AGRICULTURAL COMMODITY FUTURES PRICE VOLATILITY: A MARKET REGULATORY POLICY STUDY

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Abstract

Agricultural commodity futures markets experienced dramatic price swings between 2007 and 2012. Applied economic research has not reached a consensus as to the cause of increased volatility. Policy research indicates that financial and commodity market regulation should revert to the policies prior to the Commodity Futures Modernization Act of 2000. The Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010 has been an attempt to re-tighten legislation, but challenges to the Dodd-Frank Act, and its implementation, have prevented a complete return to more constrained market regulatory policies. Policy scholars credit financial and commodity market turmoil to changes in regulatory policy, but no specific research has been identified that associates changes in market volatility with changes in regulatory policy. This research examines the price volatility of four agricultural commodity futures markets and how their price volatility relates to economic fundamentals, speculative participation, and regulatory policy shifts. Commodity regulatory policy, along with other variables, is associated with changes in market volatility.

The Problem

Increased price volatility, between 2007 and 2012, across physical and agricultural futures markets has drawn the attention of both applied economic and public policy scholars because turbulent commodity prices have significant economic and political implications. The larger commodity markets by volume and value, such as

energy and metals, have attracted the most interest. The smaller agricultural crops, such as corn, wheat, soybeans, and cotton, have received less attention. Regardless of size, commodity futures regulatory policy blankets all actively traded futures markets. Regulatory policy change may be one of many significant causes of these booms and busts.

This research question is: *why has agricultural commodity futures price volatility changed over time?* This question is important to policy studies because it is important to understand if a regulatory policy influences market volatility. If regulatory policy can influence market volatility, policy makers may be able to enact a policy that is gauged for a level of volatility in the market. Economic research has centered on the causes of price volatility. Policy research has observed market behavior before and after regulatory change but without quantitative analysis, especially for agricultural commodity markets. Comparing market volatility both prior and after a major regulatory policy change is one way to determine the correlation between regulatory policy and volatility; but to understand the relative significance of the relationship, other variables must be corrected for in the model.

This research focuses on recent historically high volatility in major agricultural commodity markets. High volatility can be a sign of market failure if there is information asymmetry[1] (markets are perceived not to reflect true economic fundamentals), severe financial hardship, and / or manipulative activity by participants (hoarding or

[1] Asymmetric information refers to a situation where, in a particular market, some market participant knows more about market characteristics than do other market participants; it appears to have played a role in the recent financial crisis (Williamson, 2011, pp. 313 and 318). Ulbrich (2011, p. 345) defines information asymmetry as the disparity between the seller and the buyer in information quality, reliability, and other aspects of product or service. The author believes information asymmetry exists in agricultural commodity markets where a participant may have knowledge of stock that is eligible for contract certification and / or product quality information (at respective locations) that all participants may not have access (and can be reflected in basis divergence).

stockpiling). If regulatory policy does not address the problem of market failure, via the rules established by Congress or regulations enforced by the designated government agency, then regulatory policy must shift to abate or minimize the problem. A quantitative assessment of volatility surrounding major shifts in commodity regulatory policy is examined, adjusting for economic fundamentals and non-commercial market participation variables. Applying policy theory, qualitative assessment examines the causes of regulatory policy change and the difficulties of implementation. Finally, the specific tool to prevent or minimize market failure is presented.

Price Volatility

In a meeting in Rome in October of 2014, the Food and Agriculture Organization of the United Nations (FAO) stressed that price volatility was a major issue affecting all agricultural commodities. International food and agricultural raw materials have become vulnerable to excessive price volatility, causing some food and fiber producing countries to lose their trust in world markets as a reliable source of supply. National governments have turned to policies that enhance their food and fiber self-sufficiency (FAO, 2014).

The result of dramatic price swings between 2007 and 2008, in the case of cotton, was bankruptcy and financial hardship for commercial cotton futures market participants, also referred to as hedgers. Commodity hedgers include producers (farmers), merchants / shippers (distributors), processors (flour and textile mills), and ancillary services to those industries (Carter, 2003). Firms that have been in business for generations were forced to dismiss employees, liquidate assets, and / or declare bankruptcy to meet the financial obligations required of futures market positions (Carter and Janzen, 2009; Janzen, 2010).

Individual participants suffered, as did national economies that rely on cotton and cotton-related income (McFerron, Javier, and Perez, 2013). Consumers and producers in both developing and developed countries faced distress, leading to market distorting responses and stockpiling by foreign governments to protect domestic economies dependent on cotton production and / or manufacturing (Plastina, 2011).

The story is very similar for other agricultural commodities. For many years speculation has been blamed as a cause of abnormal volatility in commodity futures markets (Medlock and Jaffe, 2009). Since the introduction of financial futures markets in the early 1970's, non-commercial participation has increased in agricultural futures markets; and since a change in regulation in 2000, speculative driven participation has increased dramatically (Robles, Torero, and von Braun, 2009). Non-commercial participants are those not directly involved in the production, distribution, processing, or consumption of an agricultural commodity. Bankers, money managers, index funds, and hedge funds are considered to be non-commercial participants, often referred to as large speculators. These Wall Street firms trade in futures markets principally for profit and use futures markets to offset (hedge) their risk in underwriting commodity-based over-the-counter (OTC) derivative products (swaps) for their customers.

Exchange-traded (ET) futures and options have traded on organized exchanges since their inception in the mid-19th century, and have been federally regulated since the 1920's (GFA, 1922). OTC derivatives are traded between firms, not on a futures exchange, and were not regulated by a government agency until the passage of the Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010 (Dodd-Frank, 2010). Many of the clients of financial institutions use commodity-based derivatives and

investment products to speculate on the price direction of that commodity or a basket of commodities. It is ironic that today's large financial institutions may have a banking division that provides a loan to a commercial hedger to finance business activity; but at the same time may be taking the opposite side of a futures transaction, inadvertently profiting from the client's loss (O'Brien, 2012).

Market Regulation

Modern agricultural futures exchanges with standardized contracts and clearing systems began in the mid-19th century in Chicago and New York. In 1936, Congress enacted the Commodity Exchange Act (CEA, 1936) that replaced the Grain Futures Act of 1922. The CEA (1936) provides federal regulation of all commodities and futures trading activities and requires all commodity futures to be traded on organized exchanges. Specifically, CEA (1936) authorized the use of "position limits" to limit the size a futures position a trader can have in the market. This regulatory legislation was enacted in response to the high degree of speculation that occurred in the 1920's and 1930's.

After the United States abandoned the gold standard in 1971, bringing the Breton Woods system to an end, and with the introduction of financial futures markets in the early 1970's, Congress established the Commodity Futures Trading Commission (CFTC) in 1974 in the Commodity Futures Trading Commission Act (CFTCA, 1974) as an independent agency to regulate commodity futures and options markets in the United States. From the middle 1970's until the late 1990's, growing domestic and international economies created more capital that encouraged financial service institutions to seek a

wider range of investment opportunities and products for their clients. The technology of the information age, allowing instant global communication and electronic transactions, has revolutionized financial markets. The increasing pace of marketing innovation has instituted round-the-clock trading by active market users and market intermediaries (Born, 2001).

Government regulatory agencies are in charge of overseeing markets to protect market participants and the public from fraud, abusive practices, and systemic risk. While the Securities and Exchange Commission (SEC) regulates stock, bond, and currency markets in the United States, the CFTC is empowered by Congress to regulate organized futures, options, and swap markets. The CFTC's mission is to foster transparent, open, competitive, and financially sound markets (CFTC, 2016). Complicated investigations and extended litigation by the CFTC have been necessary to prove manipulation.

In 2000, responding to the demand for flexibility by the financial industry, Congress passed the Commodity Futures Modernization Act (CFMA, 2000) that deregulated certain financial products. Over-the-counter derivatives went unregulated, much to the chagrin of the CFTC (Brush and Schmidt, 2013). This de-regulation lead to an explosion in a myriad of financial products, many based on commodities, where the underlying price exposure was hedged in commodity futures markets. Since then, institutional hedge funds, pensions funds, and investment banks have substantially increased participation in agricultural commodity futures markets. Based on the findings of the International Food Policy Research Institute (Robles, Torero, and von Braun, 2009), noncommercial firms are more than half of market participation, compared to one-

third twenty years ago. No longer are the majority of participants commercial hedging organizations who use futures to manage price risk; instead they are large non-commercial institutions trading purely for profit for their clients and themselves. This phenomenon has become known as "the financialization of commodity markets," according to a World Bank policy research working paper (Baffes and Haniotis, 2010).

In response to the financial crisis of 2007-2009, Congress passed the Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010 (Dodd-Frank, 2010), which changed the financial regulatory environment affecting all federal financial regulatory agencies. As part of the overhaul, Dodd-Frank (2010) requires the CFTC to limit the amount of futures contracts that a single trader or firm can hold (position limit) on a commodity; however, the law failed to offer much guidance on the scope of the limits (Protess, 2011). Under the guidelines of the CFTC, commodity exchanges each establish position limits for each commodity traded on its own exchange. From 1936 until 2000, the dominant policy instrument utilized to curb excessive speculation was position limits, the constraint on participants to prevent manipulation in the market. However, after 1991, the CFTC used its discretion to grant exemptions from position limits to certain futures market participants. As of October 2013, twenty-eight physical commodity futures markets (including cotton, soybeans, corn, and wheat) had not seen the Dodd-Frank (2010) requirement implemented, despite a proposal by the CFTC for a new system of position limits. The CFTC ruling was rejected in a District of Columbia court on appeal by a consortium of financial industry representatives (Peterson, 2012). In November 2103, the CFTC proposed a new rule setting position limits and modifications were still being proposed (Federal Register, September 29, 2015).

Policy Implementation

Prior to the enactment of the Dodd-Frank (2010), the CFTC was a regulatory agency struggling to find its level of authority and enforcement in a rapidly expanding derivatives market. The high costs of enforcement and prosecution were a deterring factor to regulators (Markham, 1991). There have also been contentions between the CFTC and the SEC over jurisdiction. That contention has been due to the complexity of the derivatives market as to what is defined as a commodity and what is defined as security. After the enactment of Dodd-Frank (2010), the CFTC found itself with clear responsibilities and defined jurisdiction on equal basis with other financial market regulatory agencies (Greenberger, 2011). Contentions with the SEC have eased as the classification of derivatives has improved under the law. Unfortunately, the CFTC has been struggling with inadequate resources to fully implement regulation in a timely and encompassing fashion (Massad, 2015).

In 1998, United States ET futures and options volume was 630 million contracts. By 2008, trading volume had increased to 3.4 billion contracts, a rise of 440 percent in ten years. In 2014, trading volume increased to 8.2 billion contracts, twelve times the amount sixteen years earlier. From 1988 to 2008, the number of large (reportable) traders[2] on U.S. exchanges monitored by the CFTC grew by 26 percent, the number of reportable traders in the Chicago Board of Trade corn and wheat contracts increased 43

[2] CFTC market surveillance staff assesses individual trader's activities and potential market power and enforces speculative position limits by using a large trader reporting system (LTRS). Under the Commission's LTRS, clearing members, futures commission merchants, and foreign brokers (collectively called reporting firms) file daily reports with the Commission under Part 17 of the CFTC's regulations, 17 CFR Part 17. The reports show futures and option positions of traders with positions at or above specific reporting levels as set by the Commission. Current reporting levels are found in CFTC Regulation 15.03(b), 17 CFR 15.03(b) (CFTC Website, 2015).

percent and 116 percent respectively, and those in the New York Mercantile Exchange West Texas Intermediate crude oil contract grew 74 percent. During the period from 2006 to 2007, just before the recent financial crisis, financial futures and energy futures volume grew by 27 percent, agricultural futures by 23 percent, and metal futures by 38 percent (Bennett, 2010). In notional value terms, in 2009, the U.S. market for ET futures and OTC swaps markets combined was $290 trillion and for the world market $600 trillion. By 2011, those figures had increased to $358 trillion and $633 trillion respectively. In 2013, the market for U.S. ET futures and OTC swaps had steadied to $356 trillion, but the world market had increased to $710 trillion (FIA, 2015), as Dodd-Frank (2010) regulations encouraged United States firms to move transactions offshore.

Agricultural Commodities

This research focuses on the agricultural commodities of cotton, soybeans, corn, and wheat. All four are major fiber, food, or fuel crops (or some combination thereof) that are internationally traded, produced, and processed in the United States and around the world. Each has one or more associated active futures markets based in the United States as well as domestic and overseas OTC derivative markets. The importance upon global food and fiber commerce and local economies of these four commodities has been revealed in such classic works as Morgan's (1979, 2000) *The Merchants of Grain*, Broehl's (1992) *Cargill: Trading the World's Grain*, Beckert's (2014) *Empire of Cotton: A Global History*, and Garside's (1935) *Cotton Goes to Market: A Graphic Description of a Great Industry*.

If the problem of abnormal volatility is not addressed, traditional participants may be forced to exit commodity futures markets. If futures market price swings continue to be extreme over extended periods of time, hedgers will not be able to finance commercial activities and futures hedging at the same time. For farmers with limited access to capital, this means that financing the production of a crop, and funding a short futures position to hedge that crop, may not be possible. Without the ability to hedge price risk, forward contracting will diminish. This would mean that producers will not be able to sell crops prior to harvest to secure profitable margins; instead they will be subject to the prevailing price at harvest. Processors will not be able to buy inventory forward; they will only be able to buy for immediate shipment or hold inventory at their own cost as merchants / shippers will not hold inventory in storage. Fear of high market volatility leads to stockpiling by commodity economies and institutions that may become normal practice. In 2010, this was the case when the Chinese central government began stockpiling cotton (McFerron, 2013).

Scholarly Significance

For economic scholars, commodity price volatility affects producer and agribusiness current and projected income. Output price volatility is an indispensable input for farmers' and agribusiness' decision-making (Yang, Haigh, and Leatham, 2001). Economic research has focused on whether increased speculation or unusual economic supply and demand fundamentals have led to more dramatic price swings and the resulting financial hardship for commodity hedgers (Janzen, 2010; Power and Robinson, 2009). While economists have not reached a consensus as to the causes of recent volatile

commodity futures prices (Irwin and Sanders, 2011), they have acknowledged that extreme volatility can be detrimental to commercial market participants (Janzen, 2010; Carter and Janzen, 2009). Some applied economists caution that a change in market regulatory policy to induce a change in market volatility could be made for the wrong reasons (Irwin and Sanders, 2011; Wright, 2011).

Applied economic research has addressed the increased participation by speculators, but most research has only focused on one sector of the speculative element, index funds. There are many other elements of speculation besides index funds. As in energy market research (Medlock and Jaffe, 2009), contract volume and open interest (at any given time) do not coincide with world production and consumption numbers (within historical ranges). For the agricultural commodity futures markets, the growth in non-regulated financial products is also likely to coincide with increased volumes, participation, and volatility. Stockpiling by governments has many industry participants concerned about the ramifications of unregulated manipulative practices on the market (McFerron, 2013, Plastina and Ding, 2011). Most of the recent work has focused just on the 2007-2008 time period, therefore a more longitudinal period of study should reveal more insight. Given the recent market volatility of 2010-2011, previous research that has addressed the issue of causation, economic fundamentals of supply and demand versus increased speculative participation should be revisited.

For policy analysts, commodity market volatility may affect United States agricultural policy in the form of farm income policy and financial market regulation. Congress is concerned with financial loss and risk borne by farmers whether the threats are from natural causes, government policy, or free market trading. Public policy

research has focused on the change in financial and commodity market regulation. The findings stress that regulatory policy needs to revert to the tighter controls utilized to curb speculative participation in financial and commodity markets prior to 2000 (Wray, 2008). Policy scholars stress that the degree of market volatility in financial and commodity markets is not just the concern of professional market participants, commercial or non-commercial, but also the general public at large. Regulatory policies that encourage market volatility can do great harm, and can lead to devastation of the American (Anderson, 2011, pp. 328-329) and global economy.

Topham (2010) identified the influential stakeholders and authorities that made policy changes, and the periods of complacency and disruption that preceded policy change, but policy research has not measured market volatility to gauge regulatory policy effectiveness. According to Topham (2010), since the early 1970's two theories have dominated economic policy: (1) the "efficient market" hypothesis holds that asset prices reflect all information available in the market and (2) the "capital asset pricing model" assumes every investor rationally balances risk against reward. These popular economic theories, combined with financial industry lobbying efforts and subsequent legislation, pushed commodity futures market regulatory policy towards financial deregulation that culminated in the creation of the Commodity Futures Modernization Act of 2000 (CFMA 2000). Wray (2008, p. 5) warned about serious disruptions in the market place in the absence of public policy reform of CFMA (2000). In the shadow of the financial crisis of 2008, these "free market" theories have proven gravely erroneous (Krugman, 2009) and the warnings by policy scholars were proven correct.

Public reaction to the financial crisis that led to the call for expanded regulation of the financial industry gained prominence as Dodd-Frank (2010) surfaced on the policy agenda. Anderson (2011) made further warnings that reform legislation would be moderate in tone as the economy improved. Anderson (2011) and Greenberger (2011) also predicted that resistance would be strong from free market economists and their Wall Street colleagues, causing delayed implementation.

Literature Review

Market behavior, as reflected by price volatility, is naturally drawn into the vortex of narrow economic rather than broader public policy research. This tendency has been especially noticeable following a financial crisis. Once the fallout of a crisis is evident, policy scholars and researchers follow their economic counterparts and begin to reflect and reassess what policy changes should be made to prevent perceived market failure of information asymmetry and widespread financial stress. Given the magnitude and daily impact on peoples' lives, energy market price volatility has drawn the greatest attention of all physical commodity markets from researchers (Medlock and Jaffe, 2009; Dugan, 2008). To a lesser degree, base and precious metal market volatility has been studied (Gilbert, 2010; Irwin and Sanders, 2011). Further down the chain of popularity are agricultural commodity markets, the grain and oilseed markets of corn, wheat and soybeans commanding the most attention (Irwin and Sanders, 2012, 2011; Irwin, Sanders, and Merrin, 2010, 2009; Wright 2011; Robles, Torero, and von Braun, 2009; Baffes, and Haniotis, 2010). The cotton market has received some economic attention, though very little in comparison to other markets (Baffes, 2005; Carter and Janzen, 2009;

McFerron, Javier, and Perez, 2013; Plastina, 2008; Power and Robinson, 2009; Janzen, Smith, and Carter, 2013).

Economic research has addressed the causes of market volatility without coming to a general consensus for two reasons: (1) when focusing on speculation as a cause, academics have concentrated on the passive speculation of index funds where institutional research has focused on more broad measures of speculative participation, *i.e.* swap dealers, hedge funds, and index funds; and (2) possibly because quantitative methods applying statistical analysis and econometric modeling have yielded different findings. Pirrong (2012) concluded that seasonal commodity prices demonstrate the limitations of partial equilibrium structural models because they do not fully capture intertemporal choices available to market participants. He suggests it is likely that general equilibrium models, with multiple storable commodities, are required to provide a more accurate characterization of commodity prices (Pirrong, 2102, p. 12).

Policy research has identified how policy authorities have reacted to prevailing economic theory, influential stakeholders, and public opinion (Kloner, 2001; Born, 2001). Where economists advise caution in implementing policy instruments that seek to reduce market volatility (for fear of adverse market effects), policy scholars call for regulatory change that reverts to tighter controls (Wray, 2008; Topham, 2010) to prevent market failure (in fear of economic and political instability). Economists theorize that policy drives market behavior; policy scholars theorize that market behavior, or a transition in power, ultimately lead to a change in policy. Regardless of why volatility levels change, research has yet to identify if commodity regulatory policy has any significant influence on agricultural commodity price volatility.

Dependent Variables

The *dependent variables* utilized in this research to measure commodity price volatility in agricultural markets are the nearby (front month) daily commodity futures price for the cotton, soybean, corn, and wheat markets. Spot or cash markets are the distributive markets for commodities, whereas futures markets are primarily financial markets that may culminate in the actual delivery of a commodity. It is a commodity's cash market that directly affects the price of goods that consumers pay. If the price of bread increases, it is likely that the price that a mill paid for a bushel of wheat has risen and has been passed on to the consumer. However, commodity futures markets indirectly affect the price of goods that a consumer pays as they facilitate the management of commodity price risk. Futures markets rely on credit and the ability of participants to meet financial obligations. Commercial participants use futures to hedge, or reduce price risk. Since futures markets are open to the public, where transactions are offset through a clearing-house and a margining (good faith deposit) system ensures contract sanctity, speculators also participate. Speculators seek price risk to reap financial rewards. If futures market movement affects cash market movement, then past values of futures markets should contain information that helps predict cash market values above and beyond the information contained in past values of cash markets alone. The following analysis justifies the use of futures price data as the dependent value in this research over cash price data.

Data

Two sets of nearby futures price were utilized: (1) First of Month (FOM) roll and (2) Last Trading Day (LTD) roll. To establish a continuous nearby futures price from one contract delivery month to the next, given multiple deliveries for futures contracts, either a FOM or LTD roll applies. A nearby futures price applying FOM rolls from the settlement price on the last trading day of the preceding calendar month for a contract delivery to the settlement price on the first day of trading in the subsequent calendar month for the next contract delivery (from one calendar month to the next is the point of roll). A nearby futures price applying LTD rolls from the settlement price on the last trading day of the delivery contract and begins on the next day's settlement of the subsequent futures delivery contract (calendar month is insignificant; contract expiration is the point of roll). The following are the data sets utilized for futures and cash prices in the GC and subsequent analyses:

Cotton Futures: the daily settlement price of the InterContinental Exchange (ICE, 2015) Cotton No. 2 Futures Contract supplied by Quandl Data Platform (2015). The nearby (continuous) includes both a First of Month (FOM) and Last Trading Day (LTD) roll. Data extended from January 2, 1973 to September 20, 2015.

Cotton Cash: the daily Cotlook 'A' Index (2015). The current spot quotation is for middling grade, 1-3/32 inch staple length, is continuous, and extends from January 2, 1973 to September 30, 2015. Prior to July 1, 2004, the A Index quote was for CIF NE Europe delivery; from July 1, 2004 to September 30, 2015 the quote is for CFR Far East.

Soybean Futures: the daily settlement price of the Chicago Mercantile Exchange (CME, 2015) Soybean Futures Contract supplied by Quandl Data Platform (2015). The nearby continuous includes both a First of Month (FOM) and Last Trading Day (LTD) roll. Data extended from January 2, 1973 to September 20, 2015.

Soybean Cash: the daily No. 1 Yellow Soybean Central, IL quote supplied by the United States Department of Agriculture (USDA, 2015). The current spot quotation is continuous and extends from January 2, 1992 to September 30, 2015.

Corn Futures: the daily settlement price of the Chicago Mercantile Exchange (CME, 2015) Corn Futures Contract supplied by Quandl Data Platform (2015). The nearby continuous includes both a First of Month (FOM) and Last Trading Day (LTD) roll. Data extended from January 2, 1973 to September 20, 2015.

Corn Cash: the daily No. 2 Yellow Corn Decatur, IL quote supplied by the United States Department of Agriculture (USDA, 2015). The current spot quotation is continuous and extends from September 2, 1992 to September 30, 2015.

Wheat Futures: the daily settlement price of the Chicago Mercantile Exchange (CME, 2015) Wheat Futures Contract supplied by Quandl Data Platform (2015). The nearby continuous includes both a First of Month (FOM) and Last Trading Day (LTD) roll. Data extended from January 2, 1973 to September 20, 2015.

Wheat Cash: the daily No. 2 Soft Red Wheat Toledo, OH quote supplied by the United States Department of Agriculture (USDA, 2015). The current spot quotation is continuous and extends from January 2, 1992 to September 30

Findings

This paper has not identified the specific economic, market inefficiency, or one rule or law that can be attributed to the recent pronounced market volatility in the cotton, soybean, wheat, and corn agricultural futures market. But what this research has done is examine why and how changes were made in regulatory policy which is intended to guide general market behavior. This research has found that commodity regulatory policy, along with many other variables, is associated with changes in market volatility.

Granger causality established that futures prices were a suitable dependent variable to represent the cotton, soybean, corn, and wheat markets in a study of commodity market volatility change over time. The coefficient of variation (CV) and a rolling coefficient of variation (Rolling CV(n)) both yielded like results to other measures of volatility; the RCV(n) proved its effectiveness in accounting for trend, seasonality, and lagging effects.

The particular risk that commercial hedgers face in using futures markets for risk management purposes was addressed. Basis is the cash (or spot) price minus the futures price. The basis study revealed that composite basis volatility across the four agricultural commodities, as measured by a RCV(4), had a positive correlation to cash and futures market volatility for weekly price data between 1992 and 2015. Basis volatility rose along with cash (spot) and futures volatility from the early 2000's until 2010/11 marketing season. Between the 2011/12 and 2014/15 marketing seasons basis volatility was at a premium to futures volatility. The peak for basis volatility came during the 2008/09 marketing season for the composite and cotton, a time when three major international cotton organizations met financial hardship.

With respect to independent variables, a significantly positive relationship between composite futures price volatility, as measured by a RCV(4), and USA stocks to use (S/U) ratio volatility (economic) was established on data from 1973 to 2015. World S/U ratio had a negative relationship with the composite RCV(4), but the results were not statistically significant. Across three categories of non-commercial participation (NCP) data (based on CFTC Commitment of Trader reports, COT) from 1986 to 2105, it was established that (1) NCP was more active in futures than option on futures markets, (2) NCP increased about 10 percent (from 50 percent to 60 percent) relative to commercial participation (CP) from the mid-1990's to 2015, and (3) there was not a significant direct relationship between composite futures volatility and either NCP or NCP volatility. For Commodity Index Traders (CIT), between 2006 and 2015, (1) volatility was greater for a change in their net position (long or short) versus the volatility of their participation and (2) CIT participation volatility was not significantly related to composite futures price volatility, except for the 2008/09 marketing season where CIT participation significantly increased as did composite and cotton futures price volatility.

No significant correlation was established between the composite volatility of USA and world supply numbers and composite futures open interest (OI), futures and option total open interest (TOI), and NCP as a percentage of composite USA and world supply. However, where previous studies in the energy markets have emphasized the increase of outstanding (open) futures contracts relative to world supply and demand (as does this research), composite NCP increased between 10 percent and 15 percent relative to composite commercial participation (CP) as a percentage of composite USA and world supply (consistent with the change in net COT participation).

Having established that composite futures price volatility and NCP level increased between 1986 and 2015, but that there was no significant relationship between composite price futures volatility and NCP volatility, econometric models constructed attempt to establish cause and effect. A model that tested mean levels of futures price volatility before and after five regulatory policy shifts found that futures price volatility was significantly different in four out of five cases. To make the model more dynamically complete by including the previously mentioned independent variables, Baumgartner and Jones' (2009) policy theory of punctuated equilibrium (PE) was put to the test.

Applying two types of autoregressive models, RCV(n) and squared residual analysis (SRA), the following conclusions were made. (1) Commodity and composite futures price volatility followed the same patterns across periods as in previous measures and models. (2) USA S/U ratio and S/U ratio volatility were significantly higher than that of the world but since the mid-2000's, world has gained significance over the USA. (3) USA S/U ratio volatility and NCP volatility were significant variables affecting composite nearby futures volatility before and after Dodd-Frank (2010). (4) A change in volatility is not solely the result of a shift in regulatory policy but is a result of many variables, each exerting their influence at different times. No one variable consistently stands out to significantly affect any specific commodity or composite futures price volatility, but no variable, regulatory policy shift, economic, or non-commercial influence, can be ruled out of the equation.

This research concurs with two recent studies (CEPS, 2013; Dwyer, Gardner, and Williams, 2011) conducted by institutions outside of the United States. Europe and Australia, though different in market size, both have sophisticated financial systems that

rival those of Wall Street and Chicago. The interconnectedness of financial and commodity markets worldwide, and the recent financial and food crises, has led to an equal amount of research study and political debate as in the United States.

Policy Tools to Address the Problem

Commodity futures markets have grown exponentially to include ET and OTC financial products as well as traditional hard (industrial) and soft (agricultural) commodity markets. Futures and OTC swaps markets are essential to the American and world economy and the way that businesses and investors manage risk. Farmers, ranchers, producers, commercial companies, municipalities, pension funds and others use derivatives to lock in a price or a rate and focus on what they do best – innovating and producing goods and services for the economy. The CFTC works to ensure that commodity hedgers and other market participants can use these markets with confidence; the Commission has an obligation to ensure that transparency, without manipulation and fraud, underpins a sound economy.

Commercial hedgers need non-commercial (speculative) participants to provide liquidity in the marketplace. But as they themselves need to comply with principles, rules, and regulations to prevent market manipulation, speculators also must comply to deter market failure. The problem is that the game has changed to the extent that the speculative element has more capital resources than the commercial participants and thus, at times, may have an "unnatural" influence on the markets (Topham, 2010). To limit that possible influence, discriminatory rules must exist to find economically tenable market balance among participants.

During the 1990's, the CFTC granted a series of exemptions regarding position limits for futures trading entities and the push for unregulated OTC derivative markets was successful with the enactment of the CFMA (2000). The financial crisis and global food crisis between 2007 and 2009 were necessary for a policy correction to be enacted. Dodd-Frank (2010) was designed to regulate all derivative markets, and give the CFTC and the SEC more salient enforcement tools to deter market manipulation and price distortion. The enactment of Dodd-Frank (2010), along with other financial market regulatory reforms, required the CFTC to limit the amount of futures contracts that a single trader or firm could hold on a commodity (Dodd-Frank, 2010; Clapp and Helleiner, 2010 via US House of Representatives, 2010: 354).

Challenges remain in the relationships that the CFTC maintains with the participants in ET futures and OTC swaps markets because of the concentration of the financial industry (small number of large firms) and diversification of commercial industries (large number of small firms). Those challenges include (1) compromising the control of market volatility with respect to position limits for agricultural commodities based on percentage of deliverable supply; (2) banks waiting on public comment regarding the ability to achieve dual objectives in the Volker Rule for proprietary trading; (3) commercial hedgers (non-financial end-users) not being required to post margin on swap transactions; (4) swap dealers putting a firewall in place to prevent conflicts of interest between trading, clearing units, and research units; (5) foreign companies dealing on U.S. markets being subject to the same rules; and (6) exchanges not being over or under-regulated to discourage participation in the markets.

These challenges of governing an evolutionary market for the CFTC have not changed over time. In the 1920's the rhetoric was that agricultural futures markets were nothing more than legalized gambling pits, by the 1980's the new "exotic" futures on financial commodities were targeted by the critics. Today, over-the-counter derivatives such as credit default swaps are called "weapons of mass destruction" (Topham, 2010). Critics of derivative markets in Congress have conceded that agricultural futures' trading is economically desirable, and in fact vital to the United States economy. The natural and necessary evolution of the financial futures trading mechanism clearly also benefits the nation's economy. The danger is in prohibiting and over-regulating these commercial tools. Targeted regulation is necessary; over-regulation is harmful. Finding the balance is the never-ending challenge of the CFTC and Congress. The noose must be tight, but not so tight as to strangle (Stassen, 1982).

While they were once the only derivatives markets around, the past forty years have seen the agricultural commodity futures markets in the United States become part of the much larger global financial derivatives market. Vested interests are at work when it comes to the regulation of commodity futures markets, irrespective of the economic laws of supply and demand. Potential manipulation needs to be controlled and one way is via position limits, i.e. limiting the amount of participation any one entity can have in the market. Historically, margining and position limits have been preferred regulatory instruments used to prevent market failure. Unfortunately, there has been only limited academic research on the effect these policy tools have had on abnormal market volatility.

The tools for effective commodity futures regulatory policy have existed in the past. Technological innovation has enabled some participants to stay one-step ahead of regulation. Given ample resources, regulators have an opportunity to monitor progress in derivative market innovation. For the success and sustainability of commodity futures markets in the United States, the most difficult challenge is for those in political authority and regulatory enforcement to maintain consistency and discipline in their actions, given a dynamic economic and political environment. (1) Congress should supply the CFTC with sufficient human and financial resources to do its job effectively. and clarify legislation to avoid ambiguous interpretation of policy and especially legal challenges that delay implementation and enforcement. (2) The CFTC should enhance and continue to improve market data (COT reports) collection on all participant positions in derivative markets. Most importantly, the Commission should enact and enforce commodity futures position limits on non-commercial accounts regardless of the economic and political climate. (3) The President should appoint the CFTC chair and commissioners who fully understand the law and their authorizing environment to implement and effectively enforce regulatory policy. (4) Commodity Groups should continue to solicit the CFTC for greater transparency of commodity market participation, especially in the OTC swaps market. Information has not been forthcoming until just before the financial crisis of 2007-2009. The swaps market continues to grow across all physical commodity and financial markets worldwide.

Future Research

For future research, this paper could be extended in of itself and two other areas of study. (1) Instead of regulatory policy shifts, actual position limit levels of specific commodities could be applied as indicator variables. This may be one way to measure the effect that position limits have on commodity price volatility when incorporated with other variables. (2) To focus more on the risk of commercial hedgers, actual basis levels and basis volatility could become a dependent variable in place of commodity price or volatility. Extreme and extended divergence of basis is a sign of market failure; if futures prices do not converge to cash prices by the end of the delivery period for a futures contract, then the futures market is not functioning as a price discovery mechanism. Greater understanding of these issues would aid in policy authorities deciding whether there should be uniform or discriminatory application amongst different classifications of commodity futures market participants.

Time and again, through the history of capitalism and free markets, predatory and manipulative practices have had to be challenged and controlled. If not, consumers (social welfare) suffer at the expense of greed (elitism). This research has clarified that the chosen dominant policy instrument for commodity futures regulatory policy is the application of feasible position limits for certain participants in the commodity futures market. Less regulation allows more participation and greater leverage by individual participants to influence the market. More regulation limits the degree to which participants can influence the market. Regulatory policy is needed that allows a balance of both commercial and non-commercial participants, where one faction is not perceived

to and does not dominate market activity. Regulations need to be clear and not ambivalent for the regulatory agency to have a clear idea what is to be done. Those regulations need also be enforced and not manipulated out of the public's eye.

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