Banking and Risk (2013).

may buy commodity futures to hedge against an investment in the spot market for the underlying commodity or an investment highly correlated to the commodity. Simply knowing who is purchasing the commodity futures contracts will not decisively indicate the motivation for or purpose of the trade. (That is one reason, among many, why the Commission's bona fide hedging definitions are necessarily complex.) Attempting to determine whether position limits are useful in curbing certain speculative activity, an economic researcher faces significant data constraints in reliably characterizing trades as speculative or hedging.

B. Limitations on Studying Markets with Pre-Existing Position Limits

Designing an economic study of the effect of position limits is complicated by the fact that for many commodity markets, the position limits are already in place. There is therefore not a reliable empirical data for how modern commodity futures markets would operate in the absence of position limits. For all the agricultural commodities referenced in the rule, the futures markets have already had in place spot- month position limits at least as strict as those proposed in the rule. For energy commodities such as crude oil, there have been pre-existing "accountability levels," meaning an exchange has the option (but not the requirement) to ask a trader to reduce its position if it exceeds a certain level. For crude oil, the current all-months-combined accountability level is 20,000 contracts. The position limit in the proposed rule for the all-months-combined limit is 109,200 contracts.

The existing of binding position limits in agricultural commodities and accountability levels in the energy markets does not mean that traders may not transgress these limits in current markets and take outsized market positions for speculative reasons. But the existence of current limits does make the economist's task of measuring position limit impact more difficult. When an economist studies an agricultural futures market and attempts to assess the economic

advantages and disadvantages of imposing position limits, he or she does not have available a dataset of market prices in a marketplace without position limits. Thus economists are dependent upon economic models and model interpretation when and if they attempt to describe how a marketplace without position limits would function. Many economic studies do not account in their models for pre-existing position limits or accountability levels. In fact, many economic studies that bear on the rulemaking do not endeavor to reach the ultimate question of the impact of position limits on prices and market dynamics.

There may be fewer instances of dramatic, large-scale "excessive speculation" because position limits have been in place in many of these commodity futures markets since 1938. There have been few opportunities to study the effect of the imposition of a position limits rule.[18] Presumptively for this reason, although theoretically for other reasons, the data set for substantial position limit breaches is not a fruitful basis for many forms of direct statistical research. Expectedly, economists tend to focus on the impact of speculation on the markets and not also on the impact of position limits. There is not a reliable before-and-after dataset involving federal position limits for marketplaces that have long operated under pre-existing limits.

C. Inherent Difficulties of Modelling Complex Economic Phenomena

Any economic model is a simplification of a complex reality. All of the various models and statistical methods used in the diverse studies have advantages and disadvantages. But whichever statistical method is chosen, the economist then makes key design decisions for the economist's model. It is not the fault of economists, but simply a reflection of the difficulty of

[18] CFTC staff, *A Study of the Silver Market*, Report To The Congress In Response To Section 21 Of The Commodity Exchange Act, Part Two at p.123 (May 29, 1981) (observing that the imposition of a position limit in silver futures contracts by the Chicago Board of Trade in 1979 did not raise prices); *id.* at pp. 123-124 (observing that price reaction to position limits involves a variety of factors and "it is not possible to predict in advance the effect of imposition of position limits").

the task, that we have not found a singularly persuasive study. When imperfect market data is deployed to reach ambitious and complex economic questions, it is especially important to fit that data into an interpretive economic model. That is, we cannot identify a study whose statistical method and modelling design is sufficiently compelling to warrant being the prevailing and dispositive in our view. In the current state of economic science, it is too tall an order to expect to find the design of an economic model that is fulsome (extending to position limits and market speculation), accurate (accommodating and reflecting economic history), and predictive. This is particularly true in the context of market data involving volatile and complex events.

Our detailed analyses of different models and methods below help to explain why this is so.

Some studies are better-designed and better-executed than others. Below we identify those economic analyses we find more persuasive and significant in our view. Among this subset of the more persuasive studies, we place studies that point to contrary conclusions on the desirability or effectiveness of position limits or the existence of speculative market bubbles. This result also does not surprise us. Given the complexity of the issue and the myriad of choices in data, statistical methods, and model design available to the economic researcher. Much of the analysis below highlights the flexibility of model design choices and the sensitive of the results to these modelling choices.

III. Staff-level Congressional Determinations

The uncertainties and debate that inhere in current economic analysis have not lessened public and congressional interest in the role of speculators in the commodities market.

There have been findings by policymakers that excessive speculation exists in various commodity futures markets, as the Commission observed in its notice of proposed rulemaking.

For example, the Staff of the Permanent Subcommittee on Investigations of the Homeland Security and Government Affairs has found that excessive speculation has had "undue" influence on wheat price movements,[19] the natural gas market,[20] and oil prices.[21] *See* Analysis, Section III(B), *infra* (economic analysis of these reports). Congress itself has found that Congress has found "excessive speculation" in futures contracts to be "an undue and unnecessary burden on interstate commerce." 7 U.S.C. § 6a(a)(1).

In sum, all of these studies take place in a peculiar context: the absence of definitive economic definitions and tests for excessive speculation; limitations on data quality and availability; and the inherent difficulty of modelling complex phenomena. Notwithstanding these difficulties, economists, policymakers, and regulators confronted with unusual market behavior face a legislative commandment to regulate using position limits. Policymakers look to economists for their best empirical and theoretical analyses to explain surprising and, at least from a policymaker perspective, troubling market phenomena.

Analysis

I. Empirical Studies: Economic Studies with Statistical Analysis Bearing on Speculative Positions in the Commodity Markets or Speculation Generally

[19] *Excessive Speculation in the Wheat Market*, Majority and Minority Staff Report, Permanent Subcommittee on Investigations of the U.S. Senate, Committee on Homeland Security and Governmental Affairs (June 24, 2009). Also available at http://hsgac.senate.gov/public/_files/REPORTExcessiveSpecullationintheWheatMarketwoexhibitschartsJune2409.pdf.

[20] *Excessive Speculation in the Natural Gas Market*, Staff Report with Additional Minority Staff Views, Permanent Subcommittee on Investigations of the U.S. Senate Committee on Homeland Security and Governmental Affairs (June 25, 2007).

[21] *The Role of Market Speculation in Rising Oil and Gas Prices: A Need to Put the Cop Back on the Beat*, Permanent Subcommittee on Investigations of the U.S. Senate Committee on Homeland Security and Governmental Affairs at pp. 19-32 (June 27, 2006) (finding increased speculation in energy commodities and an effect of speculation on prices).

Economic studies presented in the context of this rulemaking may involve theoretical models; statistical analysis based upon market data; and, most commonly, a combination of the two. The economic studies using statistical methods can be categorized into give basic statistical methods, such as models of fundamental supply and demand (and related methods), Granger causality, or other methods. The economic studies presented or cited in the comment letters in this rulemaking are best grouped and analyzed by the statistical method they employ, for there are advantages and disadvantages particular to each statistical method.

The Office of Chief Economist ("OCE") has reviewed 244 papers in connection with the position limits rule: 133 studies submitted as comments or mentioned in the Commission's Notice of Proposed Rulemaking ("NPRM"); over 100 additional studies or articles listed in the Henn Letter; and 10 additional studies submitted by commenters not included in the above sets.

Breaking down this group of 244 papers by statistical methodology, the OCE position limits team on economic studies reviewed the following economic papers in the record:

- 36 Granger causality analyses (cited at nn.37, 49, 58, 59, and 60);
- 25 comovement or cointegration analyses (nn.66, 67, and 68);
- 46 studies creating models of fundamental supply and demand (pp.59-72);
- 8 switching regressions or similar analyses (nn.102, 103);
- 3 studies using eigenvalue stability analysis (n.108);
- 26 papers presenting theoretical models (pp.81-84); and
- 73 papers that were primarily surveys of the economic literature, perhaps with some aspect of empirical testing or analysis (pp.84-93).[22]

[22] The remaining 27 papers fall into two groups. Two additional papers presented unique methodologies involving volatility are interwoven into the analysis below. Twenty-five papers, while we have attempted to be very democratic in including submitted papers for economic analysis, were not ultimately susceptible to meaningful economic analysis. These papers

See generally Appendix C (Excel spreadsheet sorting and categorizing studies).

A. Granger "Causality"

1. Overview of the Granger method

Below we consider the 34 studies employing the "Granger" or "Granger causality" method of statistical analysis. Because this is an important method that is used often in this context, we describe the method and its advantages and disadvantages at some length.

The Granger method seeks to find if there is a linear correlation between two sets of data that are known as "time series." An example of a time series would be a pairs of numbers constituting future prices and time, with the time between the different future prices being a fixed amount of time. This fixed time is known as the "time step." The Granger method takes two time series, such as Series A (futures price returns, each for a different time, for a fixed time step) and Series B (changes in speculative positions over the same time step). It then seeks to determine whether there is a linear correlation between Series A and Series B. This is done by using position data that is lagged over time.

For example, for the time of 12:00 p.m. and the price of $20 for a May cotton futures contract, the researcher using Granger "causality" would associate a position in May cotton futures from a set time prior to 12:00 p.m. If the time step were one minute, that time would be 11:59 a.m. The researcher performs a regression analysis on these two time series (price and time on the one side of the equation, and position and lagged time on the other). They estimate

---

included pure opinion pieces, studies written in foreign languages, press releases, backgrounder documents on basic points of economics or law, studies unavailable due to broken hyperlinks not easily resolved, or studies founded on methodologies too suspect to warrant mention. In the latter category, for example, was an unpublished study purported to use a "novel source of information" – Google metrics involving user searches – as a proxy for the demand associated with "corn price dynamics." Peri, Vandone, Baldii, *Internet, Noise Trading and Commodity Prices* (working paper 2012), cited by Henn Letter.

the correlation (technically, they look at the coefficient of the regression) through this analysis to come to a conclusion of whether, over that minute-interval, it can be said that there is a linear correlation between futures prices and positions.

While the Granger test is referred to as the "Granger causality test," it is important to note that, notwithstanding this shorthand, "Granger causality" does not imply an actual cause-and-effect relationship. When the Granger method gives as a result is evidence of the existence of a linear correlation between the two time series or a lack thereof.

More fundamentally, because correlation does not imply causality, "Granger causality" does not imply causality. While cause and effect implies correlation – if A causes B then surely, in particular, A and B are correlated – the converse is not true. Correlation does not imply cause and effect. Neither the Granger method, nor any other statistical method, promises otherwise. There can be correlation between two economic variables for a variety of reasons. For example, both variables may be moving in relation to a third factor. Or a correlation could be spurious.[23]

Moreover, the Granger method only tests for linear correlations. It also cannot exclude causation associated with other statistical relationships. A Granger study testing for a correlation between futures prices and positions does not, and does not purport to, determine whether there are other possible statistical relationships between the variables besides linear correlation.

There have been several "Granger causality" papers on speculative positions and price or price volatility. In general, these studies tend not to find much empirical support for the hypothesis that speculative positions or changes in speculative positions are correlated with price changes or price volatility. These studies tend to show a lack of linear correlation. In economic

[23] For example, a correlation between the divorce rate in Maine and per capital consumption of margarine in the United States, and a correlation between per capital consumption of mozzarella cheese and civil engineering doctorates awarded, may well be spurious.

terms, many of these studies find an absence of "Granger causality." Using this method, many of these authors infer that speculative positions or changes are not causing price changes or price volatility.

The lack of linear correlation between two sets of economic variables under the Granger method can be empirical evidence for a lack of actual cause and effect between economic variables. However, it is not conclusive proof. The Granger method cannot, by establishing a lack of correlation, establish an absence of actual cause and effect in the real world. In sum, the absence of Granger causality does not necessarily imply the absence of actual causation. The persuasiveness of a Granger study often turns on the soundness of the modelling choices, as discussed further in subsection 3 below.[24]

2. Advantages of the Granger Method

At the highest level, the Granger method is based on well-credentialed statistical methodology. It has been used for several decades by economists and its properties are well-established and well-debated in the economic literature. In that sense, unlike some of the other methods employed in this context, it has stood the test of time. It has been deployed in macroeconomics and financial economics. In particular, the Commission's enforcement litigators have sometimes submitted expert forensic economic analysis relying predominantly on Granger analysis.

The Granger test has several advantages.

The Granger test is auditable in the sense that it can be fully replicated by a third party. The method is relatively simply to apply. It need not depend on complex mathematics.

[24] For a fuller description of this methodology, *see* Grosche, *Limitations of Granger Causality Analysis to Assess the Price Effects From the Financialization of Agricultural Commodity Markets Under Bounded Rationality*, at pp.2-5 (Agricultural and Resource Economics 2012).

The method's straightforward approach permits a great deal of transparency in analyzing both inputs and results. Although the results can be highly sensitive to modelling choices, the modelling choices are made explicitly. That is, the equations that are used for the linear regression can easily be viewed together with the definitions for the variables.

3. Disadvantages of the Granger method

Not all statistical methods apply well to all situations. In the particular context of speculation and positions limits, application of the Granger methodology has some disadvantages and causes for concern. While the statistical answers are, by their nature, fairly precise, the drafting of the question and the economic interpretation of the result s can cause problems. This limitation of the Granger method of course is shared with some other statistical methods. However, we discuss below why this is particularly true of Granger in the context of these studies on speculation and prices. Many of the potential problems in these studies do not so inhere so much in the method itself as in the modelling choices, other operational choices such as the length of time step and time lag, and the interpretation of the results.[25] Below, we analyze why this is so.

First, the typical application of the Granger method in the studies review assumes a linear relation between the variables of interest: for example, prices and positions. The technique is useful for describing statistical patterns in data among variables ordered in time. But Granger does not claim to discuss simultaneous events. It is a statistical test for which economists will say, in rough terms, says that if event A typically precedes event B, the event A "Granger-

[25] *See* Grosche, *Limitations of Granger Causality Analysis to Assess the Price Effects From the Financialization of Agricultural Commodity Markets Under Bounded Rationality* (Agricultural and Resource Economics 2012); Williams, *Dodging Dodd-Frank: Excessive Speculation, Commodities Markets, and the Burden of Proof*, Law & Policy Journal of the University of Denver (2015).

causes" event B. Granger is a statistical method for analyzing data for correlations, and "Granger causation" is not "causation" *per se*. It does not example the method and means of actual causation nor does it claim to establish actual causation in reality.

For example, what causal mechanism links two events, events A and B? The Granger method cannot explain this. How does one design a Granger model so as to detect all real-world causation? For example, is there a relation between event A and event B that is "hidden" because the time step chosen is long, so that the events look to occur simultaneous over the observed interval (be it a day or a week)? An individual Granger model cannot answer this question.

A second disadvantage concerns the sensitivity of the test to the time period studied. Especially in the context of the Granger method, the selection of the particular time internal is important to obtain the most useful results: selection of too large a time period may hide correlations. Some of the position studies use daily price data, while others use weekly price data. When commodity prices are quite volatile, and positions are more gradual in changes, daily time steps may have greater unexplained variation in the commodity prices than when the time series for price data is constructed based on weekly sampling. A study by International Monetary Fund economists, using weekly data, observed that this time interval "may hamper the identification of very short-run effects, given that the transmission from positions to prices may happen at higher frequency. Indeed, some market participants anecdotally suggest that there are short-run effects that may last only a matter of days."[26]

[26] Antoshin, Canetti, and Miyajima, *IMF Global Financial Stability Report*: *Financial Stress and Deleveraging: Macrofinancial Implications and Policy*, Annex 1.2, Financial Investment in Commodities Markets at p.65 (October 2008) (footnote and citation omitted).

Another potential problem is picking a time lag that is too short to detect possible market phenomenon. Lead and lag patterns that might be useful for identify short-term manipulation in futures markets will not necessarily be similar to longer-duration patterns that would might be more naturally associated with the hypothesis that ebbs and flows of "herding-like" price pressure of commodity index investor funds influences commodity futures prices. "[K]nowing whether price changes lead or lag position changes over short horizons (a few days) is of limited value for assessing the price pressure effects of flows into commodity derivatives markets."[27]

In the statistical calculations underlying the Granger method, this greater volatility may lead to a larger denominator in what is called the "t-statistic," and that will in turn lead to a lower t-statistic (in absolute value). The t-statistic is used in the Granger method to assess how well a variable, such as positions, explains another variable, such as commodity prices. In this way, the selection of the time internal can easily affect the strength of the Granger method result.

This example – that the Granger correlation result is highly sensitive to the length of the time step chosen in the study – is but one aspect of a broader disadvantage of the Granger method of the length of the time lag is another example of this sensitivity. A third disadvantage of Granger inheres in the selection of the time lag. A Granger analysis will not capture an effect that is delayed beyond the length of the time lag. And a Granger analysis with too long a time lag may not detect price changes during periods of price volatility. The Granger technique does not guide the selection of the time lag. There are some heuristic techniques to help determine the

[27] Singleton, *The 2008 Boom/Bust in Oil Prices*, at p.15 (working paper March 23, 2011) ("Of more relevance is whether flows affect returns and risk premiums over weeks and months.") (footnote omitted).

time lag based on the "goodness-of-fit"[28] of regressions, but these supplemental techniques may yield time lags that do not have a strong theoretical footing. *See generally* Williams, *Dodging Dodd-Frank: Excessive Speculation, Commodities Markets, and the Burden of Proof*, at pp.136-138, Law & Policy Journal of the University of Denver (2015) (discussing problems associated with Granger test's assumptions and parameters).

In such ways, and others, the authors of such study have wide license in modelling design. The results can be highly dependent upon and sensitive to model design choices. Key design decisions of seemingly little import, such as the selection of time steps, can in fact may a substantial difference in the study's result. While such flexibility can be useful, this flexibility also permits Granger results to be, wittingly or no, quite sensitive to modelling assumptions. Such sensitive, especially in the particular context of the volatile commodity prices, is problematic. Volatility in commodity prices is a complex phenomenon, with possibly overlapping effects of short- and long-term volatility and many exogenous variables that can affect prices. In short, "care must be taken not to overstate the interpretive power" of Granger causality studies. *Id.* at p.138.

More fundamentally, the method is silent, and does not claim to ascertain, the true cause of something when event A and B occur almost simultaneously. Granger cannot say whether A caused B or whether C causes A and then C causes B with a brief time lag. In this way, Granger correlation analysis is fundamentally incapable of establishing a cause and effect relationship. One needs a theoretical model to assert that. Indeed, for some economic variables Granger

[28] Roughly speaking, "goodness-of-fit" analyses examine how well the data fits the model. Using a goodness of fit criteria allows the data to select the number of lags that empirically fits the data the best.

"causality" goes both ways: within the mathematical nuts and bolts of the Granger method, it is possible for both economic variables A and B to "Granger cause" each other.

The majority of the Granger studies on position limits used Commission data. There is a substantial problem which inheres in this data in the particular context of position limit studies. The trade data used identifies the entity doing the trade as "commercial" or "non-commercial." The data does not identify whether a particular trade is a hedge or a speculative gamble. In the real world, commercial traders may speculate and non-commercial traders may place trades which are not speculative and function as hedges of portfolio risks. While the studies' authors may hope that a trader's identity as a commercial is strongly associated with hedging (or at least non-speculative trades), in practice that may be far from the case. (This is a limitation which to both publicly available CFTC data such as commitment of traders and, more generally, to Section 8-protected data streams.)

As one study author has noted, there are other difficulties in the CFTC dataset that complicate empirical analysis of hedging activity. "The CFTC hedging classification has significant shortcomings; in particular, anyone that can reasonably argue that they have a cash position in the underlying can obtain a hedger classification. This includes consumers of the commodity, and more prominently, banks that have offsetting positions in the commodity (perhaps on account of holding a position in the swap market). The line between a hedge trade and a speculative trade, as defined by this measure, is therefore blurred."[29]

There is also the statistical concept of "robustness," meaning roughly that the results of a study are not qualitatively different based on different applications (different data sets, different tweaks of assumptions). In several ways, application of the Granger method in this particular

[29] Acharya, Ramadorai, and Lochstoer, *Limits to Arbitrage and Hedging: Evidence from the Commodity Markets*, at p.19 (Journal of Financial Economics 2013).

context offers grounds for caution for study authors seeking statistical robustness. First, for a given time step and commodity, the particular time interval chosen may affect the result. Second, a Granger method is, by its nature, very sensitive to which particular dataset is chosen. Once again, a study's author(s) have wide discretion in the selection of which datasets to study, and Granger methodology will be highly sensitive to this selection.

There is the related problem of economic robustness: the Granger method is highly sensitive to what particular dataset chosen. For example, a study limited to a particular commodity or time period may not be extensible to other time periods of commodities. This fact flows from the nature of a Granger study: it is a correlation analysis, not a broader explanatory model of how markets work.

Applying Granger analysis to commodity prices presents special challenges in this context because many commodity prices can be quite volatile, especially in the short-term. That is, the Granger method raises the concern that the Granger method may have low "statistical power" in this context. In mathematical terms, high volatility in one of the Granger variables can lead to large standard errors for regression coefficients for the t-statistic. This problem is not so substantial to block meaningful results.[30]

A modelling choice to include other variables can further reduce the statistical power of the statistical test used in the Granger method.[31] Other economic variables in the regression analysis, if not properly chosen, can compromise the Granger "causality" test. For instance, explanatory variables may not be uncorrelated to the speculative position or position change variables. To the extent that the variables are correlated to speculative positions, they may, in

[30] *E.g.*, Bahattin Büyükşahin and Jeffrey H. Harris, The Role of Speculators in the Crude Oil Futures Market (working paper 2009) (later published in The Energy Journal, Vol. 32, No. 2, pp. 167-202 (2011) under the title *Do Speculators Drive Crude Oil Futures Prices?*).

[31] These test statistics is a t-test for one lag in the relevant variable or an F-test for multiple lags.

the estimation of the regression, wash out the price effect. The t-statistic of the regression coefficient remains small because the standard error estimate of the coefficient is large due to common correlation between explanatory variables.[32]

While somewhat technical, it is important to note the possible effect on statistical power of the introduction of other variables. Authors of Granger method studies will often add "control variables" in order to reflect other factors that may be effecting or relevant to the two main variables of primary interest (such as price and position). The introduction of control variables will help to discount spurious corrections between the variables of primary interest by studying whether another variable could be correlated to (and thus "Granger causing") variables such as price and position. Adding extra variables can, on the one hand, affect for third factors which may be relevant. On the other hand, the introduction of the third factors may compromise the statistical power of the primary question of interest.

Finally, there are indications in the academic literature that stock market prices do not possess the formal properties for Granger-type tests to be reliable (in the sense that the underlying statistical assumptions and probability distributions do not reliably apply to this type of market data).[33] There are also economic studies casting doubt on the suitability of commodities data for meaningful Granger tests, given volatility in commodities price data.[34]

4. Comparison of Strengths and Weaknesses

Granger techniques provide great flexibility. This flexibility also provides great license to economists on selection of critical factors such as the length of the time lag and the time step.

---

[32] This argument is also correct for F-tests (a multivariable extension of t-tests).

[33] David Frenk, *Review of Irwin and Sanders 2010 OECD Report*, at p.6 (Better Markets June 20, 2010) and citations therein, cited in Henn Letter at p.7.

[34] Frenk, *id*. at pp. 6-7.

The ultimate conclusions of such studies may be influenced by model design. Unsurprisingly, different economists reach different results. In this sense, the conclusions of Granger-based papers are somewhat suspect. These conclusions are vulnerable because of difficulties which in here in the Granger method.

5. Analysis of Studies Reviewed that use Granger methodology

Overall, when the Granger studies find a correlation (in the sense of a lead-lag relationship) between speculative positions and price returns, they do so not with respect to price returns as a whole, but instead the risk premium component of price returns. The risk premium is the portion of expected return of a futures contract associated with holding the contract. It is not an express term of the contract, but an amount that can be derived from economic analysis as the difference between the futures price return and a hypothesized price return for a futures contract. The risk premium is the return required to bear the undiversifiable risk on the relevant side of a futures contract.[35]

There are also Granger studies that analyze speculative positions with respect to price returns as a whole or price volatility; these do not find a statistically significant correlation. Moreover, those studies that do find a lead-lag correlation using the Granger methodology in the risk premium context are limited to studies in particular markets in particular time frames: studies using weekly, not daily, price data and analyzing crude oil and ethanol related

[35] In theory, if the futures contract at expiration is a perfect substitute for the spot commodity, then the expiring futures price should converge to the spot price. It is important to note that many expiring futures contracts are imperfect substitutes for the spot commodity and this might prevent convergence, all else being equal. Moreover, the risk premium decreases to zero as the futures contract approaches expiration. Thus, the risk premium has no effect on the final convergence of the futures to the spot price at expiration of the futures contract, but could, in theory, impact the rate of convergence (although any impact may be negligible).

commodities (including wheat which is an economic substitute for corn) during the 2007-2010 timeframe.

There are 36 primarily Granger-based economic studies in the administrative record. For analysis purposes, we group these papers according to whether they discuss primarily crude oil or other energy derivatives (8 studies); the possible impact of commodity index funds across multiple commodities (13); and agricultural commodities (15).

Crude Oil and Other Energy Derivatives

There was a substantial increase in crude oil prices through July 2008, followed by a significant price collapse from July 2008 through March of 2009.[36] Several Granger analyses have looked at price returns and/or price volatility in the crude oil markets, or the energy markets generally, in the 2007-2009 timeframe.[37]

Professor Kenneth Singleton found evidence that speculative positions Granger-causing risk premium on weekly time intervals during the 2007 to 2009 period when studying the crude oil futures markets. Singleton, *Investor Flows and the 2008 Boom/Bust in Oil Prices* (March 23,

[36] Bahattin Büyükşahin and Jeffrey H. Harris, *The Role of Speculators in the Crude Oil Futures Market* at p.2. (working paper 2009).

[37] These are: Goyal and Tripathi, *Regulation and Price Discovery: Oil Spot and Futures Markets* (working paper 2012); Irwin and Sanders, *Energy Futures Prices and Commodity Index Investment: New Evidence from Firm-Level Position Data* (working paper 2014); Kaufmann and Ullman, *Oil Prices, Speculation, and Fundamentals: Interpreting Causal Relations Among Spot and Futures Prices*, Energy Economics, Vol. 31, Issue 4 (July 2009); Kaufman, *The role of market fundamentals and speculation in recent price changes for crude oil*, Energy Policy, Vol . 39, Issue 1 (January 2011); Mobert, *Do Speculators Drive Crude Oil Prices?* (2009 working paper); Sanders, Boris, and Manfredo, *Hedgers, Funds, and Small Speculators in the Energy Futures Markets: An Analysis of the CFTC's Commitment of Traders Reports*, Energy Economics (2004); Singleton, *Investor Flows and the 2008 Boom/Bust in Oil Prices* (working paper March 23, 2011) (published in final form in Management Science in 2013); Singleton, The 2008 Boom/Bust in Oil Prices (working paper May 17, 2010).

2011 working paper).[38] Part of Singleton's results were replicated in part in a paper by Hamilton and Wu using a different methodology than Granger causality analysis.[39] Professor Singleton found a link between the volume of speculative positions and an increase in risk premium. Because risk premium is a component of price returns and hence price, he thus found a link – Granger causal link – between speculative positions and price. However, because risk premium is just a small component of price, this study does not purport to explain the large 2008 changes in crude oil prices through speculative positions taken by institutionalized investors.

In the case of index funds, many funds take long positions. The presence of large index funds positions raises an issue of whether what economists would call this "heterogeneity of views" can affect marketplace health. Singleton presents, with his Granger-like analysis, a discussion of heterogeneity in this context. He conjectures – without supporting empirical analysis – that learning about economic fundamentals with heterogeneous views may induce excessive price volatility, drift in commodity prices, and a tendency towards booms and busts. He asserts that under these conditions the flow of financial index investments into commodity markets may harm price discovery and thus social welfare. Singleton, *Investor Flows and the 2008 Boom/Bust in Oil Prices*, at pp. 5-8 (March 23, 2011 working paper).

Another paper using Granger analysis concluded that speculators did have an impact on price volatility in the crude oil market. Mobert, *Do Speculators Drive Crude Oil Prices?*, at pp.9-10 (2009 working paper using 2006 and 2009 data samples).[40]

---

[38] *Id.* at p.18 (Equation 6, lagged correlation analysis that is, functionally, a Granger analysis).

[39] Hamilton and Wu, *Risk Premia in Crude Oil Futures Prices*, Journal of International Money and Finance (2013) (replicating Singleton's result using a different methodology, a two-factor linear model of fundamental supply and demand).

[40] This Mobert paper is not widely known or cited. It part of a "research notes working paper series" within Deutsche Bank Research (Paper No. 32e). By contrast, Professor Kenneth Singleton's work is often cited in the economic literature and his work is more well-established.

Some commenters have suggested that using a weekly, not a daily, time interval for a Granger analysis in this context is a better choice because speculative positions change gradually and there is, on a daily basis, price volatility, especially in the crude oil market.[41] The common sense explanation for this may be that prices change more often and more rapidly than positions, as a general rule. A weekly time interval is a good way to filter out price changes that speculative position changes cannot explain.[42]

Other Granger analyses of the crude oil market use shorter time intervals and do not find Granger-causality between speculative position changes and either price returns, price changes or price volatility.[43]

The academic literature contains a divergence of views on whether the existence of "excess speculation" in the crude oil market would necessarily result in something that is easy to measure, increases in oil inventories. Some economists argue against the role of "excess

---

In any event, the Mobert paper concluded that as net long positions increased, volatility increased. This paper was inconclusive of the impact of speculation on price levels, *id.* at pp.8-9, and observed caveats on the difficulty of accurate modelling in the complex crude oil market, *id.* at p.11.

[41] Frenk, *Review of Irwin and Sanders 2010 OECD Report*, at p.6 (Better Markets June 10, 2010).

[42] There are not many other economic studies in the administrative record duplicating the results of Singleton and Hamilton and Wu. A few others reached similar conclusions regarding the crude oil market using Granger analysis, but these are relatively modest or narrowly constructed studies that are not often cited by economic peers. *E.g.*,Goyal and Tripathi, *Regulation and Price Discovery: Oil Spot and Futures Markets* (working paper 2012) (concluding that regulations of the nation of India, including position limits, may have mitigated short duration "bubbles").

[43] Irwin and Sanders, *Energy Futures Prices and Commodity Index Investment: New Evidence from Firm-Level Position Data* (working paper 2014); Kaufmann and Ullman, *Oil Prices, Speculation, and Fundamentals: Interpreting Causal Relations Among Spot and Futures Prices*, Energy Economics, Vol. 31, Issue 4 (July 2009); Kaufman, *The role of market fundamentals and speculation in recent price changes for crude oil*, Energy Policy, Vol . 39, Issue 1 (January 2011); Sanders, Boris, and Manfredo, *Hedgers, Funds, and Small Speculators in the Energy Futures Markets: An Analysis of the CFTC's Commitment of Traders Reports*, Energy Economics (2004).

speculation" in crude oil, observing that when there were run-up in prices of certain commodities, there was no noticeable increase in inventories.[44] This makes sense because, all else being equal, one might assume that a fundamental shock in the oil prices, for example, is likely to increase or decrease inventories, as hedgers in the physical market anticipate future price increases or decreases. However, other economists have explained that, at least in theory, speculation can affect spot oil prices without causing substantial increases in inventory (providing the price elasticity of oil demand is small).[45]

Irwin and Sanders, *Energy Futures Prices and Commodity Index Investment: New Evidence from Firm-Level Position Data* (working paper 2014), concludes that there is no Granger-causation between positions in a particular commodity index fund and price returns in four energy commodity markets. Irwin and Sanders' paper contains a fairly robust Granger analysis which analyzes several models in conjunction with their standard model equation for position and price. All of the equations that they test for Granger causation contain a possible prejudice: the use of variables that may be correlated with price other than the position variable, thus masking the power of the position variable.[46] Moreover, their paper fails to show that the

[44] Irwin and Sanders, *Index Funds, Financialization, and Commodity Futures Markets*, at pp. 14-15, Applied Economic Perspectives and Policy (2010).

[45] Hamilton, *Causes and Consequences of the Oil Shock of 2007-2008*, Brookings Paper on Economic Activity(2009); Parsons, *Black Gold & Fool's Gold: Speculation in the Oil Futures Market* at pp.82, 106-107 (Economia 2009) (if oil prices were driven above the level determined by fundamental factors of supply and demand by forces such as speculation, storage would not necessarily increase, for "successful innovations in the financial industry made it possible for paper oil to be a financial asset in a very complete way"); *accord* Lombardi and Van Robays, *Do Financial Investors Destabilize the Oil Price?*, at pp. 21-22, European Central Bank Working Paper Series No. 1346 (June 2011). The ability drawdown or stock pile inventory is limited by storage capacity. Further, since it is expensive to store oil above ground, buy and hold strategies are only a loose constraint on prices.

[46] *See generally* n.57.

particular index fund data they used was generally representative of index funds by statistical testing.[47]

There is an earlier paper by Sanders, Boris, and Manfredo, *Hedgers, Funds, and Small Speculators in the Energy Futures Markets: An Analysis of the CFTC's Commitment of Traders Reports*, Energy Economics (2004), that has a similar result. However, this 2004 paper uses variables that may be correlated with price other than position data, and so, in the Granger analysis, the price equation used for Granger testing may mask some or all of the impact of positions on price (if any). *See id.* at p.439, Equation 5. Irwin and Sanders' 2014 paper, discussed above, is not completely free from this masking problem. However, it has only one, not several, variables that could mask correlation between position changes and price returns: a lagged price return variable. Irwin and Sanders, aware of the possibility of this masking of correlation, present a defense of their choice to include a lagged price return variable in their model. They argue that one does not know whether positions will affect just current price returns or both current and lagged price returns, and in this way it is not necessarily the case that there is a masking effect.

This argument does not prove the contrapositive – that there is definitely no masking effect. There is at least the concern that the Irwin and Sanders model, as constructed, masks possible Granger-causality between position changes and price returns. Because their 2014 is well-done and relevant to the position limit rulemaking, one would ideally want to know whether the masking is occurring. Theoretically, one could learn more by examining the linear correlation between explanatory variables (lagged price returns and changes in position) by

[47] In this paper, Irwin and Sanders critiqued Singleton's results, concluding that Singleton found Granger causation because he improperly calculated positon data. This debate cannot be resolved definitively. In the absence of better daily data on position in both swaps and futures markets, it is unclear who is correct here.

performing additional diagnostic regressions. These regressions would estimate correlations between explanatory variables and resolve the open question of whether the price equation is significantly "masking" Granger-causality between position changes and price returns.

Selecting between competing models with divergent results becomes more of a judgment call than a science. Irwin and Sanders' 2014 paper is well-done. As are papers with opposite conclusions, finding a causal relationship between position changes and price returns: the Singleton Granger analysis discussed above, and a paper by Hamilton and Wu, *Risk Premia in Crude Oil Futures Prices*, Journal of International Money and Finance (2013), based on a different statistical method discussed below.

It is impossible to easily discern who is correct or what accounts for the difference in result. It could be the "masking" issue in the Irwin and Sanders model. Or it could be the focus in the Irwin and Sanders work on price returns, whereas both Singleton as well as Hamilton and Wu use just a component of price returns, risk premia, for their studies that may be the portion of price return that is most sensitive to position changes. Irwin and Sanders, by focusing on price returns, are doing Granger-causality testing with a model less sensitive to changes in just risk premia. Or the differing results could be due to the different time horizons used in the competing studies.

This clash of well-executed studies is on an important issue – the dramatic changes in crude oil prices in 2006-2009. The study by Kaufman, *The Role of Market Fundamentals and Speculation in Recent Price Changes for crude oil*, Energy Policy, Vol . 39, Issue 1 (January 2011), is not directly on point. He finds Granger-causation between different types of crude oil contracts, but does not look to positions or whether positions Granger-cause changes in price returns.

Kaufman also finds that far-out futures contracts and spot crude oil are not correlated and he concludes that the reason for this lack of correlation is speculation in the crude oil market. However, there are gaps in this inference. Kaufman assumes there should be a long-run equilibrium between the spot and the futures price but cannot discern a supply and demand reason for the lack of correlation. There are many factors of supply and demand that would lead to differences between far-out futures prices and spot prices in the crude oil market during the time period studies, 1986-2007. These factors include the depletion of oil fields; variability in economic grown; discovery of new oil sources and better modes of extraction; adaption of oil infrastructure. *See* n.70 and associated text.[48]

Index Funds Generally

Some economists have used the Granger methodology to study a group of commodity markets and to attempt to analyze, overall, the effect, or lack thereof, of commodity index fund investments in on both energy and agricultural commodity prices.[49] These relatively few

[48] There is also an early study, Kaufmann and Ullman, *Oil Prices, Speculation, and Fundamentals: Interpreting Causal Relations Among Spot and Futures Prices*, Energy Economics, Vol. 31, Issue 4 (July 2009), with a similar result. The authors conclude that there is Granger-price causation between different types of crude oil. This study does not look for causation between position and price and so, again, is of marginal relevance in the position limits context.

[49] These are: Antoshin, Canetti, and Miyajima, *IMF Global Financial Stability Report*: *Financial Stress and Deleveraging: Macrofinancial Implications and Policy*, Annex 1.2, Financial Investment in Commodities Markets (October 2008); Jeffrey H. Harris and Bahattin Büyükşahin, *The Role of Speculators in the Crude Oil Futures Market* (working paper 2009); Brunetti and Büyükşahin, *Is Speculation Destabilizing?* (working paper 2009); Frenk, *Review of Irwin and Sanders 2010 OECD Report* (Better Markets June 10, 2010); Gilbert, *Speculative Influences on Commodity Futures Prices, 2006-2008*, UN Conference on Trade and Development (2010) (page citations are to the 2009 working paper version placed in the administrative record); Gilbert, *Commodity Speculation and Commodity Investment* (powerpoint presentation 2010); Irwin and Sanders, *The Impact of Index and Swap Funds on Commodity Futures Markets: A Systems Approach*, Journal of Alternative Investments (2011); Irwin and Sanders, *The Impact of Index and Swap Funds on Commodity Futures Markets: Preliminary Results* (working paper 2010); Mayer, *The Growing Interdependence Between Financial and Commodity Markets*, UN

Granger studies on the "financialization" effect vary in their conclusions. Overall, as a group, the Granger studies on the effect of index funds across a swath of commodity futures prices do not agree.[50]

In Gilbert, *Speculative Influences on Commodity Futures Prices, 2006-2008*, UN Conference on Trade and Development (2010), Gilbert concluded that commodity index fund positons did Granger-cause price increases in certain commodity futures markets during the 2006-2008 time period. Gilbert, a Professor of Economics at the University of Trento, Italy, found that this price impact appeared to be lasting or "permanent." *Id.* at p. 23. *See* p.24, Table 6 (average price impact by commodity, including a maximum price impact of over 16 percent for crude oil during 2006-2008 time period).

Gilbert's study is based upon a composed proxy for commodity fund index investments. The index data they use is not explained in sufficient detail in the paper and the results derived from this index are therefore not replicable.[51] The price equation he uses for testing is problematic.[52]

Conference on Trade and Development (discussion paper 2009); Stoll and Whaley, *Commodity Index Investing and Commodity Futures Prices* (working paper 2010); Tse and Williams, *Does Index Speculation Impact Commodity Prices?*, Financial Review, Vol. 48, Issue 3 (2013); Tse, *The Relationship Among Agricultural Futures, ETFs, and the US Stock Market*, Review of Futures Markets (2012). A fairly late submission by Williams, *Dodging Dodd-Frank: Excessive Speculation, Commodities Markets, and the Burden of Proof*, Law & Policy Journal of the University of Denver (2015), studies generally the limitations of Granger causality.

[50] There are many more studies using the comovement or cointegration analysis, discussed in Section I(B) below, that look at the financialization questions.

[51] Several statements about the index in the paper indicate a lack of economic rigor, or at least major inferential leaps, in the assumption that the index approximates commodity index funds. *E.g., id*. at pp. 18, 21.

[52] *See id.* at p.22 (Equation 4) (complex equation that subtracts logarithmic prices without detailed economic justification for the destructive of data though subtraction).

Gilbert's numerical results on price impact are dramatic, finding substantial average impact in various due to speculation, with average impact in parts of 2008 of over 10 percent for aluminum, copper, nickel, wheat, and corn. *Id.* at p.24, Table 6. Yet he provides little detail on how he arrived at these percentages other than to say that they are "estimates" that he inferred them from the statistical results set forth in his Table 5. *See id.* at pp.23-24 (little or no statistical assessment of how the results of Table 4 and 5 results translate into the large price impact percentages in Table 6). Because his findings are not well-documented and contain unexplained inferences, his paper may be viewed as suspect.

By contrast, the Granger analysis of Stoll and Whaley, *Commodity Index Investing and Commodity Futures Prices* (working paper 2010), concludes that inflows and outflows from commodity index funds to the commodity markets have not Granger-caused price changes in the commodity futures market. The authors of this study did find a fleeting price impact from when commodity index funds roll over to another contract month. (This fleeting rollover impact finding may be outdated; markets have learned to anticipate and account for index fund rollovers.)[53]

[53] Stoll and Whaley also found a divergence of futures and cash prices in wheat in 2006-2009 period, especially in 2008 period, but concluded that there were limited negative impacts on market functioning associated with this failure to diverge. This result should not be used to suggest that divergence is not a costly phenomenon. Stoll and Whaley's analysis is limited to CME's wheat futures contract. It failed to converge for a period of time because storage was mispriced in the contract during this time period, and market participants knew this and prices reflected this difference. CME eventually changed the wheat contract to charge a more appropriate amount for storage and the divergence phenomenon dissipated. So this example of divergence is associated with economic differences between the spot and futures contracts. It not an example of divergence associated with market manipulation, with attendant social welfare costs. *See* Easterbrook, Frank, *Monopoly, Manipulation, and the Regulation of Futures Markets*, at p. S118, Journal of Business (1986) (When the closing price on a futures contract significantly diverges from the price of the cash commodity immediately before and after, this is strong evidence that someone has reduced the accuracy of the market price and inflicted real economic loss on participants in the market.").

Stoll and Whaley's analysis does not account for the possibility that there could be a delayed effect on futures price changes associated with a delay in laying off, in the futures markets, risks acquired in commodity index swap contracts. In practices, dealers may do this, acquiring risk in multiple markets within acceptable limits as they manage their portfolio risk.[54] Moreover, a paper by Tse and Williams, *Does Index Speculation Impact Commodity Prices?*, Financial Review, Vol. 48, Issue 3 (2013), critiques Stoll and Whaley's approach for using "low frequency data" as failing to use "sufficiently granular data to capture fast futures markets dynamics." *Id.* at p.3. Using intraday, shorter time intervals to analyze from the possible effect of commodity fund investments in the futures markets, Tse and Williams conclude that there was "transmission" of price impacts from futures contracts in a particular commodity fund index (the GSCI index) to commodities that were not in the index. However, this Granger-causation result does not necessarily establish any price impact associated with excessive speculation. Other factors may lead to this result, such as time delay in illiquid markets, the role of the GSCI index as a price influencing mechanism, or the more rapid market response that tends to occur with more liquid markets.[55]

While both the Stoll and Whaley and the Gilbert papers are often cited in the literature, they both have limitations in scope and approach. Other studies do not fully resolve this

[54] *See* Easterbrook, Frank, *Monopoly, Manipulation, and the Regulation of Futures Markets*, at p. S124, Journal of Business (1986) (in the specific context of position limits, "Offenses may be harder to detect when they involve more than one market.").

[55] Stoll and Whaley also observed that commodity index funds should not be thought of as speculators because they participated in these markets to diversify their returns (relative to equity holdings). In Tse, *The Relationship Among Agricultural Futures, ETFs, and the US Stock Market*, Review of Futures Markets (2012), Tse concluded that there were now positive correlations between agricultural ETF returns and S&P 500. This result suggests that the diversification benefit has at least decreased. (In this paper, Tse also found, using 5-minute, intraday returns, that agricultural ETF price returns are Granger-caused by some of the underlying commodity futures market. This result is a rare result finding causation *from* the futures prices *to* financial or institutional traders.)

academic debate. In Williams, *Dodging Dodd-Frank: Excessive Speculation, Commodities Markets, and the Burden of Proof*, Law & Policy Journal of the University of Denver (2015), the limitations of Granger causality analysis in the position limits context is discussed. *Id.* at pp.135-138 (sensitivities of Granger studies to parameters, including time-sensitivity to time intervals, makes "Granger-inspired studies of excessive speculation … problematic," a problem compounded by the volatile nature of the commodity markets).

The general findings of Irwin and Sanders, *The Impact of Index and Swap Funds on Commodity Futures Markets: A Systems Approach*, Journal of Alternative Investments (2011), support Stoll and Whaley's conclusions. Irwin and Sanders analyzed weekly CFTC price data over a number of years and found that there was neither Granger-causation between index fund positions and futures price returns or Granger-causation between changes in fund positions and futures price volatility. Utilizing a Working's T-index, Irwin and Sanders also find that there was not excessive speculation in these markets.

Frenk, *Review of Irwin and Sanders 2010 OECD Report* (Better Markets June 10, 2010), criticizes Irwin and Sanders (1) both their specific methodology, arguing that they used incorrect proxies for hedging volumes and (2) rehearsing the general disadvantages of using Granger analysis.[56] Frenk identifies difficulties in Irwin and Sanders' data and underlying assumption.

Our examination of the Irwin and Sanders papers identifies a significant issue. The price formula used for Granger testing in *The Impact of Index and Swap Funds on Commodity Futures Markets: A Systems Approach* is complex, incorporating many lagged price returns and lagged

[56] Some of Frenk's critiques fall short of the mark. For example, he criticizes Irwin and Sanders for using a one-week interval for their testing. *Id.* at p.7. This is not a flaw in the Irwin and Sanders paper and in fact using a one-week time interval helps to ameliorate another problem Frenk identifies: the difficulty of applying Granger analysis to highly volatile data such as commodity prices.

positions, risks masking correlation due to the possible interdependence of variables. In a model designed to test whether there is Granger-causation between position changes and price return, additional variables may diminish the statistical power of the position change variable in the testing equation by masking the effect of positon on price returns. The inclusion of these lagged price returns and position change variables in the model design, such as the equation on page 18, Table 54, may well diminish the statistical power of the positon change variable.[57] And, in this way, (inadvertently) mask a possible correlation between position changes and price returns. *See* Williams, *Dodging Dodd-Frank: Excessive Speculation, Commodities Markets, and the Burden of Proof*, at pp.137-138, Law & Policy Journal of the University of Denver (2015) (Granger methodology may be problematic in analysis of position limits, because there may be nonlinear relationships between economic variables).

Other studies doing Granger testing for the effects of commodity index funds on prices arrive at conflicting results. *Compare* Mayer, *The Growing Interdependence Between Financial and Commodity Markets*, UN Conference on Trade and Development (discussion paper 2009) (financial investment in commodity trading Granger-cause price changes in soybeans, soybean oil, copper, crude oil, per p.21, Table 4) *with* Antoshin, Canetti, and Miyajima, *IMF Global Financial Stability Report*: *Financial Stress and Deleveraging: Macrofinancial Implications and Policy*, Annex 1.2, Financial Investment in Commodities Markets (October 2008) (not providing

[57] On page 18 Table 4 of the Irwin and Sanders paper, the price return equation used for the Granger correlation analysis diminishes the potential impact of positions on current price returns. Irwin and Sanders use this equation to test for Granger-causation between price returns and position changes, but inclusion of lagged price returns in the equation is problematic. Within the workings of the Granger statistics, placing lagged price returns and change of position data in the same equation can mask the impact of change of positions on price. That is because price returns and lagged price returns may have common correlation; a statistician would say that lagged price return data and change in positions are competing for common correlation with price returns in the Table 4 equation. In this way, the explanatory power of the change in position variable in this Irwin and Sanders paper is diminished by introduction of the lagged price return variables.

specifications or background on study, but reporting results finding absence of Granger causation between position and price in all but the copper markets).

In sum, there is an active debate in this arena with many conflicting results. Tilting the balance toward caution are papers written by then-CFTC economists were able to access non-public, daily market data to do Granger-based economic analysis of the possible impact of commodity index funds. A battery of Granger tests in Bahattin Büyükşahin and Jeffrey H. Harris, *The Role of Speculators in the Crude Oil Futures Market* (working paper 2009), leads to the conclusion that there was no Granger-causation between swap dealer positions (a proxy for commodity index fund positions) and returns in the crude oil or natural gas futures. This finding stayed consistent across tests using different time periods within 2000 to 2008 and different lag periods. Rather, Büyükşahin and Harris found price changes Granger-cause changes in position. This study performs an additional Working T analysis and concludes that this measure of speculative positions was not Granger causing price changes in the crude oil or natural gas markets.

The study of Brunetti and Büyükşahin, *Is Speculation Destabilizing?* (working paper 2009), is also an important contribution to the literature. Brunetti and Büyükşahin consider price returns and positions in several markets (crude oil, natural gas, corn, Eurodollar, and mini-Dow) and finds no Granger causation between position and price returns for any of these commodity markets during a time period when commodity index funds were participating in these markets. This study also finds that speculators in these markets during the time period are decreasing, not increasing, volatility.

Both of these CFTC papers are well-executed and often-cited. These studies also have the advantage of using non-public, daily data. The studies' only apparent limitations are those

that inhere in Granger analysis in this context: the open question of whether the proper time lag was selected, the ad hoc assumption of the time step selected to compute the volatility, and the inclusion in both studies of variables such as lagged price returns that may inadvertently mask correlation.

The inherent limitations of Granger analysis may well bear on the conflicting results of these Granger papers.

Agricultural Commodities

The final set of Granger papers concern the agricultural commodity markets. These include a series of papers by Irwin and Sanders and co-authors not finding Granger causation between positions and price returns.[58] A few papers arrive at nuanced or inconclusive results, but generally cannot find significant Granger causation between position and price in the agricultural commodity markets.[59]

---

[58] There are: Irwin and Sanders, *The "Necessity" of New Position Limits in Agricultural Futures Markets: The Verdict from Daily Firm-Level Position Data* (working paper 2014); Irwin and Sanders, *The Performance of CBOT Corn, Soybean, and Wheat Futures Contracts after Recent Changes in Speculative Limits* (working paper 2007); Sanders, Irwin, and Merrin, *Smart Money? The Forecasting Ability of CFTC Large Traders*, Journal of Agricultural and Resource Economics (2009); Sanders, Irwin, and Merrin, *A Speculative Bubble in Commodity Futures? Cross-Sectional Evidence*, Agricultural Economics (2010); Irwin, Sanders, and Merrin, *Devil or Angel: The Role of Speculation in the Recent Commodity Price Boom*, Journal of Agricultural and Applied Economics (2009); Sanders, Irwin, and Merrin, *The Adequacy of Speculation in Agricultural Futures Markets: Too Much of a Good Thing?*, Applied Economic Perspectives and Policy (2010). An additional paper is, for the most part, in accord with Irwin and Sanders' work. Aulerich, Irwin, and Garcia, *Bubbles, Food Prices, and Speculation: Evidence from the CFTC's Daily Large Trader Data Files* (NBER Conference 2012) (concluding overall that buying pressure from financial index investment in recent years did not cause massive price "bubbles" in agricultural futures prices, and any such evidence of price increase is weak evidence of small and fleeting price impact).

[59] There are: Borin and Di Nino, *The Role of Financial Investments in Agricultural Commodity Derivatives Markets* (working paper 2012) (finding "sparse" evidence of Granger causation between traders' investment decisions and futures prices and also "scarce evidence of hearing behavior except in the cotton market"); Grosche, *Limitations of Granger Causality Analysis to Assess the Price Effects From the Financialization of Agricultural Commodity Markets Under*

There are studies (some are more properly categorized as articles) that do purport to find Granger causation between positions and price returns.[60] The few papers finding substantial price impacts caused by speculative positions in the commodity futures markets are not published in academic, peer-reviewed economic or agricultural journals.[61]

Gilbert in a 2008 paper, *How to Understand High Food Prices*, Journal of Agricultural Economics (2008), reaches a different result with respect to agricultural commodities. Gilbert performs Granger testing on other variables that could explain (in the sense of Granger-causing) run-ups in agricultural commodity futures prices. Specifically, he looks at macroeconomic and financial factors that affected the price of many commodities during the 2005-2008 time period. *Id.* Gilbert obtains results suggesting that the main determinants in agricultural commodity futures prices during this time period are macroeconomic (such as GDP growth) and financial

---

Bounded Rationality, Agricultural and Resource Economics (2012); Gilbert, *How to Understand High Food Prices*, Journal of Agricultural Economics (2008); Robles, Torero, and von Braun, *When Speculation Matters* (working paper 2009) (speculative trading may have influenced agricultural commodity prices "but the evidence is far from conclusive").

[60] These are Algieri, *Price Volatility, Speculation and Excessive Speculation in Commodity Markets: Sheep or Shepherd Behaviour?* (working paper 2012) ("excessive speculation" has driven price volatility for maize, rice, soybeans, and wheat for a particular timeframe); Cooke and Robles, *Recent Food Prices Movements: A Time Series Analysis* (working paper 2009) (concluding that financial activity in futures market and proxies for speculation can help explain observed changes in international food prices for corn, wheat, rice, and soybeans); Timmer, *Did Speculation Affect World Rice Prices?*, UN Food and Agricultural Organization (working paper 2009) (concluding that the price of rice was not affected by financial speculators, but run-ups in wheat and corn prices "was almost certainly caused by financial speculators"); Varadi, *An Evidence of Speculation in Indian Commodity Markets* (working paper 2012) (inferring the unexplained price increases must be due to speculation).

[61] Other limitations arise from fairly cryptic inferential reasoning that the cause of any price-run up must be due to speculation. Timmer, *Did Speculation Affect World Rice Prices?*, at p.38, UN Food and Agricultural Organization (working paper 2009) (regarding theory that financial speculators are the cause for price run-ups, the paper states that "[t]hese conclusions are reached mostly by eliminating the other explanations and by logical reasoning"); Varadi, *An Evidence of Speculation in Indian Commodity Markets* (working paper 2012) (asserting author's "estimations" that speculation has played a "decisive role" in creating commodity price bubbles in Indian commodity markets, without provision of a theoretical framework to reach this conclusion).

factors (such as the value of the dollar and interest rates). *Id.* at 27-28. In sum, Gilbert concludes that (1) there is little Granger-causation evidence that speculation by commodity index funds caused the run-up in agricultural commodity prices during this time period; and (2) moreover, there is evidence of that macroeconomic factors other than "excessive speculation" might have caused the price run-up. Gilbert's work does not purport to show that macroeconomic and financial factors account for all price changes. Moreover, his 2008 piece is hard to square with his 2010 work, which does find price impacts using Granger analysis for some agricultural commodities. Gilbert, *Speculative Influences on Commodity Futures Prices, 2006-2008*, at 24 (Table 4), UN Conference on Trade and Development (2010) (price impacts in wheat, corn, and soybean).

The work of Gilbert, as well as Irwin and Sanders, bodes caution for how sizeable or lasting any price impact associated with "excessive speculation" can be, at least when employing a Granger analysis. One paper authored by Irwin emphasized that the only evidence of Granger-causation between positions and price returns in the agricultural market was weak evidence of temporary changes in price. Aulerich, Irwin, and Garcia, *Bubbles, Food Prices, and Speculation: Evidence from the CFTC's Daily Large Trader Data Files*, *id.* at p.22 (NBER Conference 2012) (finding some weak evidence of temporary changes in price Granger-caused by positions, but observing that the "size of the estimated system impact is too small" to be consistent with the commodity index funds causing a huge run-up in prices).

The debate is hard to resolve, including for the fairly technical reasons provided in Grosche, *Limitations of Granger Causality Analysis to Assess the Price Effects from the Financialization of Agricultural Commodity Markets Under Bounded Rationality*, Agricultural and Resource Economics (2012). Grosche observes that index trading and other financial

investment may be based on a mixture of speculative and hedging motives in the agricultural sphere. *Id*. at p.18. The interaction between the physical and financial contracts in the agricultural commodity sphere is under-researched and the possible "spillover" effects from financial to agricultural markets is unknown. *Id.* at p.17. *See also* Williams, *Dodging Dodd-Frank: Excessive Speculation, Commodities Markets, and the Burden of Proof*, Law & Policy Journal of the University of Denver (2015).

In sum, despite the importance of the issue, there is no authoritative and compelling Granger analysis establishing any lasting or significant agricultural commodity futures price returns or price changes due to (Granger-caused by) positions. The only peer-reviewed and published economic studies to suggest this may be so find little or short-lived impact on price, nothing of the order of magnitude to explain run-ups in commodity prices in the 2006-2009 time period. These studies do not disprove the thesis that agricultural commodity positions may have impacted prices in a lasting or significant manner, but, working within the limitations of Granger methodology, the published studies find little evidence to support this thesis.

B. Comovement, Cointegration and "Financialization"

1. Description

These studies employ a statistical method that can be viewed mathematically as a special case of Granger causality, a method frequently referred to as comovement. This method looks for whether there is correlation that is contemporaneous and not lagged. (This is effectively similar to a Granger analysis where the type period of lag is set to zero.) Like Granger causality, this method employs linear regression to establish correlation between market prices or price returns and positions. When the time step is set to zero, the economist can no longer be seeking to establish an inference of cause and effect between prices or price returns and positions. Instead,

the economist is using a Granger-type analysis to establish whether there is a correlation that is contemporaneous. A subset of these comovement studies uses a technique called cointegration for testing correlation between two sets of data, to see if there is a statistical relationship notwithstanding the "white noise" of price data.[62]

This technique can be used to ferret out unexpected divergences in prices. For example, many economists perform cointegration tests comparing futures and spot prices, which generally should constrain each other by staying within reasonable bands of each other. If they find a divergence, they consider whether excess speculation or a price "bubble" could explain this price discrepancy.

2. Advantages and Disadvantages

Such approaches are useful to compare commodity markets with other markets in seeking a correlation over time between these sets of prices. For example, a study may examine a price index for commodities for one time series and a price index for equities for another time series. In rough terms, studying the linear regressions of these price data over time establishes whether there is a confluence of price trends in these two markets. It may capture correlations which a Granger causality approach may miss if the latter uses too large a time lag. In this way, comovement analyses may be stronger than Granger analyses at finding correlations, avoiding the problem of correlation being hidden by the improper selection of length of time lag.

[62] Two time series of price data are said to be cointegrated if the error term in the modeling of their statistical correlation is a term that is, among other things, independent of time. In layperson's terms, the two streams of price data each roughly follow a random walk through time. (In more technical terms, cointegration means there is a linear connection between the two streams of data where the difference is "white noise" (Brownian motion) or a random walk. There is some cointegrating vector of coefficients that can be used to form a linear combination of the two time series.)

But the complementary disadvantage is that a comovement result cannot establish even weak, Granger-style causation. In the particular context of position limits, this disadvantage is significant. As further explained below in the discussion of specific studies, correlations between prices or price returns and positions can be caused by external factors such as broad macroeconomic trends. In particular, using comovement to try to establish a "price bubble" over time rangers that are short-term (months) or medium-term (18 months to two years) is problematic because of the impact macroeconomic or other external factors (wars, recessions) can have on short-term prices. A comovement study showing a correlation between two sets of data – crude oil futures and spot prices – over just a year or two years is, all else being equal, a fairly weak basis to infer a price bubble. There can be other factors which cause decoupling of prices over such a time period.

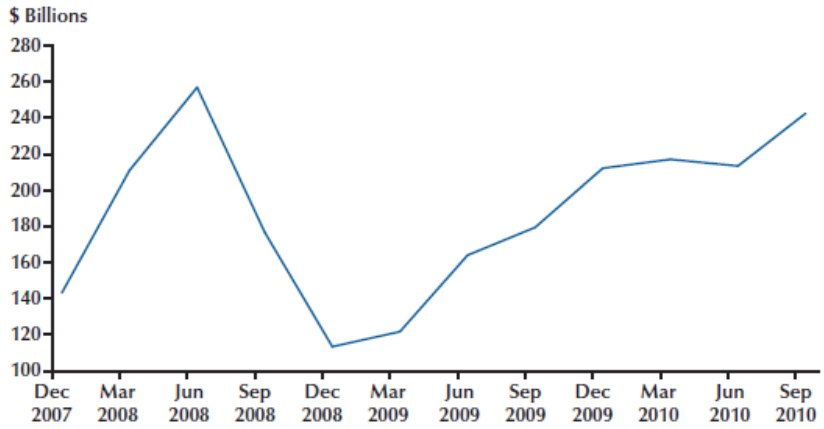
3. "Financialization"

Many of the papers in this category focus on a documented correlation between returns to commodity futures and the financial (including equity) markets has increased strongly in recent years.[63] This is often called comovement between the commodity and financial markets. The many factors that have driven explosive growth in commodity derivatives trading in recent years are well-documented in Basu and Gavin, *What Explains the Growth in Commodity Derivatives?*, Federal Reserve Bank of St. Louis (2011). There has been substantial growth in commodity index investments; this includes commodity exchange-traded funds and other commodity indices which fund managers and other financial investors may use. Both the number of such indices, and the volume of trading involving them, has grown substantially in the last decade. There have

[63] Tang and Xiong, *Index Investment and Financialization of Commodities*, Financial Analysts Journal (2012).

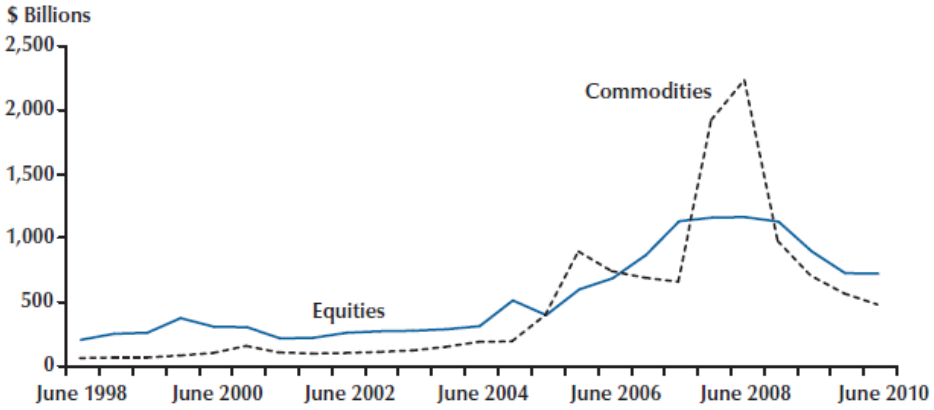
also been significant changes in the long positions held in commodity futures index funds during the financial crisis:

Notional Long Positions Invested in Commodity Futures Index Funds



Id. at 40, Figure 1B. Over-the-counter trading in commodity derivatives by swap dealers has also increased over time, with a pronounced spike during the 2007-2008 time period:

OTC Trading in Commodity and Equity Derivatives (gross market value)



SOURCE: Bank for International Settlements derivatives statistics.

Id. at 41, Figure 2B. The factors driving this growth include the desire of institutional portfolio managers to hedge against stock risk, based on the *belief* by some academic and industry economics that there were negative correlations between returns on equity and commodity

futures. *Id.* at pp.38, 44-45. (This belief may not be economically justifiable.[64]) Investors also sought higher yields in a low-yield environment. *Id.* at pp. 38, 44.

4. The Masters hypothesis

One variation on this financialization theme is the Masters "hypothesis." Michael W. Masters, a hedge fund manager, is a leading proponent of the view that commodity index investments have been a major driver of increases in the commodity futures prices. In brief, his statement is:

> Institutional Investors, with nearly $30 trillion in assets under management, have decided en masse to embrace commodities futures as an investable asset class. In the last five years, they have poured hundreds of billions of dollars into the commodities futures markets, a large fraction of which has gone into energy futures. While individually these Investors are trying to do the right thing for their portfolios (and stakeholders), they are unaware that collectively they are having a massive impact on the futures markets that makes the Hunt brothers pale in comparison. In the last 4½, years assets allocated to commodity index replication trading strategies have grown from $13 billion in 2003 to $317 billion in July 2008. At the same time, the prices for the 25 commodities that make up these indices have risen by an average of over 200%. Today's commodities futures markets are excessively speculative….[65]

---

[64] *See id.* at p.44 (however, following the collapse of commodity prices in the summer of 2008 and subsequent financial panic in September of 2008, the correlation between commodity prices and equities became highly and positively correlated). Use of commodities to hedge equity or business cycle risk is controversial. Basu and Gavin, *What Explains the Growth in Commodity Derivatives?*, at p.44 Federal Reserve Bank of St. Louis (2011), *citing* Büyükşahin, Haigh, and Robe (2008) (unconditional correlation between equity and commodity futures returns is near zero).

[65] M.W. Masters, A.K. White, *The Accidental Hunt brothers: How Institutional Investors Are Driving up Food and Energy Prices*, www.accidentalhuntbrothers.com (2008). Mr. Masters, Portfolio Manager for Masters Capital Management, LLC, has often referred to these large investors as "passive" investors. "Passive speculators are an invasive species that will continue to damage the markets until they eradicated." Masters Statement, CFTC March 2010 hearing at p.5. According to Barclay's, index fund investment fund in commodities reached $431 billion as of July 2011. Algieri, *A Roller Coaster Ride*, at p.5 (working paper 2011).

Statements are not, in themselves, rigorous economic studies, nor do they purport to be. Several economists have attempted to formalize and study rigorously the "Masters hypothesis" or related conjectures using comovement or cointegration methods. These studies are discussed below.

5. Discussion of Specific Studies

There are 25 papers that use some form of comovement or cointegration analysis, broadly defined. Former and current economists within the Office of Chief Economist have used this method repeatedly (7 papers);[66] several government and policy researchers deploy this method (4 papers);[67] and other academicians have used this method (14 papers).[68]

---

[66] These are: Boyd, Büyükşahin, and Haigh, *The Prevalence, Sources, and Effects of Herding* (working paper 2013); Büyükşahin and Robe, *Does it Matter Who Trades Energy Derivatives?*, Review of Env't, Energy, and Economics (2013); Büyükşahin and Robe, *Speculators, Commodities, and Cross-Market Linkages* (working paper 2012); Büyükşahin and Robe, *Does "Paper Oil" Matter?* (working paper 2011); Büyükşahin, Harris, and Haigh, *Fundamentals, Trader Activity, and Derivatives Pricing* (working paper 2008); Cheng, Kirilenko, and Xiong, *Convective Risk Flows in Commodity Futures Markets* (working paper 2012); and Haigh, Harris, and Overdahl, *Market Growth, Trader Participation and Pricing in Energy Futures Markets* (working paper 2007).

[67] There are: Baffes and Haniotos, *Placing the 2006/08 Commodity Boom into Perspective*, World Bank Policy Research Working Paper 5371 (2010); Belke, Bordon, and Volz, *Effects of Global Liquidity on Commodity and Food Prices*, German Institute for Economic Research (2013); Kawamoto, Kimura, *et al.*, *What Has Caused the Surge in Global Commodity Prices and Strengthened Cross-market Linkage?*, Bank of Japan Working Papers Series No.11-E-3 (May 2011); and Pollin and Heintz, *How Wall Street Speculation is Driving Up Gasoline Prices Today* (AFR working paper 2011).

[68] These are: Adämmer, Bohl and Stephan, *Speculative Bubbles in Agricultural Prices* (working paper 2011); Algieri, *A Roller Coaster Ride: an Empirical Investigation of the Main Drivers of Wheat Price* (working paper 2013); Babula and Rothenberg, *A Dynamic Monthly Model of U.S. Pork Product Markets: Testing for and Discerning the Role of Hedging on Pork-Related Food Costs*, Journal of Int'l Agricultural Trade and Development (2013); Basu and Miffre, *Capturing the Risk Premium of Commodity Futures: The Role of Hedging Pressure*, Journal of Banking and Risk (2013); Hoff, *Herding Behavior in Asset Markets*, Journal of Financial Stability (2009); Tang and Xiong, *Index Investment and Financialization of Commodities*, Financial Analysts Journal (2012); Creti, Joets, and Mignon, *On the Links Between Stock and Commodity Markets' Volatility*, Energy Economics (2010); Bichetti and Maystre, *The Synchronized and Long-lasting Structural Change on Commodity Markets: Evidence from High Frequency Data* (working paper 2012); Bunn, Chevalier, and Le Pen, *Fundamental and Financial Influences on the Co-movement of Oil and Gas Prices* (working paper 2012); Coleman and Dark, *Economic*

(1) The Example of Oil Prices 2006-2008

One of the key challenges for application of the Masters hypothesis is reconciliation of a supposed speculative price with what is happening in the physical market. The debate within academia, practitioners and policymakers on this topic has been considerable, especially given the run-up in prices in certain commodities, such as the 2006-2008 rise in crude oil prices. "Dramatic swings in crude oil prices have led Congress to examine the functioning of the markets where prices are set." Jickling and Austin, *Hedge Fund Speculation and Oil Prices* at p.1, (Congressional Research Service R41902 June 29, 2011). The correlation of oil with economic trends is not necessarily evidence that finance trends are causing increases in oil prices. As a Congressional Research Study observed, this might suggest that certain traders with "better information on macroeconomic trends, which strongly influence energy demand, take more aggressive positions, which would then influence oil prices."[69]

The economics of the crude oil market are a good example of the dangers of applying comovement or cointegration methods over short- and medium-term. Short-term crude oil prices are more inelastic than longer-term prices. This means, in the short term, changes in price do not affect the supply of crude oil as much as long-term price changes do. There are many reasons why this is so, having to do with the cost of storing crude oil above ground and the cost of starting and stopping crude oil extraction. *See* n.44 and associated text (economics of crude oil

---

Significance of Non-Hedger Investment in Commodity Markets (working paper 2012); Dorfman and Karali, *Have Commodity Index Funds Increased Price Linkages between Commodities?* (working paper 2012); Korniotis, *Does Speculation Affect Spot Price Levels? The Case of Metals With and Without Futures Markets* (working paper, FRB Finance and Economic Discussion Series 2009) (also submitted as a comment by CME); Le Pen and Sévi, *Futures Trading and the Excess Comovement of Commodity Prices* (working paper 2012); and Windawi, *Speculation, Embedding, and Food Prices: A Cointegration Analysis* (working paper 2012).

[69] Jickling and Austin, *Hedge Fund Speculation and Oil Prices* at p.16, (Congressional Research Service R41902 June 29, 2011).

inventories). So it is unsurprising that there are short- and medium-term divergences in price between spot and longer-term futures contracts in the crude oil markets.

On the supply side of crude oil market economics, a short-term shock to supply (wars, embargoes, or other events) will not necessarily translate into a long-term change in prices, even though it may cause substantial short-term price changes and volatility. Similarly, on the demand side of crude oil market economics, short-term changes to demand can impact short-term crude oil prices without causing lasting long-term price impact.[70] *See generally* Hamilton, *Causes and Consequences of the Oil Shock of 2007-2008*, at pp. 17-23, Brookings Paper on Economic Activity (2009) (while oil prices may have been "too high" in July 2009, "low price elasticity of demand, and the failure of physical production to increase" are more likely the predominant causes than "speculation per se").

For such reasons, comovement and cointegration studies of crude oil prices over medium time frames are unpersuasive.[71] Büyükşahin and Robe, *Does "Paper Oil" Matter?* (working paper 2011), showed that correlations between equity and energy commodity investments increased massively after Lehman's collapse in 2008. As explained in Büyükşahin and Robe, *Does it Matter Who Trades Energy Derivatives?*, Review of Env't, Energy, and Economics (2013), this does naturally raise the question of whether hedge funds and index funds inflows are transmitting financial shocks to commodity prices. However, as Büyükşahin and Robe's survey

[70] This is true for a variety of reasons, including the fact that refining production is expensive to change on short notice.

[71] Pollin and Heintz, *How Wall Street Speculation is Driving Up Gasoline Prices Today*, at p.10, Americans for Financial Reform (working paper 2011) ("Lagged values of both gasoline prices and crude oil prices can affect current gas prices. This implies that past speculative pressures are carried over, at least for several months, to current prices."); Bunn, Chevalier, Le Pen, and Sevi, *Fundamental and Financial Influences on the Co-movement of Oil and Gas Prices*, at p.18 (working paper 2012) ("we find significant evidence that speculation, with its focus on index trading, increases the correlation between oil and gas").

of Granger and comovement economic literature, it does not appear that index traders and hedge funds had an impact on crude oil prices during this time period. *Id.* at p.5. Celso Brunetti and Bahattin Büyükşahin, in *Is Speculation Destabilizing?* (working paper 2009), found that hedge funds exert a calming influence on crude oil prices by lowering oil price volatility.[72]

Cointegration results suggest that financial traders' influence of crude oil futures prices is desirable. For example, then-CFTC economists Büyükşahin, Harris, and Haigh, in *Fundamentals, Trader Activity, and Derivatives Pricing* (working paper 2008), show how the increased presence of swap dealers, hedge funds, and other financial traders have led to the cointegration of various crude oil futures contracts (the nearby contract, the one-year contract, and the two-year contract). This co-integration result by CFTC economist suggests that there was a long-term relation between the strength of price cointegration and the market activities of financial traders, *id.* at p.3, but this result does not suggest any harm to the marketplace or price discovery from the cointegration of various crude oil contracts. The authors conjecture that the greater market activity by these traders can "enhance market quality" through "enhance[d] linkages among various futures prices" that make these commodity markets "more informationally efficient." *Id.* at pp.4-5.

Both Büyükşahin and Robe, *Does it Matter Who Trades Energy Derivatives?*, Review of Env't, Energy, and Economics (2013), and Büyükşahin, Harris, and Haigh, in *Fundamentals, Trader Activity, and Derivatives Pricing* (working paper 2008), are of course correct that, respectively, there is increased comovement between crude oil prices with financial investments

[72] *See also* Haigh, Harris, and Overdahl, *Market Growth, Trader Participation and Pricing in Energy Futures Markets* (working paper 2007) (participation of swap dealers and arbitrageurs has assisted in improved price efficiency – price converge – in crude oil futures contracts, with nearby, one, and two-year crude oil futures contracts statistically cointegrated through the period studied, July 2004 to mid-2006).

and cointegration between nearby, one-year, and two-year crude oil futures contracts. At least for the crude oil market, these price linkages exist. However, one cannot obtain, using comovement and cointegration techniques, decisive evidence on whether this effect improves market efficiency. Such a conclusion involves interpretation of the informational linkages between the markets. To the extent that *Fundamentals, Trader Activity, and Derivatives Pricing* moves beyond establishing the linkage to inferring that the linkage has salutary effects on commodity markets, that conclusion was not empirically tested, because it was not modelled explicitly. The most these studies establish empirically are the existence of these price linkages.

(2) Financialization Comovement Literature

Some studies have examined "financialization" by using comovement analysis to ask whether increased investment flows into commodity indices (typically composed with substantial long futures positions) are correlated with increases in futures prices or the volatility of commodity futures prices across many different types of studies. Some of these financializaton comovement studies have looked to whether these investment flows decrease the risk premium for holding a long futures contract, thereby causing a non-transient increase in the long futures contract price (which, in turn, may increase the price of the underlying commodity).

There is consensus in the economic literature that equities and commodities no longer have the negative correlations that index fund investment managers may have sought to hedge. In recent years there has been an increased positive correlation between equity and commodity prices since 2008.[73] There is also substantial consensus among economists who study this issue that risk premiums for holding long futures contracts have decreased due to financialization.[74]

[73] *E.g.*, Basu and Gavin, *What Explains the Growth in Commodity Derivatives?*, at p.44 Federal Reserve Bank of St. Louis (2011) (commodity and equity prices highly and positively correlated in February 2010); Tang and Xiong, *Index Investment and Financialization of Commodities*,

However, there is a divergence of views among economists on the impacts, if any, on the large positions taken by index funds on commodity futures prices or price volatility. *See* Irwin and Sanders, *Index Funds, Financialization, and Commodity Futures Markets*, at p.15, Applied Economic Perspectives and Policy (2010) (surveying literature in support and against the idea of a speculative bubble in prices arising from commodity index fund participation in the futures market).[75] These hypothesized effects of financialization are debated among academics, practitioners, and policymakers. Results of studies that test for a bubble component in commodity futures prices – regardless of the cause – are decidedly mixed.[76]

Commission-affiliated economics have confirmed a general decrease in volatility associated with financialization, a salutary effect associated with increased liquidity. Brunetti and Büyükşahin, *Is Speculation Destabilizing?* (working paper 2009).[77] In theoretical models

---

Financial Analysts Journal (2012); Inamura, Kimata, *et al.*, *Recent Surge in Global Commodity Prices* (Bank of Japan Review March 2011).

[74] Hamilton and Wu, *Risk Premia in Crude Oil Futures Prices*, Journal of International Money and Finance (2013).

[75] *See id., comparing literature generally in support,* Gilbert, *Speculative Influences on Commodity Futures Prices, 2006-2008*, UN Conf. On Trade Development (2010); Einloth, *Speculation and Recent Volatility in the Price of Oil* (working paper 2009), and Tang and Xiong, *Index Investment and Financialization of Commodities*, Financial Analysts Journal (2012), *with literature generally against,* Bahattin Büyükşahin and Jeffrey H. Harris, *The Role of Speculators in the Crude Oil Futures Market* (working paper 2009); Brunetti and Büyükşahin, *Is Speculation Destabilizing?* (working paper 2009); Stoll and Whaley, *Commodity index Investing and Commodity Futures Prices*, Journal of Applied Finance (2010), Irwin and Sanders (multiple studies).

[76] *E.g.*, Büyükşahin and Robe, *Speculators, Commodities, and Cross-Market Linkages* (working paper 2012); Irwin and Sanders, *Index Funds, Financialization, and Commodity Futures Markets*, at p.15, Applied Economic Perspectives and Policy (2010), *citing, inter alia*, Phillips and Yu, *Dating the Timeline of Financial Bubbles During the Subprime Crisis*, Quantitative Economics (2011); and Kilian and Murphy, *The Role of Inventories and Speculative Trading in the Global Market for Crude Oil*, Journal of Applied Econometrics (2010).

[77] This study finds that hedge funds in the commodity markets take the opposite position with other market participants, therefore providing liquidity to the market in various commodity market places studied: crude oil, natural gas, corn, and two financial contracts.

outside the comovement methodology, competition from index investment reduces the risk premium that accrues to long position holders, and this can have the net effect of lowering the cost of hedging to traditional physical market participants.[78] Some economists rely upon the efficient market hypothesis that market prices fully incorporate all the available public "information" into prices – in support of conclusion that financialization provides benefits such as better price discovery, liquidity, and transfer of risks to entities better prepared to assume it.[79] Comovement and cointegration analyses are some of the statistical tools used to test whether these purported benefits of greater market participation hold true under particular market conditions.

While competition and increased trading volume can generally help markets, inflows do not universally benefit market welfare. In Cheng, Kirilenko, and Xiong, *Convective Risk Flows in Commodity Futures Markets* (working paper 2012), the authors use comovement methodology to conclude that in times of distress, financial traders reduce their net long position, causing risk to flow from financial traders to commercial hedgers. "[J]ust when the uncertainty in the economy was rising, the number of futures contracts used by commercial hedges to hedge their risk was going down." *Id.* at p.2 (citing papers on a growing body of theoretical work indicating that at times of financial crisis, funding and risk constraints may force financial traders to unwind positions, which, in turn, forces hedges to reduce their hedging positions).

[78] Acharya, Ramadorai, and Lochstoer, *Limits to Arbitrage and Hedging: Evidence from Commodity Markets*, Journal of Financial Economics (2013) (existence of financial commodity index trading will tend to decrease risk premium, thereby generally making it cheaper for producers to hedge through short futures contracts).

[79] Filimonov, Bicchetti, and Maystre, *Quantification of the High Level of Endogeneity and of Structural Regime Shifts in Commodity Markets*, at p.3 and citations therein (working paper 2013).

Cheng, Kirilenko, and Xiong argue that tests such as Granger, which look to whether financial traders' positions and futures prices are negatively correlated when they trade to accommodate hedgers, overlook an important lesson from the distressed financial literature. *Id.* at p.3. When financial entities trade in response to their own financial distress, their trades may be correlated positively to futures price changes. *Id.* These correlations may net out, so that any significant correlation between their positions and price changes may be masked by trading during financial distress. *Id.* *See* Acharya, Ramadorai, and Lochstoer, *Limits to Arbitrage and Hedging: Evidence from the Commodity Markets*, Journal of Financial Economics (2013) (decreases in financial traders' risk capacity should lead to increases in hedgers' hedging cost, all else being equal).

Using cointegration techniques and non-public trading data, then-CFTC economists Büyükşahin and Robe, *Speculators, Commodities, and Cross-Market Linkages* (working paper 2012), demonstrates that the correlations between equity indices and commodities increases with greater participation by finances speculators. There is no such effect for other types of traders. In concert with the work of Cheng, Kirilenko, and Xiong, they find that this cointegration effect, the price linkages between equity indices and investible commodities, is lower during times market stress.

Another comovement study has provided an empirical link between commodity index investment and futures price movements, including increased price volatility. *E.g.*, Tang and Xiong, *Index Investment and Financialization of Commodities*, Financial Analysts Journal (2012). Tang and Xiong find that the increasing presence of index traders in commodity futures markets improves risk sharing in these markets with concomitant volatility spillover from outside markets. This study finds evidence of volatility spillovers from the financial crisis in the 2006-

2009 time period, spillovers that may have been a key driver of recent commodity price volatility.[80]

This Tang and Xiong finding of volatility "spillovers" is frequently cited by commenters in support of position limits. However, some academics are skeptical of their results. Irwin and Sanders concede that the Tang and Xiong paper "appears to offer concrete evidence" of some form of financialization, but offers several reasons to view these findings with caution. Irwin and Sanders, *Index Funds, Financialization, and Commodity Futures Markets*, at p.15, Applied Economic Perspectives and Policy (2010) (questioning the small magnitude of correlation and suggesting that Tang and Xiong may not have adequately controlled for fundamental factors affecting price).

Tang and Xiong's results, even if valid, do not necessarily point to lasting difficulties associated with the integration of financial and commodity markets. Instead, they argue that commodity markets were not integrated with financial markets prior to the development of commodity index funds. In their paper, Tang and Xiong view financialization as a "process" which helps explain "the synchronized price boom and bust of a broad set of seemingly unrelated commodities" during the 2006-2008 time period. Tang and Xiong, *Index Investment and Financialization of Commodities*, at p.1 Financial Analysts Journal (2012).

A fundamental problem with this line of reasoning is that there could be other factors which lead to increased correlation between equities and futures during this time period. After all, 2006-2009 was an eventful time where broad macroeconomic factors held sway and could

[80] Of course, the spillover effect may not be limited to domestic markets. *Cf.* UN Food and Agricultural Org., *Price Volatility in Agricultural Markets. Economic and Social Perspectives Policy Brief 12* (2010) (citing financialization as a possible basis for short-term volatility and observing that international integration of markets can propagate price risks to domestic markets quicker than before).

have led to large positive correlations between these markets, all else being equal. According to many, one of the factors leading to the influx of investment funds in during the 2006-2008 time period was negative correlations between commodities returns and equities returns. Yet this factor is less prevalent today. "The positive correlation between the agriculture ETFs and S&P 500 suggests that the diversification benefits of using an agricultural index have decreased."[81]

Some commenters have pointed to studies such as Tang and Xiong's in support of the position limits rule.[82] Yet neither the proposed rule nor the final rule establishes position limits for commodity index funds themselves. Most financial investor's exposure to commodities through commodity index funds or ETFs would not be prevented by position limits. Even when investors are aggregated in large, exchange-traded funds, investors can choose to invest in more than one fund. So even if there are volatility or price "spillover" effects, position limits would not necessary address them. Studies on the price returns or price volatility effect of commodity index funds are thus not directly relevant to the placement of position limits on individual commodities contract.[83] Moreover, commodity index funds are not the only large investors whose activities may affect commodity futures prices.[84]

---

[81] Tse, *The Relationship Among Agricultural Futures, EFTs, and the US Stock Market*, at p.16, Review of Futures Markets (2012). Indeed, this decreased correlation may be due, in part, to ethanol, an economic substitute for gasoline as an additive to reformulated blend stock, being manufactured with corn and other grains.

[82] *See generally* Henn Letter (and citations therein).

[83] *See* NPRM at 75740 n.483 ("The speculative position limits that the Commission proposes apply only to transactions involving one commodity or the spread between two commodities…. They do not apply to diversified commodity index contracts involving more than two commodities…. [C]ommenters assert that such contracts, which this proposal does not address, consume liquidity and damage the price discovery function of the marketplace").

[84] Irwin and Sanders, *Index Funds, Financialization, and Commodity Futures Markets*, at p.26, Applied Economic Perspectives and Policy (2010) (evidence that "other traders, such as broker-dealers and hedge funds, play key roles in transmitting shocks to commodity futures markets from other sectors"), *citing inter alia* Büyükşahin and Robe, *Does it Matter Who Trades Energy*

A paper by Korniotis, *Does Speculation Affect Spot Price Levels? The Case of Metals With and Without Futures Markets* (working paper, FRB Finance and Economic Discussion Series 2009) (also submitted as a comment by CME), contains an important caveat in the financialization debate: the effects of financialization may vary widely depending on the type of commodity. Crude oil is an important component of the S&P Goldman-Sachs Commodity Index (GSCI), more so than industrial metals. Federal Reserve Board economist George Korniotis found that there was cointegration between metals with and without futures contracts that did not weaken as financial speculation increased in the marketplace and the spot prices for industrial metals were unrelated to the GSCI.

With the exceptions discussed in detail above, many of the studies in this vein do not warrant detailed discussion. Even well-executed economic studies using comovement methodology that do not focus on position limits may be of little or marginal relevance.[85]

(3) Herding

There are other possible ways in which additional trading volume may not be an unalloyed benefit to the wellbeing of a marketplace. A few comovement studies attempt to test

---

Derivatives?, Review of Env't, Energy, and Economics (2013); Haigh, Hranaiova, and Overdahl, *Hedge Funds, Volatility, and Liquidity Provisions in the Energy Futures Markets*, Journal of Alternative Investments (Spring 2007); Basu and Gavin, *What Explains the Growth in Commodity Derivatives?*, Federal Reserve Bank of St. Louis (2011) (documenting increased participation in commodity trading by swap dealers).

[85] *See* Baffes and Haniotos, *Placing the 2006/08 Commodity Boom into Perspective*, World Bank Policy Research Working Paper 5371 (2010); Kawamoto, Kimura, *et al.*, *What Has Caused the Surge in Global Commodity Prices and Strengthened Cross-market Linkage?*, Bank of Japan Working Papers Series No.11-E-3 (May 2011); Coleman and Dark, *Economic Significance of Non-Hedger Investment in Commodity Markets* (working paper 2012); Dorfman and Karali, *Have Commodity Index Funds Increased Price Linkages between Commodities?* (working paper 2012); Le Pen and Sévi, *Futures Trading and the Excess Comovement of Commodity Prices* (working paper 2012); Creti, Joets, and Mignon, *On the Links Between Stock and Commodity Markets' Volatility*, Energy Economics (2010); Bichetti and Maystre, *The Synchronized and Long-lasting Structural Change on Commodity Markets: Evidence from High Frequency Data* (working paper 2012).

for the existence of "herding." This is a formalized version of price trending. The idea here is that traders may initiate a trade with the expectation that positive-feedback traders will purchase the traded instruments at a higher price later. Boyd, Büyükşahin, and Haigh, *The Prevalence, Sources, and Effects of Herding* (working paper 2013); Hoff, *Herding Behavior in Asset Markets*, Journal of Financial Stability (2009).[86] Some economists argue that financialization aggravates "herding" behavior and herding creates price bubbles.[87] Others dispute any such effect.[88]

The evidence for herding is meager and the idea of herding currently lacks a strong theoretical foundation. However, the underlying idea is consistent with accepted and theoretically plausible results on risk premia. Risk premiums rise with the volatility of the futures markets, and risk premiums depend in part on speculators' hedging pressure and inventory levels. Basu and Miffre, *Capturing the Risk Premium of Commodity Futures: The Role of Hedging Pressure*, Journal of Banking and Risk (2013).

(4) Agricultural Commodities and Financialization

Agricultural economists have reached similarly conclusions on the cointegration of financial speculators and food prices. While there are respectable empirical results suggesting

[86] *See also* Froot, Scharfstein, and Stein, *Herd on the Street: Informational Inefficiencies in a Market with Short Term Speculation* (working paper 1990) (theoretical paper discussing herding); Weiner, *Do Birds of A Feather Flock Together? Speculator Herding in the Oil Market* (working paper 2006) (doing a herding analysis to conclude that there are subgroups within speculators that act in parallel, and this amplifies their effect on crude oil prices); CITE TO KAUFMAN paper using different methodology but discussing also herding.

[87] Hoff, *Herding Behavior in Asset Markets*, Journal of Financial Stability (2009); Mayer, *The Growing Interdependence Between Financial and Commodity Markets*, UN Conference on Trade and Development (discussion paper 2009) (Granger analysis).

[88] *E.g.*, Brunetti and Büyükşahin, *Is Speculation Destabilizing?* at p.5 n.3 (working paper 2009) ("the moderate level of herding in futures markets [among hedge funds] serves to stabilize prices").

that financial speculation have affected some recent agricultural commodity price dynamics, there is no unanimity in the academic community on conclusive empirical evidence of the causal dynamics, breadth, and magnitude of such effects.[89] *See* Aulerich, Irwin, and Garcia, *Bubbles, Food Prices, and Speculation: Evidence from the CFTC's Daily Large Trader Data Files*, at p.3 n.4, NBER Conference on Economics of Food Price Volatility (2012) (studies testing for the existence of price bubbles in agricultural futures markets have led to "mixed results"). While "the bulk of studies" do not support the Masters hypothesis in the agricultural food markets, *id.* at p.5, it important to note that the research to date is subject to important limitations in data, *id.* at p.5 & n.5, and model limitations discussed above.

C. Models of Fundamental Supply and Demand and Related Methods

1. Description

Some economists have developed economic models for the supply and demand of a commodity. These models often include theories of how storage capacity and use affect supply and demand, often a critical factor in the case of physical commodities and their inter-temporal price (that is, their price over time). Using models of supply and demand, the economist then attempts to arrive at a "fundamental" price (or price return) for commodity based on the model. Specifically, the economist looks at where the model is in equilibrium with respect to quantities supplied and quantities demanded to arrive at this price. The fundamental price given by such a model is then compared with actual prices. The economist looks for deviations between the

[89] Belke, Bordon, and Volz, *Effects of Global Liquidity on Commodity and Food Prices*, German Institute for Economic Research (2013); Adämmer, Bohl and Stephan, *Speculative Bubbles in Agricultural Prices* (working paper 2011); Algieri, *A Roller Coaster Ride: an Empirical Investigation of the Main Drivers of Wheat Price* (working paper 2013); Babula and Rothenberg, *A Dynamic Monthly Model of U.S. Pork Product Markets: Testing for and Discerning the Role of Hedging on Pork-Related Food Costs*, Journal of Int'l Agricultural Trade and Development (2013); Windawi, *Speculation, Embedding, and Food Prices: A Cointegration Analysis* (working paper 2012).

fundamental price, based on the model, and the actual price of the commodity. When pursuing this method, economists look for whether the price deviations are statistically significant. When there is a statistically significant deviations of the actual price from market fundamentals, they infer that the price is not driven by market fundamentals.

Many of these studies present a model for one particular commodity or set of commodities. Some looked at volatile markets. Others used at very predictable markets.

We group together for analysis a diverse set of studies that fall within this broad category of economic models of fundamental supply and demand. Some asserted that their models generally could explain prices Some papers were neutral. And some papers reached the conclusion that market fundamentals could not explain certain price data in the markets they studied.

2. Advantages

This methodology is well-recognized and accepted means for detecting price deviations. This is a centuries-old technique, as old as the quantification of economics. The model forces the economist to explain supply and demand. This requirement thus provides welcome transparency.

Moreover, the models are auditable: when the fundamental price deviates from the actual price, the economists may well be able to look at the model and see which aspects of supply and/or demand created the deviation. If the economist cannot ascertain the source of the deviation, (1) the economist may seek to add additional variables to the models for supply or demand to better model supply and demand or (2) conclude that this unexplained deviation is empirical support for the existence of a non-fundamental price.

Another advantage of this model is that the loose language of "bubble" is replaced by the term "non-fundamental price." The model supplies an economically motivated specification for the price of a commodity. This feature permits deeper economic analysis and debate on whether a non-fundamental price exists without a digression into impressionistic and essentially philosophical debates about what the term "bubble" means.[90]

3. Disadvantages

However, as applied to position limits, this approach has several drawbacks.

First and foremost, all these analyses and conclusions which flow from these studies are only as good as the models themselves. Specifically, the price benchmark is based on the model, and an analysis of deviation from the benchmark is only as strong as the model itself. These models incorporate many simplifying assumptions. Market behavior and the real world in general, are much more complicated. Indeed, society would not go to expense of employing markets to allocate commodity resources if there were reliable and accurate econometric models that could determine price.

Moreover, these models do not function well when there is a supply shock or when demand falls precipitously. Another disadvantage is model construction using variables that are highly correlated with the price. If the correlation between price and a variable is too high, then using the variable in the model may permit the variable to function as a proxy for price. This will hobble the model's ability to detect price deviations.

[90] Nobel laureates in economics cannot agree on whether bubbles exist or what the proper definition of a bubble is. Studies that focus on the causes of price formation avoid these definitional uncertainties. *See* Easterbrook, Frank, *Monopoly, Manipulation, and the Regulation of Futures Markets*, at p. S117, Journal of Business (1986) (it is not necessarily market manipulation to exploit an advantageous position in the marketplace in anticipation of changes in supply and demand.")

A substantial disadvantage of this model is the inherent difficulty of modelling fundamentals of supply and demand in a market of any complexity. Or even, in a model, in anticipating or measuring the impact of large macroeconomic trends. For example, economists are notoriously bad, with the rest of humanity, in predicting economic recessions. It is wishful to think that a model with a few variables, designed without this hindsight, would be successful in predicting how crude oil prices would behave during the advent of an economic recession. With hindsight, economists know now that September 2008 was at the outset of a substantial global recession. And with hindsight, it is apparent that the recession dramatically reduced the demand for crude oil. But at the outset of a recession, a model designed without knowledge of the recession might reveal a statistically significant deviation of actual crude oil prices for the fundamental price derived from the model.

While this statistical method replaces loose language of "bubbles" with a statistically derived fundamental price, studies offering economic analysis of fundamentals of price and demand do not eliminate all subjectivity in determining whether a non-fundament price has occurred. An economist will often obtain from these models a "price band," a band for which prices falling within that range remain reflective of fundamental supply and demand. Prices outside the price band are non-fundamental prices. Determining the height of the band depends on what is viewed as a statistically significant deviation, by definition. But determining what is a statistically significant deviation requires the economist to make an assumption that can be quite consequential. The economist must set a level of price changes that his or her model will ignore as attributable merely to chance. Nothing in underlying statistics of the price data will provide the economist with this level. If the level is fixed so that the price band is relatively tall, less prices are likely to be labelled statistically significant deviation by the test.

4. Analysis of Specific Papers Using Fundamental Models

Crude Oil Models

Even before 2007, there were suspicions about prices in the crude oil market. The Governor of the Federal Reserve Board said in 2004: "The sharp increases and extreme volatility of oil prices have led observers to suggest that some part of the rise in prices reflects a speculative component arising from the activities of traders in the oil markets."[91] Then the price of crude oil doubled from June 2007 to June 2008, and then rapidly declined in the second-half of 2008. Many economists thereafter published papers saying that the increase in demand up to June 2008 and/or the decrease in demand for September 2008 crude oil could not be explained by market fundamentals (in their model). Many attempted to infer from this fact that speculative trading was causing changes in crude oil prices or price volatility.

To understand these papers' strengths and weaknesses, it is important to appreciate a critical factor about crude oil market economics: storage.[92] Data on storage is often used to study crude oil prices for speculative price influences.

Crude oil is storable, and so, its price reflects, in particular, the demand for crude oil inventory. Speculators influence the spot price of crude oil by placing physical crude oil into storage when future prices are anticipated to be higher and out of storage when future prices are anticipated to be lower. Given this, some economists have studied crude oil storage to determine whether crude oil inventories could be part of the cause of the boom and bust in crude oil prices during the 2007-2008 time period. Specifically, using models of fundamental supply and

[91] Ben S. Bernake, *Oil and the Economy*, Remarks by then Governor Bernake at the Distinguished Lecture Series, Darton College, Albary, Georgia (2004).

[92] Brennan and Schwartz 1990

demand, they study the elasticity of crude oil prices to determine whether the effect of speculators' trading on crude oil inventories could affect crude oil prices.

Several economists have examined above-ground oil inventories in the United States during this 2007-2008 timeframe and examined the interplay of crude oil inventories and prices. They concluded that the short-term elasticity of crude oil demand would have had to have been unusually low – quite inelastic – for inventory demand to fully explain the unusual crude oil prices in 2007-2008. (Price inelasticity of demand means that the price of crude oil is the sensitivity to changes in quantity demand: a small decrease in demand is likely to cause a large drop price, for example, when the short-term elasticity of demand is inelastic, all else being equal.) From this, they conclude that speculative traders' effect on inventory demand was unlikely to be at least a complete explanation for the 2007-2008 crude oil price swings. That is, it would be unlikely for speculators to be able to (at least easily) cause substantial movements in crude oil prices by speculators' influence on the amount of crude oil stored in above-ground crude oil inventories. Byun, *Speculation in Commodity Futures Market, Inventories and the Price of Crude Oil* (working paper 2013); Hamilton, *Causes and Consequences of the Oil Shock of 2007-2008*, Brookings Paper on Economic Activity (2009); Kilian and Lee, *Quantifying the Speculative Component in the Real Price of Oil: The Role of Global Oil Inventories* (working paper 2013); Kilian and Murphy, *The Role of Inventories and Speculative Trading in the Global Market for Crude Oil*, Journal of Applied Econometrics (2010); Knittel and Pindyck, *The Simple Economics of Commodity Price Speculation* (working paper 2013).

Nonetheless, inventories may still explain part of the unusual price behavior of crude oil in 2007-2008. Even if the short-term elasticity of demand would have to have been very small in absolute value, speculation may have also affected below-ground inventories. Hamilton, *Causes*

and Consequences of the Oil Shock of 2007-2008, Brookings Paper on Economic Activity (2009) (below-ground inventories should also be considered and are not included in the data) (concluding that speculative trading did affect both the speed and magnitude of the price decline in 2008).

Many economists conclude that there was a substantial demand shock to crude oil during this time period, a demand arising from the onset of a global recession. As the deep recession of 2008 and 2009 began to set in, there was a decrease in demand for September 2008 crude oil in the crude oil futures market. It is unlikely that a demand shock associated with recession was anticipated by the marketplace, including speculators, given the notorious difficulty of predicting recessions. Kilian and Murphy, *The Role of Inventories and Speculative Trading in the Global Market for Crude Oil*, Journal of Applied Econometrics (2010), assert, if a global recession causes the demand shock, the economics of the crude oil market suggests that there is little policymakers can do to prevent this kind of price bubble from appearing in the crude oil market at the outset of the recession. *See id.* at p.6 & n.8 (economic theory suggests a link between cyclical fluctuations in global real activity and the real price of oil).

Several economists wrote papers suggesting that their results indicated that crude oil price changes during this time period reflected uneconomic or "bubble-like" behavior. Generally, these authors find that their models of supply and demand could not track well the run up in crude oil prices to around $145 in mid-2008 or the bust to close to $30 a barrel just a few weeks later, and they concluded that activity by speculators in these markets was or might be affecting the rapid crude oil price changes. *E.g.*, Cifarelli and Paladino, *Oil Price Dynamics and Speculation: a Multivariate Financial Approach*, at p.1, Energy Economics (2010) ("Despite the difficulties, we identify a significant role played by speculation in the oil market, which is

consistent with the observed large daily upward and downward shifts in prices — a clear evidence that it is not a fundamental-driven market"); Einloth, *Speculation and Recent Volatility in the Price of Oil* (working paper 2009) (using convenience yields to conclude that speculation did not play a major role in rise of crude oil to $100 a barrel in March of 2008, did play a role in its subsequent rise to $140 a barrel, and did not play a role in subsequent decline); Hamilton, *Causes and Consequences of the Oil Shock of 2007-2008*, Brookings Paper on Economic Activity (2009) (speculative trading increased the speed and magnitude of mid-2008 price collapse).[93]

These studies do not, in total, lead to consensus. There are distinctive differences and disagreement in the papers on the existence of excessive speculation in the crude oil market 2007-2009. Even within the Federal Reserve system, there is disagreement, for instances, Plante and Yücel, *Did Speculation Drive Oil Prices? Futures Market Points to Fundamentals* (working paper Federal Reserve of Dallas 2011) (crude oil data for the 2007-2009 time period "are

[93] Papers using this methodology reach a broad range of conclusions. *See also* Eckaus, *The Oil Price Really is a Speculative Bubble* (working paper 2008) (reject the hedging pressure hypothesis that inventory positions are an important determinant of risk premiums, and concludes that oil prices are speculative because he cannot perceive a reason for the prices based on supply and demand); Morana, *Oil Price Dynamics, Macro-finance Interactions and the Role of Financial Speculation*, pp. 206-226, Journal of Banking & Finance, Vol. 37, Issue 1 (Jan. 2013) (concluding that there is excessive speculation in the crude oil market that did lead to a substantial price impact in 2007-2008); Sornette, Woodard and Zhou, *The 2006-2008 Oil Bubble and Beyond: Evidence of Speculation, and Prediction*, Physica A. (2009) (find evidence of a bubble, but only based upon an undocumented model largely presented by graphs); Stevans and Sessions, *Speculation, Futures Prices, and the U.S. Real Price of Crude Oil*, American Journal of Social and Management Science (2010) (contending that there is "hoarding" in the crude oil market and that elimination of the longer-term futures contracts would curb excessive speculation); Weiner, *Speculation in International Crises: Report from the Gulf*, Journal of Int'l Business Studies (2005) (a combination of political and market events, not speculation, was behind the price volatility in 1990-1991); Breitenfellner, Crespo, and Keppel, *Determinants of Crude Oil Prices: Supply, Demand, Cartel, or Speculation?*, at p. 134, Monetary Policy and the Economy (2009) (concluding "it is conceivable" that interaction between crude oil production and financial markets exacerbated pressure on crude oil prices, but finding no proof of this).

consistent with how a well-functioning futures market would behave," and if speculation had been to blame, there would have been "very large positive spreads … followed by significant increases in inventory"),and Juvenal and Petrella, *Speculation in the Oil Market* (working paper of Federal Reserve Bank of St. Louis 2012) (concluding that speculation played a "significant role" in both the price increases in 2008 and the subsequent collapse, but they did not carefully model "excess speculation." Instead, they interpreted the second principle component as being "excess speculation" even though the second component may be assigned many other interpretations or even be deemed uninterpretable.).

The methodology of fundamentals of supply and demand does not zero in on causation and leaves room for interpretation of why a price does not follow modelled supply and demand behavior. Labelling prices "bubbles" or caused by speculation simply because one does not understand or cannot otherwise account for price movements is problematic. One explanation for the failure of these models to track such fast-moving prices that is speculative activity is at work. But there are other explanations. On some level, there is a tautological error in labelling price changes as "bubble-like" simply because economists could not, as of a certain time and with certain model, otherwise explain or predict price movements. These models are trying to explain very complex phenomena and make difficult choices on how to use imperfect data.

Some models performed better at modelling the real-world crude oil prices, using models of fundamental supply and demand, by selecting one of the stronger proxies for crude oil, such as the Dry Baltic Index or macroeconomic variables such as global gross domestic product as explanatory variables. *E.g.*, Kilian and Murphy, *The Role of Inventories and Speculative*

Trading in the Global Market for Crude Oil, Journal of Applied Econometrics (2010);[94] Morana, *Oil Price Dynamics, Macro-finance Interactions and the Role of Financial Speculation*, pp. 206-226, Journal of Banking & Finance, Vol. 37, Issue 1 (Jan. 2013) (careful, large-scale modeling of the oil market macro-finance interface, finding the existence of "excess speculation" in these markets using Workings T and other tests, and concluding that financial factors may have up to a 30 percent contribution to oil price fluctuations).[95]

One of the strongest studies in this area is Hamilton, *Causes and Consequences of the Oil Shock of 2007-2008*, Brookings Paper on Economic Activity (2009). He concludes that fundamentals of supply and demand are responsible for most of the run-up in prices, while speculative trading may have increased both the speed and absolute magnitude of the mid-2008 decline in prices. As to the first point, he concludes that while oil prices may have been "too high" in July 2008, "low price elasticity of demand, and the failure of physical production to increase" are more likely the predominant causes than "speculation per se." *See id.* at pp. 17-23. He acknowledges, however, that the speed and magnitude of the price decline in mid-2008 may have been induced, in part, by speculative trading.

Given this mixed result, both proponents and opponents of position limits cite various aspects of this Hamilton. Hamilton's work is even-handed. His study follows the data closely;

---

[94] In the construction of his study, Kilian used a shipping index, the Dry Baltic Index. In shipping, a predominant factor in the cost of shipping is the cost of crude oil. By using the Dry Baltic Index to attempt to compose a model to explain crude oil prices, the economist chose a variable which would naturally be highly correlated to crude oil prices. However, by using a proxy, the effectiveness of the model is lessened. It is unclear whether the results are attributable to fundamentals driving crude oil prices or crude oil prices driving the Dry Baltic Index.

[95] *Id.* at p.220 (using Working's T and model to conclude that there is a significant liquidity effect associated with non-fundamental financial shocks in the oil market, leading to a higher real oil price without affecting inventories); id. at p.223-224 (macro-finance factors played a larger role than "financial factors" in the 2007-2009 crude oil "price shock," but "excessive speculation" did have a price impact).

his model discusses key issues such as inventory. He does not leap to strained interpretations based on theoretical model assumptions. Hamilton chooses his words carefully. When his model does not provide a full explanation for price behavior based on supply and demand, he does not simply jump to the conclusion that speculation is at work. Instead, he offers measured judgments on the possibility that speculation may have affected the precipitous mid-2008 crude oil price decline and presents statistical evidence that this *may have* occurred.

Other Studies Based on Supply and Demand Models

A discussion of crude oil prices during the 2007-2008 timeframe is illustrative of other commodities during this time period. For example, there is considerable comovement between the real price of crude oil and the real price of other industrial commodities during times of major fluctuation in global real activity (such as global recessions). Kilian and Murphy, *The Role of Inventories and Speculative Trading in the Global Market for Crude Oil*, at p.7 n.9, Journal of Applied Econometrics (2010). All commodities during this time period were buffeted by macroeconomic factors, including a global recession, and a deep one at that during 2008 and 2009.

Outside of the crude oil context, there are some noteworthy studies of fundamental supply and demand that bear on the position limits rulemaking.

Allen, Litov, and Mei, *Large Investors, Price Manipulation, and Limits to Arbitrage: An Anatomy of Market Corners*, Review of Finance (2006) examine historical corners and squeezes in security and commodity markets and conclude that a corner or squeeze may induce arbitragers to exit the market, since arbitragers will only take short positions when the prospect of profits is high enough. Two papers, Gorton, Hayashi, Rouwenhorst, *The Fundamentals of Commodity Futures Returns*, Review of Finance (2013), and Ederington, Dewally, and Fernando,

Determinants of Trader Profits in Futures Markets (working paper 2013), offer empirical support for the hedging pressure hypothesis: that the returns on long futures positions vary inversely with inventory and price volatility.[96] Haigh, Hranaiova, and Overdahl, *Hedge Funds, Volatility, and Liquidity Provisions in the Energy Futures Markets*, Journal of Alternative Investments (2007), suggest that hedge funds supply liquidity and that there is little linkage between price volatility and hedge fund position change. They claim that hedge fund participation in futures markets, at least as of 2007, was not inducing unwarranted volatility into futures prices. *See also* Harrison and Kreps, *Speculative Investor Behavior in a Stock Market With Heterogeneous Expectations*, Quarterly Journal of Economics (1978) (differences in subjective beliefs induce trading and speculation); Manera, Nicolini and Vignati, *Futures Price Volatility in Commodities Markets: The Role of Short-Term vs Long-Term Speculation* (working paper 2013) (short-term speculation, as estimated by daily volume divided by open interest, increases volatility while long term speculation, using a Working's T analysis, decreases it); Trostle, *Global Agricultural Supply and Demand: Factors Contributing to the Recent Increase in Food Commodity Prices*, USDA Economic Research Service (2008) (surveying supply and demand fundamentals explain a lot of the futures prices and price volatility: slow growth in production relative to demand for biofuels, declining US dollar, rising oil prices, bad weather 2006 to 2007, growing holdings by foreign countries, and increased cost of production for agriculture in general).

Other papers on fundamental of supply and demand, although interesting in their own right, do not bear directly on position limits. Some discuss matters far afield from the impact of

[96] All else being equal, the more inventory available for delivery the less costly it is for shorts to hedge their exposure. Similarly, the more volatile the commodity prices are, the more price risk is being accepted by the longs (all else being equal). This means that in volatile markets hedgers that are short will pay higher risk premia to hedge.

positions on price or other matters bearing on position limits.[97] Others rest on unreliable model assumptions.[98]

---

[97] Chan, *Trade Size, Order Imbalance, and Volatility-Volume Relation*, Journal of Financial Economics (2000) (studying the equity market to determine the role that trade size has on volatility for equities); Chordia, Subrahmanyam and Roll, *Order imbalance, Liquidity, and Market Returns*, Journal of Financial Economics (2002) (show that order imbalances in either direction for equity markets affect daily returns after controlling for aggregate volume and liquidity); Doroudian and Vercammen, *First and Second Order Impacts of Speculation and Commodity Price Volatility* (working paper 2012) (claiming a "second order" price distortion caused by institutional investors); Frankel and Rose, *Determinants of Agricultural and Mineral Commodity Prices* (working paper 2010) (two macroeconomic fundamentals – global output and inflation – have positive effects on real commodities, but microeconomic variables have greatest overall effects, including volatility, inventories, and spot-forward spread); Girardi, *Do Financial Investors Affect Commodity Prices?* (working paper 2011) (during the late 2000s there was a positive, statistically significant and substantial correlation between hard red winter wheat price and the U.S. equity market, as well as a substantial correlation between hard red winter wheat prices and crude oil prices); Hong and Yogo, *Digging into Commodities* (working paper 2009) (investors use commodities to hedge market fluctuations, as evidenced by yield spread analysis); Kyle and Wang, *Speculation Duopoly with Agreement to Disagree: Can Overconfidence Survive the Market Test?*, Journal of Finance (1997) (theoretical model explaining how overconfidence by fund managers can lead to a persistence in market prices); Plato and Hoffman, *Measuring the Influence of Commodity Fund Trading on Soybean Price Discovery* (working paper 2007) (finding that the price discovery performance of the soybean futures market has improved along with the increased commodity fund trading"); Westcott and Hoffman, *Price Determination for Corn and Wheat: The Role of Market Factors and Government Programs* (working paper 1999) (analysis of supply and demand fundamentals for wheat and corn that does not include position data); and Wright, *International Grain Reserves and Other Instruments to Address Volatility in Grain Markets*, World Bank Research Observer (2012) (about price limits, not position limits).

[98] Bos and van der Molen, *A Bitter Brew? How Index Fund Speculation Can Drive Up Commodity Prices*, Journal of Agricultural and Applied Economics (2010) (most of the changes in spot prices can be attributed to shifts in demand and supply, and failure to account properly for these inputs in the coffee price generation process may lead to serious overestimation of the effects of speculation; nevertheless, asserting without detailed analysis that speculation is an important part of the coffee price generation process), Gupta and Kamzemi, *Factor Exposures and Hedge Fund Operational Risk: The Case of Amaranth* (working paper 2009) (trying to explain the behavior of Amaranth on the mistaken notion that a hedge fund should be diversified); Henderson, Pearson and Wang, *New Evidence on the Financialization of Commodity Markets* (working paper 2012) (analysis founded on questionable assumption that commodity link note investors are uninformed investors); Van der Molen, *Speculators Invading the Commodity Markets* (working paper 2009) (data handling problems: dataset which covers twenty years, while the variable index speculators is only available for two to three years, and assumes that net position is in indication of index speculators).

D. Switching Regressions

1. Switching Regression Analysis Described

In a switching regression analysis, an economist poses the existence of a model with more than one state. In the particular context of position limits, there are typically two states: (1) a normal state –where prices are view as what they theoretically should be, following market fundamentals and (2) a second state – often described as a "bubble" state in these papers. Using price data, authors of these studies calculate the probability of a transition between these two states. The point of transition between the two states under this methodology is called a structural "breakpoint." The breakpoint is the point of transition between the two states. Examination of these breakpoints permits the researcher to date and time the existence of a second state, such as a bubble state.

These authors sometimes find empirical support in the data for the existence of a second state by calculating the probability of breakpoints. When the probability is high enough, the research will say that there is evidence for a second state.

2. Advantages

A variant of this method was first published in 1973. It is fairly well-credentialed within academia. If there are two states of the world, it makes sense that distinct states would have different economic models. Because switching regressions uses at least a two-state regression, this method satisfies the economist's intuition that different states would be better described using different models. A one-size-fits-all model, applied to varying economic states, could potentially be compromised in design to accommodate disparate states.

This model is flexible, allowing for many different specifications (of model design) posed by researchers. This can include specifications, as explanatory variables, of speculative positions and futures prices.

When using this method, the economic researcher permits the data itself to choose the structural breakpoints. This differs from some other statistical methods, where the economic researcher may choose exogenously, based on interpretation of the data or historical knowledge, where and when a transition to a supposed bubble state occurs. The model's selection of the breakpoint permits data to be tested against known historical events and thus lend a measure of credence to the model's choices for structural breaks.

The model permits close study of particular time periods. An economist may well be aware of historical events that were market-transition events such as "bubbles," and this method permits the economist to zero-in on that time period and to investigate potential causes and/or confounding events associated with a suspected market transition.[99]

3. Disadvantages

This method has a significant disadvantage that is highlighted in the position limit context. This statistical technique tests for a second state. There could, however, be reasons for a non-normal state other than a "bubble" state. This method leaves quite a bit to economic

[99] This method is particularly good at "accommodating" abrupt shifts in market data. This type of accommodation refers to economic models that track well abrupt changes in the underlying data. Some statistic methods, such as those based on linear regression, may have difficulty with volatile data or data discontinuity.

This technique is particularly well-suited for studying policy changes. For example, if the Federal Reserve makes a policy change that is expected to have a long-term, but not necessarily an immediate, impact, this method will permit an economist to infer, based on the model, the duration of the lag before the policy change begins to affect the markets.

interpretation of the model, not raw data analysis, to reach their inference that the second state is a "bubble" state.

While the existence of a second state may indicate a "bubble" state and may indicate a problem with excessive speculation, this statistical method cannot definitively prove these inferences, even if position data were used in the analysis. The probability of the existence of second state in these studies in only circumstantial evidence of (1) a "bubble" state and (2) a "bubble" state cause by excessive speculation.

Consider an example of why data alone cannot explain why a deviation from a normal market state is a bubble state: the case of feeder cattle. If there is a drought and feed becomes scare and expensive, the cattlemen may sell off part of their herd. Prices of feeder cattle may then drop in the short term as well, because cattleman may sell young calves, too. But subsequently, because so many cattle have been slaughtered, there is a shortage of feeder cattle the next season and the prices of feeder cattle rise. So in this case, there is theoretical and empirical support for two states, but they correspond to non-drought and drought states and not normal and "bubble" state. Switching regression analysis, if applied to feeder cattle prices during a time period encompassing both drought and non-drought state would not establish the existence of what we could typically view as a "bubble" in the post- drought price rise.[100] In any event, none of this price phenomenon can be viewed as a problem of "excessive speculation." One could still use the ill-defined word "bubble" to describe the second state, but it would be a dearth of rainfall, not excessive speculation, which created this second state.

[100] This is example is taken from an academic paper not within the administrative record that found non-fundamental (or "bubble") prices in crude oil and feeder cattle markets. Brooks *et al*, *Boom and Busts in Commodity Markets: Bubbles or Fundamentals?* (working paper 2014).

Even when a switching regression result might indicate the existence of a "bubble," based on persuasive economic interpretation and model designs, these studies do not tell the reader whether the price "bubble" was caused by "excessive speculation." The theoretical level of the analysis, and in particular the lack of firm empirical data linking non-normal states to speculative "bubble" markets, are weaknesses of this statistical method. The studies following this method do not provide categorical proof of the existence of speculative "bubble" markets and they do not provide statistical evidence that positions limits would be effective in ameliorating "bubble" markets.[101]

4. Analysis of Studies Reviewed that Used Switching Regression

Five studies used a standard form of switching regressions analysis.[102] Three studies used a related methodologies, multi-state regressions or conditional correlations.[103]

---

[101] These models are difficult to design well in this context for several other reasons. The economist is making an informed, probabilistic inference that a transition has occurred. This inference is more than a seat-of-the-pants intuition, but it is less than a mathematical certainty. The result of this statistical method is also highly dependent upon what set of data the econometrician selects for analysis. An economic model founded on this method should be given more credence when it is applied to more than one dataset and the results are replicated with different data. Selection of controlling variables that would account for position data is a difficult task with this statistical model. The data-driven nature of model does not help in selection of proper controlling and explanatory variables. Ingenuity (or luck) is required to design explanatory variables that would account well for position data.

[102] These are: Cifarelli and Paladino, *Commodity Futures Returns: A non-linear Markov Regime Switching Model of Hedging and Speculative Pressures* (working paper 2010) (concluding that speculation, not supply and demand factors, drive some daily price swings in certain energy futures); Chevallier, *Price Relationships in Crude oil Futures: New Evidence from CFTC Disaggregated Data*, Environmental Economics and Policy Studies (2012) (the influence of financial investors through the S&P GSCI Energy Spot may have contributed to price changes in the crude oil market) (discussed in ensuing text); Hache and Lantz, *Speculative Trading & Oil Price Dynamic: A Study of the WTI Market*, Energy Economics ,Vol. 36, p.340 (March 2013) (cannot reject hypothesis that variations in the positions of non-commercial players may have played a "destabilising role in petroleum markets" and "speculative trading can be considered an important factor during market instability and 'oil bubbling' process"); Lammerding, Stephan, Trede, and Wifling, *Speculative Bubbles in Recent Oil Price Dynamics: Evidence from a Bayesian Markov Switching State-Space Approach*, Energy Economics Vol. 36 (2013) (claims to

Most of these studies are not helpful because they do not use position data or have technical issues.[104] It is difficult to perform these types of studies well. A study finding the existence of transitions between states can be unconvincing if it does not have solid theoretical and economic justifications for the data selected and the model's design. Many of the disadvantages of this methodology, discussed above, find expression in these papers.

However, there is one switching regression study worthy of further discussion in our view. It is well-executed and employs position data: Chevallier, *Price Relationships in Crude oil Futures: New Evidence from CFTC Disaggregated Data*, Environmental Economics and Policy Studies (2012). Of course, it inherits all the difficulties of speculative position data, such as the difficulty separating hedgers from speculators. Yet Chevalier's effort does persuasively suggest the existence of two states in price structure during 2008 crude oil market price swings. His paper suggests that with highly inelastic supply and demand, the influence of financial investors

---

find robust evidence of "bubbles" in oil prices associated with speculation); and Sigl-Grüb and Schiereck, *Speculation and Nonlinear Price Dynamics in Commodity Futures Markets*, Investment Management and Financial Innovations, Vol. 77, pp. 59-73 (2010) ("short-run autoregressive behavior" of commodity markets is driven not only by fundamentals but also by trading of speculators).

[103] These are: Fan and Xu, What Has Driven Oil Prices Since 2000? A Structural Change Perspective, Energy Economics (2011) (multi-state); Baldi and Peri, Price Discovery in Agricultural Commodities: the Shifting Relationship Between Spot and Futures Prices (working paper 2011) (multi-state); Silvernnoinen and Thorp, *Financialization, Crisis and Commodity Correlation Dynamics*, Journal of Int'l Financial Markets, Institutions, and Money (2013) (conditional correlations). All three of these papers are of mixed methodology, applying switching regression analysis to relationships between prices that are viewed by the papers' authors as cointegrated.

[104] For example, the study by Sigl-Grüb and Schiereck employs a smooth transition (as opposed to an abrupt change) between states. Unfortunately, the study's model does not have a high goodness-of-fit values (all adjusted-R^2 are below 0.05 and most are below 0.01), nor fundamental economic explanatory variables (only lagged prices and speculative positions in the transition component between states). These are shortcomings. In particular, the latter omission may overstate the importance of speculative positions.

through the S&P GSCI Energy Spot may have contributed to price changes in the crude oil market.

Using switching regressions, Chevallier attempts to reconcile two strands of economic literature: papers that posit the predominance of supply and demand fundamentals and other papers that investigate speculative trading. Chevallier employs macroeconomic variables, proxies for supply and demand fundamentals, and speculative positions (net open position of speculators) in his model specifications. Using switching regression analysis, he concludes that one cannot eliminate the possibility of speculation (a reason why the physical commodity may move into and out of storage) as one of the main reasons behind the 2008 oil price swings.

This is an important result. Other economic studies using models of supply and demand purport to explain the 2008 price swings in crude oil without speculation being incorporated into demand. Chevallier's paper suggests that speculation cannot be ruled out as a cause. Specifically, using net speculative positions as one of his variables in his test, he found that this variable, positions, was statistically significant on crude oil futures natural logarithm of price returns during the 2008 time period.[105]

This result conjectures that speculation may have played some role during the 2008 crude oil futures price swings. This result suggests that studies that look only to supply and demand without incorporating speculative demand to explain the crude oil market in 2008 may be overlooking an important factor. The switching regression methodology in this context functions as a cross-check to determine whether models of fundamental supply and demand can, in fact,

[105] Specifically, Chevallier found that in the first state, the coefficient of the logarithmic returns of net speculative positions is positive and significant (1 percent level). In the second state, this coefficient is negative and mildly significant (10 percent level). Chevallier's results show statistically significant relationships between the volume of speculative positions in particular and logarithmic prices returns.

account for all the price swings in crude oil during this time. In at least this particular commodity market and timeframe, Chevallier's finding of net speculative positions are correlated with crude oil future prices suggests a price effect from net speculative positions.

E. Eigenvalue Stability

1. Description

Some economists have run regressions on price and time-lagged values of price. They estimate the time-lagged regression over short time internals. They do this to detect, through examination of at specific terms in their lagged price model, specific, unusual price changes. In technical terms, they use a difference equation for lagged price with different estimated values (*i.e.*, coefficients) for different time-lagged price variables. They then solve for the roots of that characteristic equation and look for the eigenvalues (latent values) with absolute value greater than one. They conclude that eigenvalue indicates that the price of the commodity is in an "exploding" state or a "bubble."[106]

2. Advantages and Disadvantages

This method can be applied after-the-fact to historical data to try to ascertain whether past price changes constituted a "bubble." Or it can be applied to real-time data to predict whether a current state of affairs is a "bubble." For these reasons, some economists perceive, as an advantage of this method, the ability through statistical means to date and time "bubbles" in prices.

On the other hand, this method is based on a model and the results of any analysis are only as strong as the model. The model is limited to price data and a constant. Models using this technique do not permit the study authors to include other explanatory variables. This is a

[106] *See, e,g,* Goyal and Tripathi, *Regulation and Price Discovery: Oil Spot and Futures Markets* at pp.15-16 (working paper 2012) (describing methodology in more detail).

disadvantage because it is likely that there are variables of interest other than lagged prices when considering whether price instability exists. For example, someone interested in position limits would want to include an explanatory variable such as speculative position in the regressions, but this technique does not permit this.

Furthermore, the model allows for a wide discretion in the number of lagged prices used. The studies' authors often look at "goodness of fit" results to determine how many lags to select, seeking to set the model based upon the data. This step may make the model uniquely tailored to a particular dataset but not easily applicable to another. Put another way, selecting an important model feature based on testing of the data runs the risk of a selection that is not based on any theoretical or economic fact, but instead ad hoc assumptions made by the modelers and idiosyncrasies of the dataset.[107]

3. Analysis

Economists using this methodology attempt to find the existence of price "bubbles" using eigenvalue stability methods. Three such papers were submitted.[108] All the authors find "evidence" of various "bubbles." However, in none of these studies is there reasonable empirical evidence to support the inferential leap between instability, "bubbles," and excess speculation. In particular, for all of these studies, there is no link made in the data between price instability and positions. These studies do not use position data. The problem inheres in the method,

[107] Even if there were not such problems, the methodology has an insurmountable theoretical difficulty. The use of the "unit root" test, as a part of this eigenvalue methodology, is an inherently suspect way of identifying explosive price behavior. That is because the unit root tests rely upon a small a set of observations to approximate long-term price behavior.

[108] These are: Phillips and Yu, *Dating the Timeline of Financial Bubbles During the Subprime Crisis*, Quantitative Economics (2011); Czudaj and Beckman, *Spot and Futures Commodity Markets and the Unbiasedness Hypothesis - Evidence from a Novel Panel Unit Root Test*, Economic Bulletin (2013); Gutierrez, *Speculative Bubbles in Agricultural Commodity Markets*, European Review of Agricultural Economics (2012) (Monte Carlo variant of eigenvalue stability approach).

which, while purporting to detect the existence of "bubbles," does not permit the research to link supposed bubble to speculative positions.

In modern markets, prices can change rapidly for many reasons. The "explosion" of a price over a short time internal does not necessarily reflect uneconomic behavior or a price "bubble." It could simply represent a shock. That shock need not come from speculative activity. The price path may not be smooth. For this reason, these models are conceptually flawed when applied to commodity prices and commodity futures prices.

For example, in Gilbert, *Speculative Influences on Commodity Futures Prices, 2006-2008*, UN Conference on Trade and Development (2010), Gilbert uses a variant of this methodology in an early section of his paper to find "clear evidence" of "bubble periods" for copper and soybeans lasting days and weeks. *Id.* at 9 at ¶ iii. He finds unexplained price increases in crude oil for periods of time that are "insufficient to qualify as bubbles." *Id.* at ¶ ii. Using just price data, and not positions, Gilbert's attribution of lingering price spikes cannot be attributed to speculative positions.[109]

There is a subtler disadvantage which inheres in the inference between the identification of price growth without bound and the existence of a bubble. To examine intervals where a price series is appearing to grow without bound and to infer that that implies a bubble is problematic. A time series for price of an asset is unlikely to tend to infinity because, eventually, this would likely lead to infeasible prices (generally, in the absence of hyperinflation). We do not expect the real price of an asset, which is the price is adjusted for inflation, to grow without bound.

[109] This is perhaps why he proceeds to a Granger-based analysis using position data in the second half of his paper.

II. Theoretical Models

Some economic papers presented or cited in the course of this rulemaking perform little or no empirical analysis and instead, present a general theoretical model that may bear, directly or indirectly, on the effect of excessive in the commodity marketplace. Within the 25 theoretical model papers in the administrative paper, there is a subset of papers which may be viewed as generally supportive or disapproving of position limits. Because these papers do not include empirical analysis, they contain many untested assumptions and conclusory statements. In the specific context of position limits, as in many areas of academic debate, theoretical models need to be tested empirically.

Theoretical papers directly or indirectly support position limits

Two studies presented theoretical model establishes the risk of price manipulation in the derivatives markets, including cash-settled contracts, suggesting that position limits might be particularly helpful in cash-settled contracts.[110] A few studies presented theoretical reasons why

[110] Kumar and Seppi, *Futures Manipulation with "Cash Settlement"*, Journal of Finance (1992) (while, without physical delivery, corners and squeezes are infeasible, cash-settled contracts are still susceptible to cash-to-futures price manipulation, and this price manipulation transfers liquidity from futures to cash markets) ; Dutt and Harris, *Position Limits for Cash-Settled Derivative Contracts*, Journal of Futures Markets (2005) (while arguing that cash settled contracts appear to be particularly susceptible to manipulation, appears in analysis to be conflating SEC options with CFTC-regulated commodity contracts).

financial investors might increase or "destabilize" commodity futures prices[111] or the spot price.[112]

Theoretical studies indirectly criticizing at least some position limits

On the other hand, there were theoretical papers that reached conclusions which could be helpful to position limit opponents, such as the power of the marketplace to "self-discipline" would-be excessive speculators.[113] Some papers offering theoretical grounds for the concern that more restrictive or "extreme" position limits might increase price volatility.[114]

Even these indirectly oppositional papers are not firm in their opposition. In fact, *The Self-Regulation of Commodity Exchanges: The Case of Market Manipulation*, Journal of Law and Economics (1995), Craig Pirrong (an economic expert for ISDA/SIFMA in the position limits rulemaking) argues that there "is no strong theoretical or empirical reason to believe that

---

[111] Lombardi and van Robays, *Do Financial Investors Destabilize the Oil Price?* (working paper, European Central Bank, 2011) (giving theoretical grounds for the ability of financial investors in futures to destabilize oil prices, but only in the short run); Vansteenkiste, *What is Driving Oil Price Futures? Fundamentals Versus Speculation* (working paper, European Central Bank, 2011); Liu, *Financial-Demand Based Commodity Pricing: A Theoretical Model for Financialization of Commodities* (working paper 2011).

[112] Schulmeister, Torero, and von Braun, *Trading Practices and Price Dynamics in Commodity Markets* (working paper 2009) (finding that price movements in crude oil and wheat are lengthened and strengthened by "speculation" in respective futures prices).

[113] Pirrong, *Manipulation of the Commodity Futures Market Delivery Process*, Journal of Business (1993); Pirrong, *The Self-Regulation of Commodity Exchanges: The Case of Market Manipulation*, Journal of Law and Economics (1995); Ebrahim and ap Gwilym, *Can Position Limits Restrain Rogue Traders?*, at p.832 Journal of Banking & Finance (2013) ("Our results illustrate that excess speculation, with or without the intent to manipulate the futures markets, is not worthwhile for the speculator") (concluding that position limits are "counterproductive" because excessive speculation enriches other market players at the expense of the speculator).

[114] Pliska and Shalen, *The Effects of Regulation on Trading Activity and Return Volatility in Futures Markets*, at p. 148, Journal of Futures Markets (2006) ("[W]ell-meaning regulatory policies can be counterproductive by reducing the liquidity which is characteristic of futures markets," including policies such as "extreme margins and position limits"); Lee, Cheng and Koh, *An Analysis of Extreme Price Shocks and Illiquidity Among Systematic Trend Followers* (working paper 2010) (using an agent-based model and assuming trend-followers in the market, no reason to believe position limits will help as opposed to leading to erratic price behavior).

self-regulating exchanges effectively deter corners." *Id.* at 143. He simply disagrees that other forms of regulation such as position limits "could do better." *Id.* (asserting that position limits are "excessively costly" and concluding that self-regulation, along with after-the-fact civil and criminal penalties for manipulation, may be more efficient, but this assertion is unaccompanied by quantitative analysis or a detailed qualitative cost-benefit analysis). Pirrong does not discount the harm of price manipulation. Pirrong's *Manipulation of the Commodity Futures Market Delivery Process*, Journal of Business (1993), documents these harms. *Id.* at 363 (futures market manipulations "distorts prices and creates deadweight losses;" "causes shorts to utilize real resources to make excessive deliveries;" "distorts consumption").

Other theoretical papers

A set of papers suggest that there can be excessive speculation in oil without a significant increase in crude oil inventories.[115] The remaining theoretical papers in the administrative record focus on useful economic background on price manipulation;[116] comovement effects in

[115] Avriel and Reisman, *Optimal Option Portfolios in Markets with Position Limits and Margin Requirements*, Journal of Risk (2000) (a theoretical model suggesting that speculation may push crude oil prices above the price level justified by physical-market fundamentals without necessarily resulting in a significant increase in oil inventories); Pierru and Babusiaux, *Speculation without Oil Stockpiling as a Signature: A Dynamic Perspective* (working paper 2010); Parsons, *Black Gold & Fool's Gold: Speculation in the Oil Futures Market* at pp.82, 106-107 (Economia 2009) (if oil prices were driven above the level determined by fundamental factors of supply and demand by forces such as speculation, storage would not necessarily increase; an argument that this would occur "overlooks how paper oil markets have been transformed" and "successful innovations in the financial industry made it possible for paper oil to be a financial asset in a very complete way"). *See* Routledge, Seppi, and Spatt, *Equilibrium Forward Curves for Commodities*, Journal of Finance (2000) (important work on the theory of storage).

[116] Kyle and Viswanathan, *How to Define Illegal Price Manipulation*, American Economic Review (2008); Westerhoff, *Speculative Markets and the Effectiveness of Price Limits*, Journal of Economic Dynamics and Control (2003) (discussing when price limits can be welfare-improving).

the equity or options markets,[117] high-frequency trading,[118] or other matters of marginal relevance.[119]

III. Surveys and Opinions

The remaining 73 papers are survey pieces. Some of these papers provide useful background material.[120] But on the whole, these survey pieces offer opinion unsupported by rigorous empirical analysis. These papers, if they presented statistics at all, presented descriptive statistics. An inherent difficulty with this approach is that the facts that the author presents statistics that support the author's theory. These facts may be incomplete and not fully representative of economic reality.

While these survey pieces may be useful for developing hypotheses, they often exhibit policy bias and are not neutral, reliable bases for policy judgments.[121]

---

[117] Dai, Jin and Liu, *Illiquidity, Position Limits, and Optimal Investment* (working paper 2009); Edirsinghe, Naik, and Uppal, *Optimal Replication of Options with Transaction Costs and Trading Restrictions*, Journal of Financial and Quantitative Analysis (1993); Shleifer and Vishney, *The Limits of Arbitrage*, Journal of Finance (1997).

[118] Schulmeister, *Technical Trading and Commodity Price Fluctuations* (working paper 2012).

[119] Morris, *Speculative Investor Behavior and Learning*, Quarterly Journal of Economics (1996); Kyle and Wang, *Speculation Duopoly with Agreement to Disagree: Can Overconfidence Survive the Market Test?*, Journal of Finance (1997); Leitner, *Inducing Agents to Report Hidden Trades: A Theory of an Intermediary*, Review of Finance (2012); Sockin and Xiong, *Feedback Effects of Commodity Futures Prices* (working paper 2012).

[120] Basu and Gavin, *What Explains the Growth in Commodity Derivatives?*, Federal Reserve Bank of St. Louis (2011), provides an excellent analysis of the factors driving rapidly increase in volume in commodity derivatives trading. *See also* Easterbrook, *Monopoly, Manipulation, and the Regulation of Futures Markets*, Journal of Business (1986); Pirrong, *Squeezes, Corners, and the Anti-Manipulation Provisions of the Commodity Exchange Act*, Regulation (1994).

[121] For example, a CME Group white paper, *Excessive Speculation and Position Limits in Energy Derivatives Markets* (undated), lacks empirical data or other economically valid supporting analysis. It uses confusing terminology. For example, CME quotes on page 5 a *Wall Street Journal* survey of economists, which in turn concludes summarily: "The global surge in food and energy prices is being driven primarily by fundamental market conditions, rather than an investment bubble." *Id.* at p.5. Even economists who find some price impact from outsized speculative positions would not disagree that, in the main, prices remain determined "primarily"

We have reviewed all 73 papers in this category and discuss below only few which add marginal value to the empirical analyses discussed above.

A. Frenk and Turbeville (Better Markets)

Frenk and Turbeville, *Commodity Index Traders and the Boom/Bust Cycle in Commodities Prices* (Better Markets 2011), present a survey of economic literature that incorporates some empirical testing for the price impact of index fund "rolling" of commodity index fund positions. Rolling refers to the time when commodity index funds, such as those tracking a popular commodity index such as the Standard & Poor's Goldman Sachs Commodity Index (GSCI), must roll forward their expiring futures contracts to maintain their (typically long) positions.[122] Frenk and Turbeville argue that the index fund roll "systematically distorts forward commodities futures price curves toward a contango[123] state, which is likely to contribute to speculative 'boom/bust' cycles…." *Id.* at p.2. *See id.* at 4 (focusing on crude oil and wheat price spreads before, during, and after the role from January 1983 to June 2011).

This set of inferences is problematic for several reasons. First, it depends on the current existence of a price impact from rolling. Yet the roll price impact, which was a market phenomenon that may no longer exist. The market now has general knowledge of the influx of commodity index traders and their established rolling behavior. Moreover, many ETFs announce in their prospectus how they will trade, and most large exchange-traded funds now

---

by market fundamentals. And many of these economists finding price impact would not ascribe the result to an "investment bubble."

[122] *See id.* at pp.8-9 for a description of the mechanics of the roll. *See also* Mou, *Limits to Arbitrage and Commodity Index Investment: Front-Running the Goldman Roll* (working paper 2011).

[123] *See id.* at pp.5-6 for a description of contango, an upward-sloping forward price curve for a commodity. Market participants may view contango as evidence that commodity prices will increase in the future.

"sunshine" their rolls: to announce to the market in advance when and how they will roll.[124] These trends have lessened the price impact of the rolls.

Moreover, the Frenk and Turbeville article ascribes the contango state of commodity futures prices to the price impact of roll without empirical analysis to support a causal link. There has historically been an alteration between contango and backwardation in the crude oil commodity market: this phenomenon has been attributed to changes in short-term supply or demand, increased market participation on the long side to earn the risk premium associated with going long, and other reasons, but not the technical aspects of commodity index rolls.[125] Frenk and Turbeville's article is unpersuasive in ascribing large boom/bust cycles in price to waning and temporary price impacts of rolls.

Several other survey papers posit the existence of a speculative bubble in price due to speculation along the lines of the Frenk andTuberville article. But these studies also do not present an empirical analysis to support this conclusion. *E.g.*, Cooper, *Excessive Speculation and Oil Price Shock Recessions: A Case of Wall Street "Déjà vu all over again"*, Consumer Federation of America (2011); Berg, *The Rise of Commodity Speculation: From Villainous to Venerable* (UN FAO 2011); Eckaus, *The Oil Price Really Is a Speculative Bubble*, at p.8, MIT Center for Energy and Env'l Research (2008) ("there is no reason based on current and expected

[124] Otherwise, other market participants may assume that the rolling activity reflects an informed trader reacting to market fundamentals and the roll could well impair the price discovery function of the commodities market. *See* Urbanchuk, *Speculation and the Commodity Markets*, at p. 12 (working paper 2011) ("traders can misinterpret an index inflow as a bullish statement by a trader with superior information"). While not every large institutional trader has to sunshine, those that announce their rolling timing in their prospectus are bound by SEC rules to follow their prospectus procedures.

[125] *See* Parsons, *Black Gold & Fool's Gold: Speculation in the Oil Futures Market*, at pp. 99-101, Economia (2009) (discussing crude oil market economics that explain why crude oil futures prices are sometimes in contango); *id.* at 101 ("Although oil futures fluctuate between backwardation and contango, on average they have been backwarded").

supply and demand that justifies the current price of oil"); Parsons, *Black Gold & Fool's Gold: Speculation in the Oil Futures Market*, Economia (2009) (explaining why, on a theoretical level, the absence of large crude oil inventories does not preclude a crude oil price bubble); Tokic, Rational destabilizing speculation, positive feedback trading, and the oil bubble of 2008, Energy Economics (2011) (survey with theoretical model adjunct).[126]

B. Senate Reports

1. Senate Report on Oil and Gas Prices

The U.S. Senate staff report on oil prices is a survey article, not a separate empirical study. It concludes that increased participation by speculators in the energy commodity futures markets has had an effect on energy prices. *The Role of Market Speculation in Rising Oil and Gas Prices: A Need to Put the Cop Back on the Beat*, Permanent Subcommittee on Investigations of the U.S. Senate Committee on Homeland Security and Governmental Affairs at pp. 19-32 (June 27, 2006) ("Senate Report on oil and gas prices"). Other survey pieces assert market fundamentals fully explain commodity price spikes. *E.g.*, Plante and Yücel, *Did Speculation Drive Oil Prices? Futures Market Points to Fundamentals* (Federal Reserve Bank of Dallas Econ. Ltr. Oct. 2011) (if speculating were the cause of crude oil spokes, it would "leave telltale signs in certain data, such as inventories"). These survey articles do not present fulsome statistical models to support their competing conclusions.

---

[126] *See also* Urbanchuk, *Speculation and the Commodity Markets*, at pp.8-9 (working paper 2011) (observing that the share of corn futures held by commercial traders has fallen from more than 70 percent in January 2005 to about 40 percent in August 2011); *id.* at 12 (arguing that speculators a major factor behind the sharp increase in the level and volatility of corn prices in 2011 because "traders can misinterpret an index inflow as a bullish statement by a trader with superior information"); Inamura, Kimata, *et al.*, *Recent Surge in Global Commodity Prices* (Bank of Japan Review March 2011) (contending that global monetary policies have tended to boost commodity prices).

The Senate report recites fundamental supply and demand factors for increasing energy prices. *The Role of Market Speculation in Rising Oil and Gas Prices: A Need to Put the Cop Back on the Beat* at p.12. But it concludes that these factors "do not tell the whole story." *Id.* at p.13. It asserts that the large purchases of crude oil futures contractors by financial speculators "have, in effect, created an additional demand for oil…." *Id.* The Senate Report on oil and gas prices concedes that the price effect is "difficult to quantify," relying without citation on the estimated price impact of "several analysts." *Id*. at p.14. *See id.* at p.23.

In the general economics of the futures market, demand for futures contracts do not necessarily increase the demand for, or price of, the physical commodity. In the particular context of the crude oil markets, as discussed above, demand for "paper oil" may not directly translate into spot price impact due to storage economics. *See* Parsons, *Black Gold & Fool's Gold: Speculation in the Oil Futures Market*, Economia (2009); n.45, *supra*.[127]

The Senate report cites anecdotal evidence, such as opinions from energy industry participants, that financial speculators have caused the price of oil to rise. Senate Report on oil and gas prices at p.22 (claiming that financial investors have created "runaway demand"), p.24 n.128 (traders assert cross-market arbitrage in energy between futures and over-the-counter markets may be driving speculative pressure). But it concedes that analyses of the effect of speculation on these energy markets have reached divergent conclusions. *Id.* at p.24. It observed that Goldman Sachs issued a report concluding that speculators were impacting crude oil prices, peaking at $7 per barrel in the spring of 2004. *Id.* It also contrasted the opinions of industry traders with a CFTC 2005 staff analysis discounting a speculative price caused by some

[127] *Contra* Senate Report on oil and gas prices at p.13 ("As far as the market is concerned, the demand for a barrel of oil that results from the purchase of a futures contract by a speculator is just as real as the demand for a barrel that results from a purchase of a futures contract by a refiner").

financial speculators. *Id.* at p.26. As the Senate report observes, because its conclusion is hard to quantify, it relies on this anecdotal evidence.

The Senate Report does not analyze how position limits would ameliorate the problem it identifies. While not all the speculators referenced in this 2006 Senate Report on oil and gas prices would be affected by a position limit rule, the Senate Report does list Brian Hunter, then a trader in natural gas for Amaranth Advisors hedge fund, among the top 2005 energy traders. *Id.* at p.30.

2. Senate Report on Wheat

The Senate staff reports concerning wheat[128] surveys economic literature and certain market data, but, like the Senate Report on oil and gas prices, this report does not use statistical or theoretical models to reach an economically rigorous conclusion. The Senate wheat report does include anecdotal evidence: virtually all of the commercial traders interviewed by the Senate staff "identified the large presence of index traders in the Chicago market as a major cause" of a problem with price convergence in wheat in 2008. *Excessive Speculation in the Wheat Market* at pp.11-12. The staff report states that the demand for wheat futures contracts has, itself, increased the price of wheat futures contracts relative to the cash market for wheat:

> These index traders, who buy wheat futures contracts and hold them without regard to the fundamentals of supply and demand in the cash market for wheat, have created a significant additional demand for wheat futures contracts that has as much as doubled the overall demand for wheat futures contracts. Because this significant increase in demand in the futures market is unrelated to any corresponding supply or demand in the cash market, the price of wheat futures contracts has risen relative to the price of wheat in the cash market. The very large number of index traders on the Chicago exchange has, thus, contributed to "unwarranted changes"

[128] *Excessive Speculation in the Wheat Market*, Majority and Minority Staff Report, Permanent Subcommittee on Investigations of the U.S. Senate, Committee on Homeland Security and Governmental Affairs (June 24, 2009).

> in the prices of wheat futures relative to the price of wheat in the cash market. These "unwarranted changes" have, in turn, significantly impaired the ability of farmers and other grain businesses to price crops and manage price risks over time, thus creating an undue burden on interstate commerce. The activities of these index traders constitute the type of excessive speculation that the CFTC should diminish or prevent through the imposition and enforcement of position limits as intended by the Commodity Exchange Act.

Id. at p.12. Observers have noted other reasons to explain this 2008 price divergence. The CME wheat contract was poorly designed to account for the cost of storage, and this was a reason for the price divergence between futures and spot wheat contracts during the 2008 time period. *See* n.53, *supra.* When CME revised its wheat contract, this price divergence dissipated.[129]

However, the more formal statistical studies discussed throughout establish rationales for concern with index traders that are grounded in more solid economic reasoning. There are circumstances when a large volume of financial index investment flows may causes market prices to deviate from fundamental values. *See* Aulerich, Irwin, and Garcia, *Bubbles, Food Prices, and Speculation: Evidence from the CFTC's Daily Large Trader Data Files*, at pp.2-3, NBER Conference on Economics of Food Price Volatility (2012) (summarizing that this could happen when (1) the futures market is insufficiently liquid to absorb large order flow, (2) the index traders are in effect noise traders who make arbitrage risky, or (3) large order flow on the long side of the market is seen erroneously as traders taking bullish positions based on valuable information about market fundamentals). *See id.* at pp.3-4 (observing contrasting findings depending on impact of index trading depending on liquidity of the agricultural commodity market); Singleton, *Investor Flows and the 2008 Boom/Bust in Oil Prices*, at pp. 5-8 (March 23,

[129] The futures wheat contract, at expiration, had a valuable real option to store the wheat at a below-market price. This may have been a primary reason why it was more valuable at expiration than spot wheat.

2011 working paper) (learning about economic fundamentals with heterogeneous information may induce excessive price volatility, drift in commodity prices, and a tendency towards booms and busts); Tang and Xiong, *Index Investment and Financialization of Commodities*, at p.30, Financial Analysts Journal (2012) ("the price of an individual commodity is no longer simply determined by its supply and demand"); *id.* at pp.29-30 ("Instead, prices are also determined by a whole set of financial factors such as the aggregate risk appetite for financial assets"). Alternatively, a classical economist would argue that prices are still determined by supply and demand, but that the aggregate risk appetite for financial assets affects the demand for commodities through a more complicated process than previously envisioned.

3. Senate Report on Natural Gas

A similar analysis applies to the Senate report on natural gas, *Excessive Speculation in the Natural Gas Market*. The report, which focuses at length on Amaranth's natural gas trading, does not include a statistical analysis of empirical data. As the then-minority report concedes, "a number of facts … support the conclusion that Amaranth's trading activity was the primary cause of" natural gas price spikes, "other facts seem to indicate the opposite," pointing to market fundamentals. *Id.* at p.135 (while price of natural gas declined after Amaranth's demise, "this alone does not prove Amaranth's ability to elevate prices above supply and demand fundamentals").

The report does argue that if Amaranth's large-scale speculative trading was causing "large jumps in the price differences" and prices that were "ridiculous," *id.* at p.3, the current regulatory regime would be unable to prevent this price disruption. *Id*. at p.3 (NYMEX exchange did not have routine access to Amaranth's trading positions on ICDE, and therefore

NYMEX could not have a complete and accurate view of whether "a trader's position . . . is too large," and there were no accountability limits on the ICE exchange).

IV. Comments that Consist of Economic Studies or Discuss Economics in Depth

Several comment letters perform substantial summary analysis of other economic studies bearing on position limits, present original economic analysis or formal economic studies. These submissions thus warrant individual analysis. The following submissions are summarized and analyzed in this section:

- (A) the February 10, 2014, comment letter by Markus Henn of World Economic, Ecology & Development, including, as an attachment, a November 26, 2013, list of studies entitled "Evidence on the Negative Impact of Commodity Speculation by Academics, Analysis and Public Institutions" ("Henn Letter");

- (B) the analysis of Philip K. Verleger of the economic consulting firm PKVerleger LLC, attached as Annex A to the February 10, 2014 comment letter by the International Swaps and Derivatives Association (ISDA) and the Securities Industry and Financial Markets Association (SIFMA) ("2/10/14 ISDA/SIFMA Comment Letter");

- (C) the analysis of Craig Pirrong, Professor of Finance at the University of Houston Business School, attached as Annex B to the 2/10/14 ISDA/SIFMA Comment Letter;

- (D) two studies by Sanders and Irwin, *The "Necessity" of New Position Limits in Agricultural Futures Markets: The Verdict from Daily Firm-Level Position Data* (working paper 2014), and *Energy Futures Prices and Commodity Index Investment: New Evidence from Firm-Level Position Data* (working paper 2014);

- (E) two studies by Hamilton and Wu, *Effects of Index-Fund Investing on Commodity Futures Prices*, International Economic Review, Vol. 56, No. 1 (February 2015), and *Risk Premia in Crude Oil Futures Prices*, Journal of International Money and Finance (2013) (submitted as second paper in the same electronic comment submission); and

- (F) materials that CME Group submitted for inclusion in the administrative record, include 3 sets of materials submitted on March 28, 2011 (first set, second set, and third set); an undated CME study on conditional spot-month limits; and a CME Group's white paper, *Excessive Speculation and Position Limits in Energy Derivatives Markets*.[130]

[130] The latter white paper, while technically not submitted formally by CME in the administrative record, warrants individualized analysis. It is cited in the Commission's NPRM; it posted on the

A. The Markus Henn List of Studies

Markus Henn's February 10, 2014, comment letter acknowledges that there is an ongoing debate about whether speculators can dominate a marketplace and exacerbate market volatility and market prices. He nonetheless asks the Commission to take into account a list of studies he submits with his letter. He then presents numerous economic studies as well as media articles.

As a group, this list of studies, opinion pieces, and news articles documents the existence of concern and suspicion about large speculative positions in commodity markets. Many of the studies cited by the Henn Letter look for evidence of financialization and in this sense suffer from interpretational bias. As a group, these opinion pieces and studies do not consistently seek alternative explanations for their conclusions. As Markus Henn acknowledges in his cover letter, these papers are part of an ongoing debate among economists, not conclusive evidence of the harmful effects of excessive speculation.

Three of the most persuasive papers cited in the Henn Letter involve the crude oil market during the financial crisis: Singleton, *Investor Flows and the 2008 Boom/Bust in Oil Prices* (March 23, 2011 working paper);[131] Hamilton and Wu, *Risk Premia in Crude Oil Futures Prices*, Journal of International Money and Finance (2013) (an earlier working paper version is cited by Henn); and Hamilton, *Causes and Consequences of the Oil Shock of 2007-2008*, Brookings Paper on Economic Activity (2009). The first two conclude that there is a statistical link between the volume of speculative positions and a component of price, risk premium, at least for some commodities in some timeframes. Hamilton's *Causes and Consequences of the Oil Shock*

CME Group's website; and it cited in the context of key economic arguments by major comments such as the MFA's February 9, 2014 comment letter at pp. 11-12, n.26.

[131] Markus Henn cites the 2011 version of the Singleton paper, which is the only version of this paper in the administrative record. A subsequent May 2012 version is available from Professor Singleton's Stanford website at http://web.stanford.edu/~kenneths/.

of 2007-2008 concludes that the oil price run-up was caused by strong demand confronting stagnating world production, but the price collapse was perhaps not driven by fundamentals.

B. Verleger's Analysis, attached to ISDA/SIFMA Comment Letter

Consultant Philip K. Verleger provided an analysis, attached as Annex A to the 2/10/14 ISDA/SIFMA Comment Letter, as a retained expert for ISDA. He opposes position limits. He contends, without quantitative modelling or empirical evidence, that in the energy markets "unwarranted price fluctuations" have historically been due to "confluence of contributing factors" such as weather, geopolitical events, or changes in industry structure. 2/10/14 ISDA/SIFMA Comment Letter, Annex A at pp. 2-3. In passing, he asserts that the high energy prices in 2008 "are attributable to environmental regulation" without any analysis or citation. *Id.* He asserts that his expertise is in the energy markets, but asserts (contrary to many comment letters from other energy market participants) that the energy markets are "subject to conditions and dynamics" of other commodity markets. *Id*. at p.2. These are examples of why we view Verleger's analysis as weak and conclusory, lacking in economic rigor and empirical data.

By way of further example, Verleger contends that if the position limits rule had been in effect in 2013, oil prices would have been $15 per barrel higher in 2013 and the cost to American consumers would have been roughly $100 billion. Annex A at p.3. He provides no quantitative reasoning in support of these numbers. He simply asks the reader to take his word for a hidden $15/barrel calculation.[132]

[132] Verlarger argues summarily that limits in the non-spot month would have an especially chilling effect, "very likely leading to, among other things, higher energy prices;" and that position limits should not apply to cash-settled markets because traders holding cash-settled contracts do not have any ability to influence the physical market prices of commodities. *Id.* at pp.2-3. Pirrong also makes these arguments but provides further analysis, so we discuss this critique in subsection C below.

Verleger asserts that exploration for sources of energy has resulted in a large increase in oil supply in recent years, and states that these companies use swaps and futures to hedge their position. *Id.* at p.7. This is true. He then summarily asserts that independent companies exploring for and developing oil and gas production would "not have achieved this success without hedging" and that hedging would not have occurred if the Commission's position limits had been in place. *Id*. at p.8. This conclusion is erroneous. His argument overlooks several critical facts.

First, companies actively engaged in oil and gas exploration would almost certainly either qualify for bona fide hedging treatment or fall within the generous position limit. As to non-spot month limits, Verleger concedes that "it may be argued that the initial non-spot month position limits are high enough (109,000 contracts for crude as an example)" to avoid liquidity impacts. *Id.* at p.12.[133]

Second, he argues that these exploration companies have "benefited indirectly because passive investors such as retirement funds have taken long positions in commodities through the swap markets," and suggests that with position limits there would be an absence of non-commercials to take positions opposite of oil and gas development companies. *Id*. at p.9. To the contrary, with the Commission's disaggregation exemption for managed funds (the independent account controller exemption), there is no basis to believe that there will be a shortage of long positions in the market. He presents no empirical evidence to support his thesis that position limits could thus "adversely affect[ ] investment in the oil and gas industry." *Id.*

[133] *See* Berg, *The Rise of Commodity Speculation: From Villainous to Venerable*, at p.263 (UN FAO 2011) (former CBOT trader suggests that spot month limit positions should be in place for at least a few days in the non-spot months to lesson price distortions from the roll).

Third, the way energy derivatives markets work, if there is demand on the short side of the market, this will create liquidity on the long side of the market at some price. Verleger himself notes the diversity of market participants – commodity-based exchange-traded funds, hedge funds, retirement funds, and the like – and does not document that the exclusion of a particular long would reduce liquidity from the marketplace. For example, commodity-based exchange-traded funds simply intermediate long positions for their investors, and if the funds themselves could not take long positions in the market, there is no reason to assume that the investors might through other vehicles take long positions. Verleger has an expressed fear, not an analysis, that liquidity in markets will be harmed by position limits. E.g., *id.* at p.12 Verleger (after observing that non-spot month limits are high enough to perhaps not impact the market, he proceeds to write that non-spot limits will "adversely affect the ability of commercial participants to use some futures market").

C. Pirrong's analysis, attached to ISDA/SIFMA Comment Letter

Professor Pirrong agrees that the nation's commodity markets have been subject to significant and disruptive corners and squeezes, such as the Hunt Silver episode of 1979-1980. 2/10/14 ISDA/SIFMA Comment Letter, Annex B, at p.2, ¶¶ 6-9. He concedes that the "ability of position limits to prevent corners and squeezes could provide a justification for application of these limits during the spot month," at least in theory. *Id.* at ¶ 7. He concedes that in theory there is such a thing as "sudden and unwarranted price fluctuations." *Id.* at 6, ¶ 27. Subject to these concessions, Pirrong opposes many aspects of the rule. Economic analysis on his various objections follows. Overall, he argues that position limits are an undesirable solution to an economic problem that has not been proven to exist. *Id*. at pp. 3-10. We analyze below his objections only when and to the extent that they rest on economic arguments.

1. Amaranth and the Possibility Utility of Position Limits in Non-Spot Months

Pirrong states that the possibility of a corner or a squeeze "provides no justification of the necessity of imposing position limits outside the spot month." 2/10/14 ISDA/SIFMA Comment Letter, Annex B, at p.2. Pirrong considers and dismisses the example of Amaranth as empirical evidence for non-spot month position limits. He argues that its market activity in 2006 is not evidence of the utility of position limits in the non-spot month. *Id.* at p.2, ¶ 7. In this context, Pirrong discusses corners and squeezes as the rationale for non-spot month position limits. *Id.* However, the Commission's NPRM discusses rationales other than corners and squeezes: economic factors such as outsized market power, disorderly liquidation, and the ability to manipulate prices.

In the context of non-spot month position limits, Pirrong focusses just on corners and squeezes. If that were the only regulatory concern, his analysis on this, *see id.* at ¶¶ 27-30, would be largely correct. Many traders exit futures contract before the spot month because they are there for the exposure, for price risk transfer, not to make or take delivery.

One key reason why ETFs "sunshine-trade" their rolls – announcing in their prospectus when they will roll – is because rolling these large positions in non-spot months can have a price impact, apart from corners and squeezes.[134] *E.g.*, Frenk and Turbeville, *Commodity Index Traders and the Boom/Bust Cycle in Commodities Prices* (Better Markets 2011) (very large institutional players rolls have had a temporary price impact that is expensive to the ETF investors.

[134] Sanders and Irwin, *The "Necessity" of New Position Limits in Agricultural Futures Markets: The Verdict from Daily Firm-Level Position Data*, at p.19 (working paper 2014) (preannounced trades can have a "sunshine trading" effect of increasing liquidity and lowering trading costs).

A good example of the risk of price impact in non-spot months from outsized positions, apart from corners and squeezes, is Amaranth. Amaranth's outsized market power existed not just in the spot month, but in the preceding months. That is, Amaranth's positon was so large that it impacted price by virtue of its outsized market position in not just the spot month, but other months. Amaranth influenced prices not just upon liquidation, not just when banging the close in the spot month, but also well before then according to a congressional study cited in the Commission's NPRM.[135]

An economist could argue that because the commodity futures price should reflect all demand, Amaranth's very large positions in the non-spot month was appropriately incorporated in market prices. After all, at a given point in time and price, demand is defined as the quantity desired by all those who are willing and able to hold a commodity futures position. Prof. Pirrong's approach does conceive of the possibility that outsized market power in the non-spot month or the price impact of Amaranth's positions could have deleterious effects on the marketplace. From a classical economical perspective, Amaranth's outsized market position in the non-spot months is just an input into price demand.

However, outsized market power may have economic outcomes that are undesirable. Outsized market power permits a player to do more than "bang the close," and Amaranth's natural gas trading is an example of this. One could influence prices in the swaps market

[135] There have been other examples of price manipulations that extended over a period of months. *See* CFTC staff, *A Study of the Silver Market*, Report To The Congress In Response To Section 21 Of The Commodity Exchange Act, Part One at pp.2-4, 9-10 (May 29, 1981) (price of silver rose and fell over a period of months, with long futures positions in silver held by members of the Hunt family in the summer and fall of 1979, prices peaking in late January 1980, and prices falling though the first quarter of 1980); *id.*, Part Two at p.100 ("behavior of silver prices during 1979-80 appears consistent with, but is not entirely explained by, fundamental developments in the silver market over this period"); p.112 (Hunt family acquired actual and potential control of world silver market of approximately 18 percent and stood for delivery on a significant portion of their futures contracts, causing silver prices to rise significantly).

through such aggregation of market powers or manipulate related markets. Amaranth's exercise of market power was real and substantial. Even after it left the natural gas market, its activities may left a lasting price impact. That is, prices of the underlying commodity, natural gas, may have been higher when Amaranth was in the market (including in the non-spot months), and prices were substantially less for a substantial time period after Amaranth left the market.[136] Pirrong's telegraphic discussion of Amaranth does not discuss this economic history or its possible relevance to non-spot position limits. Although Pirrong criticizes the Commission for not engaging in a "rigorous empirical analysis" on Amaranth (2/10/14 ISDA/SIFMA Comment Letter, Annex B, at p.2, ¶ 10), the establishment of outsized market power in economics is more straight forward in the case of Amaranth. Did the disappearance of an Amaranth from the market with its formerly outsized position lead to a significant decline in price?

By focusing simply on Amaranth's activities in the spot month, Prof. Pirrong does not discuss the potential for harm arising from Amaranth's outsized positions in the non-spot month. If someone is exerting market power, they can cause a negative externality for other purchases of natural gas if they, for example, bid up the price of natural gas. A higher price for a natural gas purchaser due to another entity's trading may simply be an example of a healthy market at work. However, there is definite harm to purchasers of natural gas if the price they pay is higher for reasons that are associated with another market participant's price influence though the exertion of market power.

Pirrong does not provide a direct factual rebuttal to the Senate investigative report finding that Amaranth's speculative activity affected overall price levels in natural gas. He argues that

[136] This observation presumes no other confounding events such as the occurrence of warmer winter. Unfortunately, we do not know whether or not the lower price resulted from the exit of Amaranth, the warmer winter, something else, or some combination of the preceding.

the Commission's reliance upon a Senate investigatory report would not be "accepted as evidence of causation in any peer reviewed academic work." *Id*. at 2, ¶ 9. Prof. Pirrong is correct that the Commission has not, in the case of Amaranth, shown causation: that it was Amaranth's departure from the markets that caused the natural gas price decline in substantial part, as opposed to confounding factors (such as, in the case of natural gas, evidence that the upcoming winter would be warmer than expected). However, proof of causation is not required for publication in peer reviewed journals in a case such as this.

To establish evidence of causation, one would need a theoretical model and empirical evidence to support it. There have been peer-reviewed studies on Amaranth such as one cited in the Commission's original NPRM. *See* Ludwig Chincarini, *Natural Gas Futures and Spread Position Risk: Lessons from the Collapse of Amaranth Advisors LLC*, Journal of Applied Finance (2008). That study observed that not just a Senate investigatory committee, but one of the exchanges that Amaranth was trading on, was alarmed by their exercise of market power in months prior to the spot months. The New York Mercantile Exchange (NYMEX) on August 9, 2006

> called Amaranth with continued concern about the September 2006 contract and warned that October 2006 was large as well and they should not simply reduce the September exposure by shifting contracts to the October contract. In fact, by the close of business that day, Amaranth increased their October 2006 position by 17,560 positions and their ICE positions by 105.75

Id. at p.24. This study documents that even though many of the Amaranth positions were not with NYMEX, and instead with ICE, these positions were extremely large relative to the average daily trading volume of the largest natural gas futures exchange. "In some cases, the positions are hundreds of times the 30-day average daily trading volume." *Id.* at p.22.

Thus Pirrong argues that there is "no logical or empirical justification" for position limits outside the spot month. 2/10/14 ISDA/SIFMA Comment Letter, Annex B, at p.6. He is on stronger ground asserting that the costs exceed the benefits. While he concedes that it is "plausible" that a sudden liquidation of a large position by a trader facing distress" could "cause sudden and unwarranted price fluctuations," he argues that there is "no evidence that this problem occurs with sufficient frequency, or has sufficiently damaging effects, to warrant continuously imposed constraints on risk transfer." *Id*. at 6, ¶ 27.

2. The Possible Harms of Corners and Squeezes

Pirrong also questions the extent of harm associated with activities such as the Hunt brothers. 2/10/14 ISDA/SIFMA Comment Letter, Annex B, at pp. 2-3. He downplays the harms of corners and squeezes. *Id*. at ¶¶ 11-12, 38-43.

Prof. Pirrong is incorrect in asserting that the Commission's view was groundless. In the NPRM, the Commission did ground its concern about outsized speculative positions in particular examples. The Commission did present evidence of inefficient resource allocation with respect to the Hunt brothers. It is as much a public policy matter as an economic matter how position limits fare as a solution to the question of these negative externalities. Even if one assumes away the existence of market imperfections, as Pirrong does, one is still left to contend with the consequences of what Pirrong assumes to be natural market events. In the case of the Hunt brothers, the Commission gave multiple examples of negative externalities. People melted down their silverware. A photo supply company dependent on silver supply went out of business.

Pirrong's assumption that persons act optimally at any given moment does not mean, across time, that resources have been allocated efficiently. While much of economic analysis is static, dynamic effects over time can have inefficient allocation of resources, intertemporally. It

may have been optimal for a possessor of silverware to melt down their silver into silver bars during the Hunt silver market disruption, but just a few months later a possessor of silverware would likely prefer silverware to silver bars. *See* Pirrong's *Manipulation of the Commodity Futures Market Delivery Process*, at p. 383, Journal of Business (1993) (futures market manipulations "distorts prices and creates deadweight losses;" "causes shorts to utilize real resources to make excessive deliveries;" and "distorts consumption").

Pirrong thus errs in asserting that the Commission does not provide an "empirical basis" for "inefficient allocation of resources." 2/10/14 ISDA/SIFMA Comment Letter, Annex B, at p.3.

3. Claim that the Spot-Month Limits Are Arbitrary

Pirrong claims that spot month limits are set too low at 25 percent of deliverable supply. *Id*. at p.8, ¶¶ 38-40. He contends that a single long trader has to control over 50 percent of deliverable supply to perfect a corner. *Id*. at ¶ 40. This conclusion is too strong. Assuming, quite reasonably, that commercials are going to stay in the market and consume, because it would be very expensive for them to leave the market, a certain percentage of deliverable supply is "locked up" in this sense. For example, a natural gas utility needs to deliver natural gas for its customers to heat their homes (among other things) and would therefore still take delivery of a substantial percentage of the deliverable supply of natural gas.

Pirrong says that "[f]ive or more perfectly colluding traders each with positions at the 25 percent level might be able to manipulate the market." *Id*. at p.8, ¶ 41. These five traders do not all need to be collude to permit one of them to manipulate price. Some of these traders may simply be those who value the commodity highly, much higher than the market price, and therefore will not let go of their contractual right to delivery. Such commercials may be willing

to stay and pay a higher price, even when a corner is in effect, because the cost, for example, of not providing natural gas to customers to heat their homes is substantially more.

Many exchanges, including CME, set position limits lower than 25 percent. It is hard for Pirrong to argue that 25 percent is excessively low when it is less than what CME does for all of the 19 commodities covered by the proposed CFTC position limits.

Pirrong's final critique of spot month limits is his assertion that application of the same limits to short and long positions is arbitrary. *Id.* at p.9, ¶¶ 42-43. The reasons he gives for this are problematic and not well-developed. Pirrong states that for storable commodities, manipulation by long traders is more likely than with short traders. *Id.*, ¶ 42. It may well be more difficult to manipulate price through a corner or squeeze as a short because there is generally a fixed limit for deliverable supply (unless one creates the impression that there is more deliverable supply than there is). Moreover, shorts may well have a bona fide hedging exemption anyway. However, for shorts as well as longs, position limits help to ensure an orderly exit and a smoother delivery process. For example, a short trader with a large position might take a partially offsetting long position in an illiquid market in the spot month; this might cause unwarranted price volatility due to the price impact of establishing the offsetting long position.

Pirrong is correct that the Commission has not explained at length the basis for treating short and long positions symmetrically. On the other hand, Pirrong does not develop an alternative or explain what the proper ratio should be.

4. Critique of the Commission's Cost-Benefit Analysis

Pirrong argues that the Commission's the cost-benefit analysis for the rule has failing to identify, let alone analyze, important potential costs. 2/10/14 ISDA/SIFMA Comment Letter,

Annex B, at pp. 4-6. As a matter of law, the Commission considered costs and benefits but stated that it did not need to present a rigorous quantification under the CEA. Pirrong does not dispute this. He suggests instead a research project involving documentation of how much speculators in the past would have been affected by position limits, had they been in effect. *Id.* at p.5, ¶ 25. Operationalizing such a vague idea is more challenging than it might sound. This would be a difficult project subject to interpretational difficulties; the results would not be conclusive; the results would likely be nondisclosable under Section 8; and the results might be difficult to generalize in any meaningful way, thereby producing highly speculative results that would be of limited usefulness.[137]

Pirrong argues that generally low risk premia makes hedging cheaper, and generally speculators' presence lowers risk premia, and thus speculators are a benefit to the marketplace. *Id.* at p.5, ¶ 24. It is true that lower risk premia will make hedging cheaper for shorts. Hamilton and Wu, *Risk Premia in Crude Oil Futures Prices*, Journal of International Money and Finance (2013). (Although cheaper hedging does not in itself mean that it a desirable or economic course of conduct.[138]) However, Pirrong, in relying on what generally happens – how speculators may

[137] The Commission's proposed limits are generous and would be broached too rarely to form reliable statistics. For many commodity markets, federal limits or exchange guidance has already curbed outsized positions. Pirrong is incorrect in assuming that "[e]very episode in which price limits would have been binding if they had been in effect" where there was "no sudden and unreasonable price changes" is an example of "zero benefits and positive costs" to position limits. *Id*. Moreover, if one is trading historically, one may have swaps and forwards in one's portfolio. An analysis of just futures positions would not reveal whether a position limit would be constraining or whether a hedge exception would be available. Pirrong's proposal overlooks the probability of hedge exemptions and the likelihood that a limit would be constraining for one trader but not constraining for another.

[138] In particular, Pirrong is incorrect in stating that cheaper hedging makes it economic to hold larger inventory. 2/10/14 ISDA/SIFMA Comment Letter, Annex B, at p.5, ¶ 24. It makes it cheaper, but not necessarily economic; how the change in the price of storage affects the change in the price of inventory is a complex economic phenomenon, and the change may be more elastic than he is tacitly assuming.

generally be good for the cost of hedging – also does not discuss or refute economic studies that suggest he may be incorrect at times of financial stress. *E,g.*, Cheng, Kirilenko, and Xiong, *Convective Risk Flows in Commodity Futures Markets* (working paper 2012) (in times of distress, financial traders have historically reduced their net long position, causing risk to flow from financial traders to commercial hedgers).

Pirrong writes: "To the extent that position limits constrain the ability of the most efficient speculators . . . to take on risk, these benefits [of lower risk premia] are foregone…." 2/10/14 ISDA/SIFMA Comment Letter, Annex B, at p.5, ¶ 24. But he gives no reason to believe that position limits will cause such a constraint to any great extent. And he certainly does not offer a means to quantify this concern or to quantify the benefits to be weighed against this effect. More generally, Pirrong ignores the potential prophylactic benefit of position limits, despite that benefit being a matter of primary emphasis by the Commission in its NPRM.

5. Technical Objections to Bona Fide Hedging Definition.

Overall, Pirrong argues that the Commission's bona fide hedging exemptions are unnecessarily narrow. *Id.* at ¶¶ 31-37. While this may or may not be correct, Pirrong's discussion in support of broadening these hedging exemptions rests in policy, not economic, arguments.

Pirrong states that the Commission should have provided an enumerated bona fide hedging exemption for unfilled storage capacity. This means, for example, that if you own a grain silo, and thus have the ability to store wheat, you can hedge the economic value of that

wheat storage facility without it counting against your speculative for wheat. One does this form of hedge using what are called "calendar month spreads." *Id.* at pp.6-7, ¶¶ 31-32.[139]

Hitting the Commission's positon limits using calendar spreads should be relatively rare. That is because, while single-month calendar spreads are including in the position limit rules, calendar spreads would net out in the all-months combined position limits. The amount one would have to have in calendar spreads to hit the single-month limit would be so substantial that the related storage capacity would be quite huge if not impossible for most commodities. For example, one would have to have a gargantuan grain silo to have a bona fide need to hedge unfilled storage capacity in excess of the single-month limit for grain. For example, in the case of corn, the single-month limit is 53,500 contracts. Each contract is 5,000 bushels of corn. One would therefore need to have a grain silo with 26,750,000 bushels of unfilled capacity in order to hit the position limit. If there ever were a facility, that operator could apply on a facts-and-circumstances basis for a bona fide hedge exemption.

That said, Pirrong's reasoning is correct: unfilled storage capacity for wheat, for example, can, as an economic matter, be hedged with wheat calendar spreads. *See id.* at ¶ 34 (suggesting it is inconsistent for the Commission to allow cross-hedging for processing margins but not unfilled storage capacity). There are counterarguments to Pirrong's critique, but they are policy, not economic arguments.[140]

---

[139] This is because calendar spreads, being spreads, are two future contracts taking equate but opposite positions in different months, and thus cancel each other out. An example of a calendar spread is going long one month and short the next. Amaranth did, in particular, calendar spreads.

[140] The Commission's test is a safe-harbor floor but there is nothing in the rule that would preclude application for bona fide hedging treatment for a particular cross-hedge at a lower rate of correlation. Automatic inclusion of the examples he gives could potentially create loopholes.

Pirrong points out that the .8 correlation coefficient for hedging is very high and is unsupported by any economic data. Further, Pirrong's argument that cross-hedges are often hedging forward, not spot prices, is also well-taken. *See id.* at p.7, ¶ 35.

6. Inclusion of Cash-Settled Contracts

Pirrong's critiques the Commission's decision to establish different position limits for cash-settled (as opposed to delivery-settled) contracts. *Id*. at pp.9-10, ¶¶ 44-48. The Commission's rule provides that an entity can trade up to five times the position limit in the cash-settled market if the entity does not own anything in the physically delivery market, on the theory that without futures contracts in the physical delivery market, it will be harder to conduct price manipulation. Pirrong correctly observes that the proposed rule does prohibit someone from owning actual deliverable supply which, when combined with cash-settled positions, would permit an entity to "reach 150 percent of deliverable supply." Id. at ¶ 46. Pirrong is unclear on how a price manipulation with such a "reach" could be easily effected. In any event, he is correct that the Commission does not provide an exact accounting for its five-times multiple for cash-settled contracts.[141]

7. Whether Position Limits Cause Economic Harm

Finally, Pirrong contends that commodity ETFs, pension funds, and other "real money" investors would be harmed by position limits and that this is unfair because not all such market participants impose the same risks. 2/10/14 ISDA/SIFMA Comment Letter, Annex B, at pp.3-4,

[141] It is conceivable, using price limits, they might attempt a price manipulation apart from futures contracts, but that is an example of a price manipulation that is outside the purview of the position limits rule. *Cf. id.* at p. 10, ¶ 47. The NPRM does not purport to cover all price manipulations, including cash-settled to physical price manipulations. Moreover, it is a hard price manipulation to pull off. Holding physical supply can be expensive, and one would have to hold a lot to affect cash-settled prices.

¶¶ 16-18. The claim that it is "unfair" to impose limits on all market players uniformly is a policy argument, not an economic argument.

D. Hamilton/Wu Papers on Risk Premia and Effects of Index Fund Investing

Professors James Hamilton and Jing Cynthia Wu of the University of California at San Diego and University of Chicago Business School, respectively, authored a well-executed set of papers that examine the effect of positions on prices.

Their paper, Hamilton and Wu, *Risk Premia in Crude Oil Futures Prices*, Journal of International Money and Finance (2013), is a well-reasoned explanation for how outsized speculative futures positions could impact risk premium, the return for accepting undiversifiable risk, a component of the return of holding a commodity futures contract. Examining the crude oil futures market, they find that crude oil risk premia fundamentally changed to financial investor flows into the crude oil market. *Id.* at p.31. Hamilton and Wu's result is limited to a particular commodity, crude oil, during a time of economic stress.

Hamilton and Wu found that, for crude oil futures, risk premiums, post-2005, were smaller than they were in the pre-2005 sample. This study contains an important conclusion founded in the interplay of positions and prices in the crude oil markets:

> From introduction at p.10: "While traders taking the long position in near contracts earned a positive return on average prior to 2005, that premium decreased substantially after 2005, becoming negative when the slope of the futures curve was high. This observation is consistent with the claim that historically commercial producers paid a premium to arbitrageurs for the privilege of hedging price risk, but in more recent periods financial investors have become natural counterparties for commercial hedgers."

Hamilton and Wu, *Risk Premia in Crude Oil Futures Prices*, at p.10, Journal of International Money and Finance (2013).

Their paper tests the idea that risk premia have been lowered by long, speculative investments in the crude oil market. That is, the idea that the futures price has become higher as it has been bid up by long speculators, so the return from holding the long futures contract has been lowered. In theory, this phenomenon would make hedging cheap for the short side of the market, but would also increase the price of the futures, all else being equal.

Hamilton and Wu use a two-factor model for price: the futures contract price less the rational expectation of the futures price equals the risk premium, the component of price associated with holding the price risk of the futures contract. A commodity that is more likely to be affected by long passives in this way is crude oil, because (1) crude oil as a commodity dominates these indices – substantial portion of the GSFI for example; (2) the economics of storage.

All else being equal, if outsized market positions affect price, we should expect risk premium to be the component of price that would be affected when market participants take outsized positions. That is because risk premium is a return for taking on undiversifiable risk. Specifically, a risk premium does not include that portion of risk that can be easily diversified through other instruments. Through the workings of market, a participant who takes on a price exposure will expect to be compensated through a premium for bearing this risk. For a futures commodity contract, there are many components of the return, and the risk premium is only one of them. It can be a fairly small component, although the fraction depends on the commodity and other the market conditions.

Hamilton and Wu construct a theoretical price return: the return of holding a long futures contract based on a rational expectations model. Hamilton and Wu, *Risk Premia in Crude Oil Futures Prices*, Journal of International Money and Finance (2013). Their risk premium is the

difference between futures return and theoretical price return. They find that risk premiums for crude oil decreased over time and became more volatile. While Hamilton and Wu listed many assets in the paper's introductory discussion of the theoretical model, in their empirical analysis they use two factors, factors that involve only futures price data. This omission fails to take into account potentially relevant data about the level of various commodities in storage[142] and observations about other financial assets.[143] Consequently, there may be some disconnect between their theoretical and their empirical model. This may mean that the study's theoretical price return is on less sound theoretical footing than it may first appear. Nevertheless, the benchmark rational expectation return may still be a suitable approximation.

In a second paper, Hamilton and Wu *Effects of Index-Fund Investing on Commodity Futures Prices, International Economic Review*, (February 2015), were able to replicate Singleton's result for the crude oil market during the 2006-2009 period. They found an effect from speculative positions of index investors on risk premium in crude oil.[144] Moreover, they did not find evidence of speculative positions influencing risk premia in crude oil after 2009. However, they did not find evidence that speculative positions affected the risk premia in the

[142] Risk premia may vary based on the amount of a commodity in storage at any given time. While discussing storage as a component of risk premia seems overly technical, in fact many of these papers, including the Hamilton and Wu paper, it might play an import role. One could go long a crude oil futures contract, or one could buy crude oil and storage it. If you do the latter, you could draw down the physical commodity available for near-term use. Also, the storing of the physical commodity has a real option component to it (one can take the crude oil out of storage and consume it relatively quickly). The value of the real option depends on how much society might need crude oil in storage, and that value depends on how much crude oil is stored elsewhere.

[143] The papers discussed in the financialization section suggest that the returns of financial assets may affect commodity returns and visa versa.

[144] Professor Kenneth Singleton found evidence that speculative positions Granger-causing risk premium on weekly time intervals during the 2007 to 2009 period when studying the crude oil futures markets. Singleton, *Investor Flows and the 2008 Boom/Bust in Oil Prices* (March 23, 2011 working paper).

agricultural commodities markets. "Our conclusion is that although in principle index-fund buying of commodity futures could influence pricing of risk, we do not find confirmation of that in the week-to-week variability of the notional value of reported commodity index trader positions." *Id*. at p.193; *see id.* at p.195 (no persuasive evidence that changes in index trader positions is related to risk premium in agricultural commodities, whether the data is studied for change on a weekly or 13-week basis). Consequently, they find only limited evidence for a theoretically reasonable version of the Master's hypothesis, *i.e*., that long speculators bid down the risk premia and as a result induce a higher futures price in various commodity futures markets. "Overall," Hamilton and Wu conclude, their work indicates that "there seems to be little evidence that index-fund investing is exerting a measurable effect on commodity futures prices." *Id.* at p.204 (adding that it is "difficult to find much empirical foundation for a view that continues to have a significant impact on policy decisions").

E. Sanders/Irwin on the "Necessity" of Limits and Energy Futures Prices

Professors Dwight Sanders and Scott Irwin submitted two working papers: (1) one paper arguing that new limits on speculation in agricultural futures markets are unnecessary;[145] and (2) a paper on energy futures prices, using high frequency daily position data for energy markets and concluding that there is no compelling evidence of predictive links between commodity index investment and changes in energy futures prices.[146]

1. The "Necessity" of New Position Limits

[145] Sanders and Irwin, *The "Necessity" of New Position Limits in Agricultural Futures Markets: The Verdict from Daily Firm-Level Position Data* (working paper 3/13/2014), comment letter at pp. 1-46.

[146] Sanders and Irwin, *Energy Futures Prices and Commodity Index Investment: New Evidence from Firm-Level Position Data* (working paper 2/17/2014), comment letter at pp. 47-89.

In Sanders and Irwin, *The "Necessity" of New Position Limits in Agricultural Futures Markets: The Verdict from Daily Firm-Level Position Data* (working paper 2014), the authors use price and positon data shared by an unnamed large investment company.[147] They do various statistical analyses to concluding that the large investment company's roll of its position does not have any lasting price impact on the market. The find that the price impact of the roll is, at most, a small and temporary price impact; there is not a day-over-day impact and the impact is smaller than the bid/ask spread.

This result does not disprove, generally, the possibility that the fund's long, speculative positions impact price. That is because Sanders and Irwin's study only focusses only on one aspect of the fund's trading: its rolling of positions. The firm data used is from a large commodity index fund that is registered investment company, and such a firm is likely put into their prospectus how they are going to roll their positions. This pre-announcement of when the commodity index fund will roll may dampen the price impact of these particular changes in position. *See* n.124 and associated text, *supra*; Aulerich, Irwin, and Garcia, *Bubbles, Food Prices, and Speculation: Evidence from the CFTC's Daily Large Trader Data Files*, *id.* at p.29 (NBER Conference 2012) (firms preannounce their rolls, and thus these position changes can be anticipated by the marketplace and thus lead to less price impact). Sanders and Irwin's result thus is not obviously extensible to any price impact of this large index fund's positions apart from its positions and trading at the time of roll.

This fund did have days of heavy trading, apart from rolling, but Sanders and Irwin did not study the price impact arising from these changes in position. The fund traded cotton

[147] *Id.* at pp.4-5. They argue that this dataset will be more comprehensive that the CFTC's commitment of trader data, but they did not test to verify this assumption. They correctly observe that prior work using CFTC data suffers from limitations in the frequency of data and the availability of swaps data. *Id.* at pp.3, 5.

contracts representing 5.8% of average daily trading in cotton and wheat trades constituting 3.5% of average daily volume in the MGEX wheat contract. Sanders and Irwin did not attempt to study price impact on these un-announced trades. They stated that because the sizes of the roll transactions are "larger than changes in outright position," "investigating the impact of rolling on market spreads" is "particularly interesting." *Id.* at p.10. On the other hand, the non-roll position changes are presumptively not preannounced to the marketplace, so studying this rich dataset for price impacts from those position changes might also be interesting.

This paper by Sanders and Irwin thus has a limitation of scope based on its focus on just the rolling of positions. This large commodity index fund presumptively pre-announced its rolling of positions in its prospectus. However, what if this same fund did not do so at a future date? Economists using empirical data can make predictions of the future, not just historical explanations of that past. This statistical result, if credited as true within a reasonable degree of certainty, would not remove the need for regulators to act prophylactically by imposing position limits to diminish the price impact of any future, non-announced rolls. We know, after all, that at least prior to sunshine trading of rolls, there is evidence of a price impact associated with rolling. Frenk and Turbeville, *Commodity Index Traders and the Boom/Bust Cycle in Commodities Prices* (Better Markets 2011). Such studies which shed light on how to diminish or prevent future damage from excessive speculation are useful, given Congress' articulated concern about preventing future burdens, even if, for this particular commodity index fund studies by Sanders and Irwin, this is not a problem currently. *See* 7 U.S.C. § 6a(a)(1) (Congress provided for position limits in order to "diminish, eliminate, or prevent such burden").[148]

[148] An example of a study that is, in part, forward-looking, is Cheng, Kirilenko, and Xiong, *Convective Risk Flows in Commodity Futures Markets* (working paper 2012). The authors use comovement methodology to conclude that in times of distress, financial traders reduce their net

Moreover, not all large players pre-announce their rolls. The fact that Sanders and Irwin found no price impact with respect to rolls that were (assumedly) pre-announced does not mean that unannounced rolls might be mistaken for informed trading by the marketplace and cause a price impact.[149]

Despite these limitations in scope, Sanders and Irwin's article is one of the best Granger analysis papers for several reasons.

First, it does present a working definition of "excessive speculation:" speculation that is "causing" price fluctuations that are "sudden" or "unreasonable" or "unwarranted." Sanders and Irwin, *The "Necessity" of New Position Limits in Agricultural Futures Markets: The Verdict from Daily Firm-Level Position Data*, at pp.2-3. This paper thus incorporates a legal analysis, not an economic analysis, borrowing language from the CEA itself. However, it is a reasonable definition in light of 7 U.S.C. § 6a(a)(1).[150] Sanders and Irwin correctly state that their "definition of excessive speculation seemingly excludes speculation that cannot be shown to *cause* price changes…." *Id.* at p.3. The authors speak of "position limits that are 'necessary' to prevent excessive speculation." *Id.* at p.2. Because this paper is an economic analysis of economic studies, not a legal analysis, so we will not respond to this legal assertion here. It is

---

long position, causing risk to flow from financial traders to commercial hedgers. *See also* Acharya, Ramadorai, and Lochstoer, *Limits to Arbitrage and Hedging: Evidence from the Commodity Markets*, Journal of Financial Economics (2013) (decreases in financial traders' risk capacity should lead to increases in hedgers' hedging cost, all else being equal).

[149] Sanders and Irwin's piece does not directly test the effect of pre-existing position limits in these markets. Examining agricultural markets for whether there can be price impact on positions generally is complicated by the fact that the agricultural markets have been subject to federal position limits since 1920s. On the other hand, in the case of a commodity index fund, they may well not be carrying substantial positions into the spot month, and so even their large source of firm data may not be useful for testing the impact or effectiveness of position limits during the spot month.

[150] Section 4(aaa)(1) of the CEA.

important to note, however, that Sanders and Irwin, by emphasizing the word "necessary," appear to elevate the requirements for establishing causation of price fluctuations to a very high level. Demonstration of causation does not require, however, rigorous verification. Rigorous verification (up to and including a mathematical proof) is not a requirement for publication of economic analysis in peer-reviewed, academic journals. Economic studies often use empirical data, typically use the tools of statistics, to achieve reasonable certainty within a specified degree of error.

Second, the data source is a novel and fairly comprehensive data set. It includes both swaps and futures, and encompassing many different commodities. The data does indicate the volume and nature of this large commodity fund's positions in the market place. All positions taken by the firm during the 2007-2012 time period were long positions, not short positions. *Id.* at p.5. The fund's total position size (including futures and swaps) grew from under $4 billion in 2007 to $12 billion in 2011. *Id.*

Third, with respect to the paper's conclusion on rolling of positions, the statistical result of Sanders and Irwin – concluding that there was no price impact from positions – is stronger than many other studies in some respects. Unlike Hamilton and Wu's work on just a component of the return from holding a futures contract (risk premium), Sanders and Irwin consider the entire return from holding the futures contract. They studied data over a long time period. If their model is correct, they have disproven (at least their formulation of) the Masters hypothesis. There is a potential concern with their statistical result. The price equation used for their Granger analysis uses both lagged returns and changes in positions. *See id.* at p.16 ("R_{t-i}" are lagged returns and "Positions" are changes in position in Equation 5a). To the extent that lagged

returns and positions are correlated with each other, their price equation may mask correlations between price return and position.

2. Energy Futures Prices

Using the same commodity index fund data, Sanders and Irwin examine energy contracts: crude oil, heating oil, natural gas, and reformulated blend stock gas (with ethanol added). Sanders and Irwin, *Energy Futures Prices and Commodity Index Investment: New Evidence from Firm-Level Position Data* (working paper 2014). This paper attempts to challenge the findings of an impact on price from positions, findings of Singleton as well as Hamilton and Wu. Sanders and Irwin contend that their richer data source compels a conclusion that positions in commodity energy markets do not impact price.

This paper also has a potential problem with the price return equation. The equation, *see id.* at p. 15 (Equation No. 7), uses lagged returns and positions to test against a correlation with price. Sometimes they use multiple lagged returns. For example, for their natural gas analysis, they used two sets of lagged returns. *Id*. at p.35 (Table 5). Again, use of lagged returns in the price equation can mask a possible correlation.

Sanders and Irwin argue that their results from a richer data source indicate that Singleton and Hamilton and Wu's results may be "artifacts" of poor data. They contend that these authors use of agricultural data as proxy for energy positions was problematic. *Id*. at p.3. They suggest this may explain the differing results of Singleton, as well as Hamilton and Wu. This could be the case.

But there are other explanations for this difference in results. Singleton's paper, as well as Hamilton and Wu, focus on risk premium, not, as Sanders and Irwin does, price returns. Although this seems like a fairly technical distinction, it can be quite important in this context. If

positions impact price by impacting risk premium, that effect will not necessarily reveal itself in a study of just price returns. Perhaps more fundamentally, Sanders and Irwin and are asking a slightly different question than Hamilton and Wu or Singleton. Sanders and Irwin are attempting to measure price return impact over a long time period, February of 2007 to May 2012. Hamilton and Wu, and also Singleton, use narrower timeframes in their papers and find a component of return, the risk premium, during a narrow time window, during a period of economic stress.

F. CME Group Study Submissions

The CME Group filed in the administrative record several studies and reports on March 28, 2011. It did so in three sets, all filed on March 28, 2011.

In the first set, CME filed:

- *Tackling the Challenges in Commodity Markets and Raw Materials*, European Commission (2011) (2.2.2011);
- Issues Involving the Use of the Futures Market to Invest in Commodity Indexes, Government Accountability Office Letter to the Hon. Collin Peterson, Chair, House Committee on Agriculture (June 30, 2009); and
- Korniotis, *Does Speculation Affect Spot Price Levels? The Case of Metals With and Without Futures Markets*, Working Paper of the Finance and Economic Discussion Series, Federal Reserve Board (2009).

In a second set, CME filed:

- Stoll and Whaley, *Commodity Index Investing and Commodity Futures Prices*, Journal of Applied Finance (2010); and
- Irwin and Sanders, *The Impact of Index and Swap Funds on Commodity Markets: Preliminary Results* (OECD Food, Agriculture and Fisheries Working Papers, No. 27 2010).

In a third set, CME filed:

- Celso Brunetti and Bahattin Büyükşahin, *Is Speculation Destabilizing?* (working paper 2009);

- Bahattin Büyükşahin and Jeffrey H. Harris, *The Role of Speculators in the Crude Oil Futures Market* (working paper 2009); and

- Interagency Task Force on Commodity Markets, *Interim Report on Crude Oil* (July 2008).

Finally, CME submitted an undated CME study on conditional spot-month limits and CME Group's white paper, *Excessive Speculation and Position Limits in Energy Derivatives Markets*.

As a group, these studies are not new to the Commission. All of these papers, except the CME undated submission on conditional spot limits and the European Commission publication, were cited by the Commission in its NPRM and so are covered in the above analysis of various studies.[151]

The papers that pose the most serious challenge to the rule are the papers in CME's third set, for these the two papers written, at least in part, by former CFTC employees. As CME argues in its comment letters, these studies indicate that speculation in the crude oil markets was stabilizing, not destabilizing, during the financial crisis. Celso Brunetti and Bahattin Büyükşahin, *Is Speculation Destabilizing?* (working paper 2009) (using Granger analysis to study several commodity markets, paper finds there was no unwarranted volatility associated with increased participation by speculators); Bahattin Büyükşahin and Jeffrey H. Harris, *The Role of Speculators in the Crude Oil Futures Market* (working paper 2009) (no Granger-

[151] The CME undated CME study on conditional spot-month limits is the only empirical work submitted by CME in is opposition to the position limits rulemaking. It has been proven wrong. The Commission explained that CME made technical data errors in doing its analysis. NPRM, 76 FR 71626 at 71635 nn. 100-101. The European Commission publication in CME's first set of submissions, *Tackling the Challenges in Commodity Markets and Raw Materials*, European Commission (2011) (2.2.2011), is simply a discussion of policy initiatives. It concedes that it is difficult to know which way causation forms between financial and physical markets and states that "the debate . . . is still open" on whether financial inflows have affected prices. *Id*. at pp.2, 7.

causation between swap dealer positions, a proxy for commodity index fund positions, and returns in the crude oil or natural gas futures, a finding consistent across tests using different time periods within 2000 to 2008 and different lag periods).[152]

G. Response to Comments on Commission's Use of Economic Analysis

With all this in mind, we respond to some of the major comments that discuss the Commission's use of economic studies in the Commission's NPRM.

BlackRock, a sponsor of many commodity index funds, states:

> The Commission does not support its proposal by citing any modern study *proving* that large speculative positions *cause* artificial prices or price volatility. To the contrary, economists, academics, international agencies, and US governmental agencies, including the Commission itself, have not identified a *causal link* between speculation—whether by index funds specifically or speculators generally—and price volatility in commodities.

BlackRock March 28, 2011 Letter at p.3 (emphasis in original, footnote omitted). Putting aside the legal question of whether the Commission is required to prove a causal link, economists, when they do studies, do proofs of the absolute existence of economic phenomenon. As demonstrated throughout this paper, economists often perform statistical analysis and speak of the likelihood or probability of a relationship between economic variables. In the economic community, there is no universally accepted, definitive studying either proving *or disproving* a

[152] In a similar vein, a CFTC-led interagency task force report ascribes crude oil price volatility to fundamentals of supply and demand. This task force was formed by the CFTC and chaired by CFTC staff. In addition to CFTC task, task force participants included staff from the Departments of Agriculture, Energy, and the Treasury, the Board of Governors of the Federal Reserve System; the Federal Trade Commission, and the Securities and Exchange Commission. March 28, 2011 submission at (pdf-pagination) p.83. This report has its limitations. It was issued quickly in the middle of crude oil price volatility of 2008 and does not attempt to differentiate between periods of market calm and financial stress. Moreover, the Granger causality test used in this report is based on a price return equation that uses not only price return and change in position, but also lagged price returns. This causes the potential for masking a correlation between price and position, and thus reducing the power of the statistical analysis to find Granger-causation.

causal link between large speculative positions and artificial prices or price volatility or the ability of position limits to disturb such a link.[153] Instead, there are empirical studies with conclusions about correlations and possible relationships between economic phenomena. These include well-respected studies that indicate that there may be a causal link between large positions and price or price volatility.[154]

CME Group states "there is virtually unanimous academic agreement that commodity price changes have been driven by fundamental market conditions, not by speculation." CME Group Comment at p.4 (March 28, 2011). This is the overstatement, although the technical accuracy of this statement turns on what the meaning of "driven" means. Fundamentals can expect to almost always be a primary determinant of price, but that form of "driving" does not discount the possibility of substantial price distortions from unwanted market activity such as attempts at price manipulation.[155] There is not "virtually unanimous academic agreement" on whether, apart from the expectedly primary factors determining price, large speculative positions have, at least in certain markets at certain times, been a significant factor in price levels or price

---

[153] *See* Greenberger, *The Relationship of Unregulated Excessive Speculation to Oil Market Price Volatility* at pp. 8, 11 (working paper 2010) (citing Amaranth as an example of "excessive speculation" but conceding "[t]here can be no gainsaying that the establishment of position limits is more properly described as an art rather than an exact science").

[154] *E.g.*, Hamilton and Wu, *Risk Premia in Crude Oil Futures Prices*, Journal of International Money and Finance (2013); Tang and Xiong, *Index Investment and Financialization of Commodities*, Financial Analysts Journal (2012).

[155]

> Rising global demand was clearly driving many prices sharply upward, and this was probably a major factor for the price of oil. The only question is whether changes in demand and supply curves for oil account for all of the movement in price. Since there is no widely accepted measure of the global demand and supply curves for oil, it is difficult for economists to clearly demonstrate that the spike in the oil price is entirely determined by fundamentals.

Parsons, *Black Gold & Fool's Gold: Speculation in the Oil Futures Market* at p.82 (Economia 2009).

volatility. There is an active debate. *See* Irwin and Sanders, *Index Funds, Financialization, and Commodity Futures Markets*, Applied Economic Perspectives and Policy at p.15 (2010) (surveying literature in support and against the idea of a speculative bubble in prices arising from commodity index fund participation in the futures market).

Even Craig Pirrong, an economist who CME Group cites elsewhere in its comment, stated in a statement in support of ISDA/SIFMA's comment opposing the rule that the "ability of position limits to prevent corners and squeezes could provide a justification for application of these limits during the spot month," at least in theory, conceding that there is such a thing as "sudden and unwarranted price fluctuations." 2/10/14 ISDA/SIFMA Comment Letter, Annex B, at p.2, ¶¶ 6-9.

Like the CME Group, the Coalition of Physical Energy Companies asserts that there is "no empirical basis to conclude excessive speculation has burdened or harmed modern markets in any way." *See also* Perlman, Coalition of Physical Energy Companies at p.3 (2011). It quotes the CFTC Interagency Task Force preliminary findings of 2008, finding that "speculative traders typically alter their positions following price changes, suggesting that they are responding to new information…." Interagency Task Force on Commodity Markets, *Interim Report on Crude Oil* at p.3 (July 2008). The Coalition of Physical Energy Companies observes that while the CFTC "does not have to base its rule on the results of this recent study," the Commission should "acknowledge this work and explain or refute it prior to implementing any rule designed to prevent excessive speculation." Perlman, Coalition of Physical Energy Companies at p.4 (2011). *Id.* ("Given its recent published findings, the need for contrary data should be self-evident"). The CFTC Interagency Task Force's preliminary draft was published in July of 2008, before the sudden downturn in crude oil and other commodity prices in the second half of 2008. It prefaces

its conclusion by stating that its conclusions are "based on the evidence available to date," and as a study issued during the middle of the crisis, it did not contain complete data on post-July 2008 sudden downturns in commodity prices, including a precipitous drop in crude oil prices in the second half of 2008.[156]

ISDA/SIFMA stated in one of their comment letters that the Commission relied upon outdated information in citing the 1980s Hunt Brothers episode and Amaranth Advisors LLC's mid-2000s natural gas manipulation to support the rulemaking: "The CFTC's case studies of these two instances of market disruption do not provide a basis for conclusions that are useful or relevant to addressing the current market and current market participants." 2/10/14 ISDA/SIFMA Comment Letter at p.12. However, the Amaranth fact pattern is relatively current one. Further, these two cases are not the sole basis for the Commission's concerns, as expressed in the NPRM. The NPRM itself cites several economic studies that indicate the potential for market disruption in current markets. The Commission has recently approved the filing of a federal civil enforcement action against entities for using long futures positions to manipulate prices in the nation's wheat markets. *CFTC v. Kraft Foods Group, Inc., and Mondelēz Global LLC*, No. 15-2881 (N.D. Ill. April 1, 2015) (complaint). The defendants are charged violating speculative position limits in wheat futures without a bona fide hedging need. This federal complaint is recent evidence that in current marketplaces, the Commission has a legitimate interest in protecting all from outsized speculative positions. [157]

---

[156] The Coalition's suggestion that the Commission expressly respond, in the context of this position limits rulemaking, to a conclusion in a study it co-authored is a sound one. We recommend that the Commission do so.

[157] *See id.* The CFTC complaint charges that defendants took outsized long positions in wheat futures contract, thereby manipulating the spot wheat price profiting by about $5.4 million: $2-3 million reversing out of a spread and the remainder by sourcing cheaper wheat due to their manipulation of the cash market. That is, according to the CFTC Complaint, in response to high

The Commission's concern is not nor should be limited to "disruptions." Regardless of whether market activity is disruptive, manipulation of prices and abusive trade prices harm the important price discovery function of commodity futures market; undermine trust in market prices; and cause uneconomic prices and market activity. The Commission detailed this in its NPRM and, most recently, in its complaint in *CFTC v. Kraft Foods, supra.*

That said, there is merit in ISDA/SIFMA's view that many of the studies supporting the existence of excessive speculation are limited to the oil market and a particular point of time (2006-2009). 2/10/14 ISDA/SIFMA Comment Letter at pp.17-18. Many of the best papers in support of large positions impacting price involve empirical studies of the oil market. For example, the work of Hamilton and Wu shows risk premia impact for a particular market, the crude oil market, at a time of the financial crisis. This market experience may not be easily extensible to all commodity markets over all time periods.

ISDA/SIFMA accuse the Commission of "cherry-pick[ing]" studies in support of its position. 2/10/14 ISDA/SIFMA Comment Letter at p.17. Its footnote explaining why this is so is unpersuasive, and even scholars who generally agree with ISDA/SIFMA's position, such as Irwin and Sanders, agree that there is an active academic debate and an absence of consensus on key economic questions. Far from cherry-picking, some of the studies that Commission staff emphasize as particularly persuasive are nuanced and balanced work. The work of Professor

---

cash wheat prices in late Summer 2011, Kraft and Mondelēz developed, approved, and executed in early December 2011 a strategy to buy $90 million of December 2011 wheat futures, which amounted to a six-month supply of wheat. The CFTC Complaint alleges that Kraft and Mondelēz never intended to take delivery of this wheat, which amounted to about 15 million bushels of wheat. Instead, the defendants executed this strategy with the expectation that the market would react to their enormous long position by lowering cash wheat prices and strengthening the spread between December 2011 wheat and March 2012 wheat futures. Those price shifts did occur and, according to the CFTC Complaint, Kraft and Mondelēz earned over $5.4 million in profits.

Hamilton, for example, is often cited by both sides of the debate. While Hamilton and Wu's piece on risk premia tends to support the idea that large positions impacted the risk premium component of price in the crude oil market during the late 2000's, they do not attempt to quantify this price impact or conclude that it was substantial. In fact Hamilton in a separate paper on the cause of crude oil prices concludes that at least the run-up in price was suitably explained by fundamental factors of supply and demand. Hamilton, *Causes and Consequences of the Oil Shock of 2007-2008*, Brookings Paper on Economic Activity (2009) (confluence of robust economic growth worldwide, capacity constraints in crude oil extraction, was responsible for a considerable increase in oil prices during this time period, although large positions may have exacerbated the speed and magnitude of the subsequent price decline). The fact that this well-respected piece is cited by both sides in the debate indicates that there is indeed a debate. *See also* Sanders and Irwin, *Energy Futures Prices and Commodity Index Investment: New Evidence from Firm-Level Position Data*, at p.2 & n.2(working paper 2014) (while disputing any link between commodity index positions and price movements, conceding that the matter is contested among economists and the economic literature is "rapidly expanding").

ISDA/SIFMA also is correct, to a degree, in challenging the direct relevance of the work of Tang and Xiong on financialization, correctly saying that the paper itself says "nothing about position limits," 2/10/14 ISDA/SIFMA Comment Letter at p.18, for finding that different commodity prices become increasingly correlated when traded together in commodity index funds. That is correct; this finding, standing alone, could simply be evidence of improved price discovery through increased market participation by commodity index funds. However, Tang and Xiong, in their paper, *Index Investment and Financialization of Commodities*, Financial Analysts Journal (2012), go further. ISDA/SIFMA does not acknowledge or comment on the

further finding of Tang and Xiong that increasing presence of index traders in commodity futures markets improves risk sharing in these markets with concomitant volatility spillover in commodity markets from outside markets.

Summary of Major Studies

Below we provide major citations on both sides of active debates. We also provide cautions against citing certain papers that are not well-respected, not well-done, or have a substantial limitation in the particular context of position limits.

I. Major Papers For and Against Large Positions Causing Price Impact

One of the strongest bases for support for position limits among the studies cited is the Hamilton/Wu paper on crude oil risk premium. Hamilton and Wu, *Risk Premia in Crude Oil Futures Prices*, Journal of International Money and Finance (2013). It is an important contribution to the economic literature. All else being equal, we should expect risk premium to be the component of price that would be affected by entities taking outsized positions in the market place. At least currently in the commodities marketplace, speculators such as long-only hedge funds or ETFs are often, when they invest, essentially bidding to earn this risk premium. That is, they have entered the marketplace to earn this premium. This study, showing changes in risk premia associated with changes in position, finds evidence for large speculative positions can affect the price level of a commodity. Their study is based upon a fundamental model of supply and demand.

Separately, Kenneth Singleton, a Professor of Management at Stanford University, has, in paper, *Investor Flows and the 2008 Boom/Bust in Oil Prices* (March 2011),[158] also shown a link

[158] Markus Henn cites the 2011 version of the Singleton paper, but a subsequent May 2012 version is available from Professor Singleton's Stanford website at http://web.stanford.edu/~kenneths/.

between the volume of speculative positions and an increase in risk premium using Granger causality-like analysis. Professor Singleton found a link between the volume of speculative positions and an increase in risk premium. Because risk premium is a component of price, he thus found a link – Granger causal link – between speculative positions and price. Because risk premium is just a small component of price returns, this study does not purport to explain the large 2008 changes in crude oil prices through speculative positions taken by institutionalized investors. Nonetheless, Singleton's study has caused many economists to examine their design and analysis of Granger causality studies and explore why Singleton has found some form of causality when so many other Granger papers have failed to do so.

It may be that in the crude oil market during the particular time period, positions change quite slowly, and so choosing too short a time interval captures day-to-day oscillations in future price returns that positions do not explain. Professor Singleton's selection of a longer time interval for this particular market may have aided his finding of Granger causality between speculative positions and increases in risk premium. Of course, different commodity markets, in different periods of time, may have different ideal time lags for a Granger analysis. These questions of model design, application, and interpretation truly are, as Markus Henn observes, a matter of ongoing economic debate in the academic community.

These papers are, however, limited to a particular commodity during a particular historical time, and that commodity – crude oil – may be especially sensitive to this effect because of the storage issues discussed above. Moreover, risk premium is a small component of overall price returns. Hamilton and Wu's results on risk premium do not, and do not purport to, explain the very large swings in price seen in the crude oil futures market in 2008. Other studies

have successfully tracked fundamental market factors that should have, and apparently did, affect crude oil prices over the same time period.

In concert with this, Chevallier, *Price Relationships in Crude oil Futures: New Evidence from CFTC Disaggregated Data*, Environmental Economics and Policy Studies (2012), uses position limit data and switching regression analysis to suggest the existence of two states in price structure during 2008 crude oil market price swings. He concludes that one cannot eliminate the possibility of speculation as one of the main reasons behind the 2008 oil price swing. Specifically, using net speculative positions as one of his variables in his test, he found that this variable, based on a proxy for speculative positions, was statistically significant on crude oil futures natural logarithm of price returns during the 2008 time period. This result suggests that studies that look only to supply and demand without incorporating speculative demand to explain the crude oil market in 2008 may be overlooking an important factor. Chevallier concludes that while tight spare capacity is a reasonable explanation for some measure of the crude oil price swings in 2008, but speculation cannot be completely ruled out as a contributing factor. His paper suggests that with highly inelastic supply and demand, the influence of financial investors through the S&P GSCI Energy Spot may have contributed to price changes.

One of the very best papers on possible price impact from positions is a case study of the crude oil market and a paper that has been cited by both opponents and proponents of the position limit rulemaking. Evidence of the vitality of the ongoing economic debate in this area can be found the mixed results of Hamilton, *Causes and Consequences of the Oil Shock of 2007-2008* at pp. 17-23, Brookings Paper on Economic Activity (2009). James Hamilton, a Professor of Economics at the University of California at San Diego, asks the question of whether only

fundamentals of supply and demand caused the rise in crude oil prices in 2007-2008 (and their subsequent fall), or whether something else was at work. The paper concludes that the oil price run-up was caused by strong demand confronting stagnating world production, but the price collapse was perhaps not driven completely by fundamentals. The latter conclusion is taken, by some readers, as evidence of a "price bubble," but Hamilton does not use this language or make this finding. His paper concludes that the factors of supply and demand drove the oil shock, but the data also indicates that something other than fundamental factors of supply and demand (as modeled) – his method does not identify the cause – may have aggravated the speed and magnitude of the oil price collapse.

Similarly, there are many papers showing price impact in the crude oil market during the 2006-2009 time period. There are special features of the energy markets not present in the agricultural markets, including price behavior associated with storage in contracts such as crude oil futures that must be accounted for.[159] Moreover, not all commodity markets exhibit the same price behavior in different time eras. It is a serious omission not to acknowledge and deal with such differences.

One of the strongest bases for opposition to the idea that long positions by commodity index funds cause lasting price increases or volatility is a paper by then-CFTC economists Bahattin Büyükşahin and Jeffrey H. Harris, *The Role of Speculators in the Crude Oil Futures Market* (working paper 2009). Using Granger causality analysis, and studying the same market

[159] For example, CME Group is correct, in its white paper, *Excessive Speculation and Position Limits in Energy Derivatives Markets*, in asserting that several studies done n studies in support of position limits in the energy derivatives markets. *See id.* at p.5 (observing that some studies demonstrate (1) unfamiliarity with industry fundamentals resulting in misinterpretation of petroleum statistics; (2) confusion of the consequence of demand for physical product and demand for derivatives; (3) use of overly simplistic models; (4) arbitrary and meaningless characterization and measurement of "excessive speculation"; (5) misstatement of volatility trends; and (6) conflation of speculation and market manipulation).

as Hamilton and Wu, these authors, both at one time CFTC-employed economists, found little evidence that hedge funds and other non-commercial (speculator) position changes were causing – or rather were Granger-causing – price changes. Rather, price changes precede the position change. This study found that no single group or combination of groups of entities commonly considered speculators systematically Granger-caused price changes in nearby futures contracts. This is a well-respected paper and often-cited study.

Another strong paper against the impact of speculative positions on price is Sanders and Irwin, *The "Necessity" of New Position Limits in Agricultural Futures Markets: The Verdict from Daily Firm-Level Position Data* (working paper 2014). The authors use price and positon data shared by an unnamed large investment company, a commodity index fund, which is taking long positions as market speculator. They find no statistically significant price impact from the commodity index fund's rolls despite substantially-sized rolls. An important caveat to this paper's conclusion arises from the strong possibility that this unnamed fund's rolls are pre-announced; this would dampen the price impact of this high-volume speculative trading.

Finally, there is the preliminary findings of an interagency task force chaired by the CFTC which found, in the wake of the 2008 energy and agricultural price volatility:

> If a group of market participants has systematically driven prices, detailed daily position data should show that that group's position changes preceded price changes. The Task Force's preliminary analysis, based on the evidence available to date, suggests that changes in futures market participation by speculators have not systematically preceded price changes. On the contrary, most speculative traders typically alter their positions following price changes, suggesting that they are responding to new information – just as one would expect in an efficiently operating market.

Perlman, Coalition of Physical Energy Companies at pp.3-4 (2011) (citing interim agency task force report), *quoting* Interagency Task Force on Commodity Markets, *Interim Report on Crude*

Oil at p.3 (July 2008). This study was completed in draft in July 2008, before the sudden downturn in crude oil and other commodity prices in the second half of 2008, and thus its caveat – "based on the evidence available to date" – is an important one.

II. Major Papers For and Against Outsized Positions Causing Price Volatility

Another often-quoted study, Tang and Xiong, *Index Investment and Financialization of Commodities*, Financial Analysts Journal (2012), is one of few studies on the question of whether financialization has increased commodity price volatility. It finds that volatility spillovers from the financial crisis as a key driver of recent commodity price volatility.

Relatedly, Cheng, Kirilenko, and Xiong, *Convective Risk Flows in Commodity Futures Markets* (working paper 2012), concludes that financial traders reduce their net long position, causing risk to flow from financial traders to commercial hedgers. "[J]ust when the uncertainty in the economy was rising, the number of futures contracts used by commercial hedges to hedge their risk was going down." *Id.* at p.2. *See also* Acharya, Ramadorai, and Lochstoer, *Limits to Arbitrage and Hedging: Evidence from the Commodity Markets*, Journal of Financial Economics (2013) (decreases in financial traders' risk capacity should lead to increases in hedgers' hedging cost, all else being equal).

These results, all else being equal, would tend to suggest that net long financial traders, in times of financial stress, may withdraw from the marketplace, causing increases in the cost of hedging and possibly higher volatility associated with lower liquidity.

The other side of that coin is that generally, the increased volume of trading from financial speculators should generally decrease, not increase, volatility. A well-reasoned study by economists in the Office of Chief Economist concluded in 2009, that speculative trading in the futures market is not, in and of itself, destabilizing. Brunetti and Büyükşahin, *Is Speculation*

Destabilizing? (working paper 2009). The paper studies the market during a time of financial stress and finds results that tend to contradict the best studies in favor of a volatility spillover.

It is not easy to reconcile these best papers. A possible explanation is the different choices of statistical methodology. Brunetti and Büyükşahin, *Is Speculation Destabilizing?* (working paper 2009), use Granger analysis to study several commodity markets – crude oil, natural gas, corn, Eurodollar, and mini-Dow – during the financial crisis. Cheng, Kirilenko, and Xiong, *Convective Risk Flows in Commodity Futures Markets* (working paper 2012), criticizes the use of Granger methodology to answer these types of questions, observing that large financial traders during this time period may behave different at times of financial stress, matching correlations that would give rise to Granger-causality findings. On the other hand, papers that just use comovement methodology, such as Tang and Xiong, *Index Investment and Financialization of Commodities*, Financial Analysts Journal (2012), necessarily make inferential assumptions that the cause of volatility is speculative financial trading; again, correlation is not causation.

III. Major Papers on Financialization

Even Irwin and Sanders, prolific author of Granger-method papers generally showing little or no price impact from the holding of positions in the commodity futures market, concede that the inflow of monies from commodity index funds may have affected commodity futures prices. In one such paper, *Index Funds, Financialization, and Commodity Futures Markets*, Applied Economic Perspectives and Policy (2010), Irwin and Sanders survey literature in support and against the idea of a speculative bubble in prices arising from commodity index fund participation in the futures market. They conclude, accurately, that while certain studies "negate the argument that *no* evidence exists of a relationship between commodity index investment and

movements in commodity futures prices," the studies are subject to important limitations and another group of studies finds no correlation between index funds and the level of commodity futures prices. *Id.* at 15. The serious academic debate is about the extent of the price effect.

In the weak version of the Masters Hypothesis, the mere presence of "massive passives" distorts the marketplace. There are no reputable economic studies which fully endorse this view of how the commodity futures markets work.

The strongest paper supporting some aspects of the Masters Hypothesis address smaller, ephemeral price increases and increases in volatility limited to certain commodity markets in certain time periods. Hamilton, *Causes and Consequences of the Oil Shock of 2007-2008* at pp. 17-23, Brookings Paper on Economic Activity (2009) (possibility that large financial players may have increased the speed and magnitude of the decline in crude oil prices in 2008, but fundamentals, not large financial players, were responsible for the price run-up); Hamilton and Wu, *Risk Premia in Crude Oil Futures Prices*, Journal of International Money and Finance (2013) (risk premium increases associated with presence of large financial traders in crude oil market); Tang and Xiong, *Index Investment and Financialization of Commodities*, Financial Analysts Journal (2012) (volatility spillovers from the 2008 financial crisis may have been a key driver of commodity price volatility during that time period); Singleton, *Investor Flows and the 2008 Boom/Bust in Oil Prices* (March 23, 2011 working paper) (evidence that speculative positions Granger-causing risk premium on weekly time intervals during the 2007 to 2009 period when studying the crude oil futures markets); Hamilton and Wu, *Effects of Index-Fund Investing on Commodity Futures Prices*, International Economic Review, Vol. 56, No. 1 (February 2015) (finding some price impact for crude oil and none for agricultural commodities).

Observe that none of these best papers point to a sizable, semi-permanent and lasting price increase. With the exception of Tang and Xiong's paper, they are limited to the crude oil market, and Tang and Xiong's paper uses the comovement method that does not purport to establish a "causal relationship" between volatility and financial speculators.

The published studies of CFTC economists, stand in opposition to efforts to establish substantial price impacts from outsized market positions due to financialization. Brunetti and Büyükşahin, *Is Speculation Destabilizing?* (working paper 2009); Bahattin Büyükşahin and Jeffrey H. Harris, *The Role of Speculators in the Crude Oil Futures Market* (working paper 2009).

The word "bubble" is ill-defined and is frequently avoided in economics. There are no generally accepted academic papers that show generally, across different commodity futures classes, a lingering, substantial and semi-permanent price increase associated with the existence of sizable with long positions of institutional investors in the commodity futures markets.[160] More generally, some of the U.N. and other governmental studies that identify sizable, semi-permanent price increases contain substantial limitations of scope and design and cannot be identified as in the category of best studies.[161]

---

[160] Amaranth's natural gas positions are held out as an example of this, but there is no rigorous academic study establishing that this occurred in the case of Amaranth.

[161] For example, Gilbert, *Speculative Influences on Commodity Futures Prices, 2006-2008*, UN Conference on Trade and Development (2010) (Granger analysis concluding that there was a semi-permanent price impact from substantial positions in some commodities), is not on our "best" list. It contains singularly dramatic results that other economists have not reproduced. Although it is one of the most frequently cited papers to say that index funds cause permanent and substantial impact on price, it has not been relied upon by economists who have been accorded greater academic credence in this area of research, and we recommend against reliance on it. Even papers asserting that institutional traders' long speculative positions have caused price increases do not claim there is firm empirical evidence to support this. *See* Berg, *The Rise of Commodity Speculation: From Villainous to Venerable*, at p.260 (UN FAO 2011) ("[m]ost attempts to date to quantify the effects of speculation in agricultural markets have failed").

In sum, economic rationales for position limits founded in historical examples of price manipulation, or serious studies such as Hamilton and Wu which measure impacts on price returns from commodity market positions during the financial crisis, are stronger footing than reliance on the loose language of "financialization."

IV. Matters of Consensus

Without perfect certainty, there are some points of consensus that arise from the best studies concerning perceived "excessive speculation."

(1) There was a price phennomenon of disputed size in certain commodities associated with the financial crisis of 2006-2009 and increased participation of financial investors. In times of price uncertainty and rapidly changing price levels, some component of price returns– the risk premium – may be higher due to the substantial presence of speculators with long positions in the marketplace. The Hamilton and Wu paper on risk premia, Hamilton and Wu, *Risk Premia in Crude Oil Futures Prices*, Journal of International Money and Finance (2013), is persuasive. There is no certainty on how much of an influence on price this phenomenon: as much because studying this particular question in the context of position limits, with the data available, is extraordinarily difficult to do.

(2) Individual commodity markets may different from each other, and in particular the crude oil commodity futures market dynamics are unique and quite distinctive from some agricultural commodity markets. There is no economic reason to assume that just because speculative positions might have a price impact in commodity futures markets in crude oil, the same type of investment would have similar effects in agricultural futures markets.[162]

[162] Hamilton, *Causes and Consequences of the Oil Shock of 2007-2008*, Brookings Paper on Economic Activity (2009); Chevallier, *Price Relationships in Crude Oil Futures: New Evidence from CFTC Disaggregated Data*, Environmental Economics and Policy Studies (2012).

(3) Speculation is generally a good thing. Even in more volatile commodity markets such as the crude oil market of 2007-2008. (1) Much of the speculative financial activity surrounding these commodity markets is helpful and does not, as a general rule, increase prices or price volatility. As a well-reasoned study by economists in the Office of Chief Economist concluded in 2009, speculative trading in the futures market is not, in and of itself, destabilizing. Brunetti and Büyükşahin, *Is Speculation Destabilizing?* (working paper 2009) (cited in the Commission's notice of proposed rulemaking). For example, in the crude oil market, when excess capacity declined in 2008, this increased uncertainty and caused increase demand among commercial producers and energy users to hedge, and "[i]ncreases in speculative activity in crude oil markets … may be seen indeed as a result of the high level of oil prices and high uncertainty surrounding the value of future oil prices, not the other way around." Chevallier, *Price Relationships in Crude Oil Futures: New Evidence from CFTC Disaggregated Data*, Environmental Economics and Policy Studies (2012).

(3) The existence of outsized market positions increases the ability to engage in price manipulation and, historically, outsized market positions have been used to engage in price manipulation or other market activity that is deleterious to sound market operations. Pirrong's *Manipulation of the Commodity Futures Market Delivery Process*, at p.363, Journal of Business (1993) (futures market manipulations "distorts prices and creates deadweight losses;" "causes shorts to utilize real resources to make excessive deliveries;" "distorts consumption").

(4) The Masters hypothesis comes in weak and plausible versions. In the weak version, the mere presence of "massive passives" distorts the marketplace. In a theoretically plausible formulation, there can be an incremental influence on futures prices through market participants bidding to earn the risk premium that may inhere from holding a long futures

contract over some time intervals. The weak version is flawed and should not be relied upon. For reputable economists agree that, all else being equal, speculators' participation can be of particular help in times of great price volatility and uncertainty; if a price "bubble" truly exists, generally well-informed speculators may be the entities who burst the bubble.

(5) One should avoid use of the word "bubble" in the context of the position limits debate. Parsons, *Black Gold & Fool's Gold: Speculation in the Oil Futures Market* (Economia 2009) (Professor John Parsons of MIT explains: "Among economists there is a prevailing skepticism toward the view that the oil price spike was a bubble"). It masks all the important details about causation, significance of price impact, and how permanent the price impact is, in one ambiguous, undefined word. As one trader recently tweeted, "A bubble is something I get fired for not investing in." It is not a communicative or helpful word, and some of the best economists avoid use of this word.

(6) For more solid food in the economic debate, rather than deploying weaker version of the Masters hypothesis or talk of "bubbles, on more solid footing in the economic debate, policy makers can consider two other ways to discuss the policy implications of the limited findings of price return impact from speculative positions in the crude oil market during the 2006-2009 time period reveal. Instead of "Masters hypothesis" or "bubbles," economically sound prisms for discussing economic studies results include "effect on risk premia" and "financial stress." Again, some leading papers under these two prisms are:

(a) *Effect on risk premia*. There is economic evidence that in certain markets under certain stresses, outsized market positions can impact higher futures price through lower risk premia. Hamilton and Wu; Hamilton, *Causes and Consequences of the Oil Shock of 2007-2008* at pp. 17-23, Brookings Paper on Economic Activity (2009);

Hamilton and Wu, *Risk Premia in Crude Oil Futures Prices*, Journal of International Money and Finance (2013) (risk premium increases associated with presence of large financial traders in crude oil market); Singleton, *Investor Flows and the 2008 Boom/Bust in Oil Prices* (March 23, 2011 working paper) (evidence that speculative positions Granger-causing risk premium on weekly time intervals during the 2007 to 2009 period when studying the crude oil futures markets). *Cf.* Chevallier, *Price Relationships in Crude oil Futures: New Evidence from CFTC Disaggregated Data*, Environmental Economics and Policy Studies (2012) (using switching regressions, Chevallier concludes that the influence of financial investors may have contributed to price changes in the 2008 crude oil market and that models of fundamental supply and demand cannot eliminate the possibility of speculation as a leading cause of the 2008 oil price swings).

(b) *Financial stress*. There can be price return impact and volatility in times of financial stress that can be hidden by the generally beneficial effect of index fund speculation in non-stressed financial markets. Cheng, Kirilenko, and Xiong, *Convective Risk Flows in Commodity Futures Markets* (working paper 2012) (criticizing use of Granger studies in this context over time periods that may mask differing behavior of index fund investors at the point of financial stress). *Accord* Acharya, Ramadorai, and Lochstoer, *Limits to Arbitrage and Hedging: Evidence from the Commodity Markets*, Journal of Financial Economics (2013) (decreases in financial traders' risk capacity should lead to increases in hedgers' hedging cost, all else being equal). There is also evidence of volatility spillovers from the financial crisis as a key driver of recent commodity price volatility. Tang and Xiong, *Index Investment and Financialization of Commodities*, Financial Analysts Journal (2012).

Of course, these results are disputed. *E.g.*, Brunetti and Büyükşahin, *Is Speculation Destabilizing?* (working paper 2009) (finding that found that hedge funds exert a calming influence on crude oil prices by lowering oil price volatility during a time of financial stress, using Granger causality analysis); Interagency Task Force on Commodity Markets, *Interim Report on Crude Oil* (July 2008).

Both of these approaches or "prisms" are exceptions to the general rule that speculation is generally good for markets and market price discovery.

Conclusion

Economists debate whether "excessive speculation," meaning a link between large speculation positions and unwarranted price changes or price volatility, exists in these regulated markets, and if so to what degree. The question presented is a surprisingly difficult one to answer. All the empirical studies on this question have drawbacks, and none is conclusive. This inconclusivity is not surprising. It is inevitable, given the economic uncertainties that inhere in the data and the complexity of the question. There are many theoretical and empirical assumptions, and often multiple leaps of faith, that are needed to transform and interpret raw market data into meaningful and persuasive results. There is no decisive statistical method for establishing evidence for or against position limits in the commodity.

Those that use Granger causality methodology tend to conclude that there is no evidence of excessive speculation or its consequences on price returns and price volatility, and many industry commenters opposed to position limits used this methodology. But that methodology is peculiarly sensitive to model design choices, and above we have analyzed designed modelling decisions that may have affected the ultimate conclusions of these studies. Moreover, there are countervailing Granger studies showing a link between large speculative positions and price

volatility. And studies such as Cheng, Kirilenko, and Xiong, *Convective Risk Flows in Commodity Futures Markets* (working paper 2012), indicate that some Granger studies may mask the impact of excessive speculation in times of financial stress.

Those that use comovement and cointegration methods tend to conclude there is evidence of deleterious effects of "excessive speculation." Yet comovement just tests for correlation, not causation, and a correlation between large financial trading in the commodity markets and price changes and volatility could be driven by a common causal agent such as macroeconomic factors.

Those studies that use models of fundamental supply and demand reach a whole host of divergent opinions on the subject, each opinion only as strong as the many modelling choices.

In this way, the economic literature is inconclusive. Even clearly written, well-respected papers often contain nuances. It is telling that Hamilton, *Causes and Consequences of the Oil Shock of 2007-2008*, Brookings Paper on Economic Activity (2009), has been cited by both proponents and opponents of position limits.

What can be said with certainty is summarized in the Commission's NPRM: that large speculative positions and outsized market power pose risks to a well-functioning marketplace. These risks may very well differ depending on commodity market structure, but can in some markets cause real-world price impacts through a higher risk premium as a component of total price. There are also economic studies indicating some correlation between increased speculation and price volatility in times of financial stress, but this correlation does not imply causation. There are studies indicating that in certain markets, such as crude oil, or certain time periods, such as times of financial stress, the impact of excessive speculation may be greater. These findings are all exceptions to the general rule that increased participation of speculators

should generally be expected to lead to better price discovery and less unwarranted price volatility.

Comment letters on either side declaring that the matter is settled in their favor among respectable economists are simply incorrect. The best economists on both sides of the debate concede that there is a legitimate debate afoot. This analysis paper documents that the academic debate amongst economists about the magnitude, prevalence, and pervasiveness of the risk of outsized market positions has reputable and legitimate standard-bearers for opposing positions.

APPENDIX A (Henn Letter)

APPENDIX B (02/10/14 ISDA/SIFMA Comment Letter)

This comment letter contains the Pirrong and Verlager economic analyses as appendices.

APPENDIX C (Study Categorization)

(separate electronic attachment)