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Commodity Price Volatility: The Impact of Commodity Index Traders

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1.0 Introduction

The dramatic rise in crop prices that occurred in the fall of 2006 was the beginning of an unprecedented level of volatility in agricultural markets. For example, corn prices for most of this decade fluctuated within a range of US\$0.50 per bushel around an average price in the low US\$2 range. However, corn prices on the Chicago Board of Trade (CBOT) doubled within a six week period beginning in September 2006 and then doubled again by the spring of 2008 (Figure 1). Corn prices have since fallen back but appear to be fluctuating around a new average price of around US\$4 per bushel. There also appears to be much greater price swings than in the past. Similar price spikes occurred in the wheat market (Figure 2) but within a shorter time frame. The recent rise of wheat prices in July 2010 has revived memories of the commodity boom of 2006-2008.

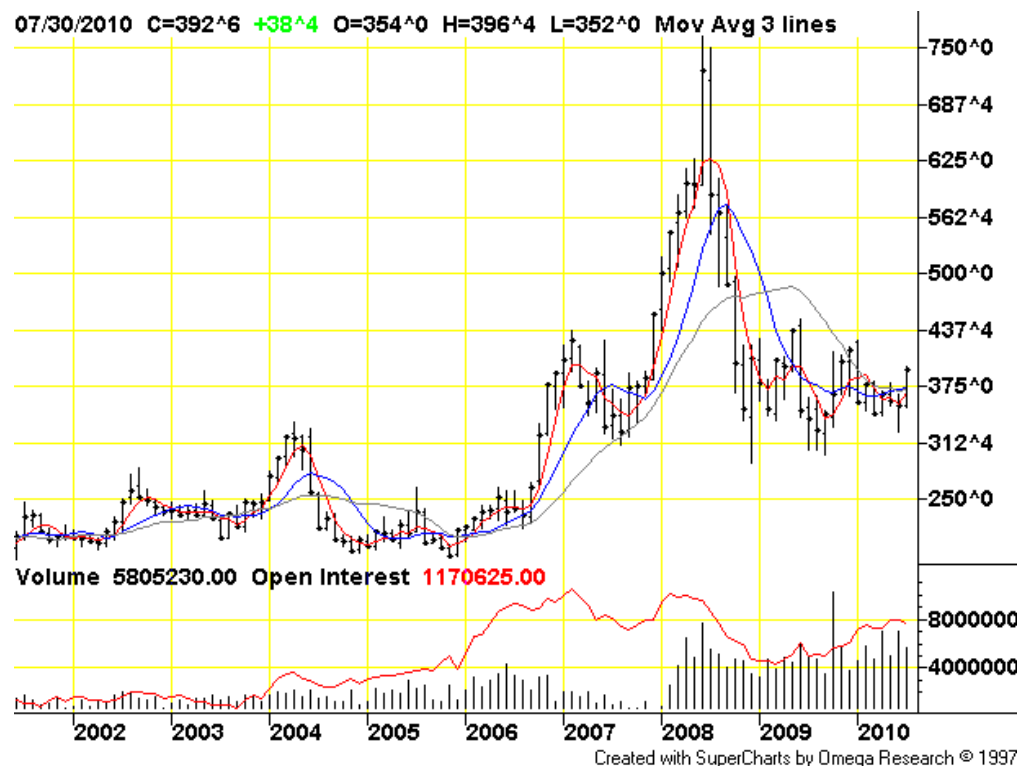
The dramatic price changes evident in the commodity markets have consequences for both consumers and producers. The sudden increase in major crop prices translated into higher food prices in developing countries and spawned concerns over the “silent tsunami” that was spreading over the less fortunate who could not afford adequate nutrition. While the apparent higher average prices are a benefit to producers, the corresponding volatility has imposed greater demands on price risk management for farmers and grain handlers. The two most important purposes of derivative markets are risk shifting and price discovery. However, the “unusual” commodity market volatility has created uncertainty around the accuracy of prices and in the potential loss of the major price shifting tool producers and the industry have – just when they need it most. Higher volatility increases hedging costs associated with financing margin calls, and the increases have been large enough to force the closure of some small and mid-sized elevators. Other grain elevators are coping with the volatility and hedging costs by refusing to buy crops in advance from farmers, barring the most common way farmers lock in prices. In an attempt to determine appropriate policies to deal with the consequences of the dramatic price swings to both consumers and producers, answers are being sought to the questions surrounding the causes for price movements in the agricultural commodity markets.

A number of factors contributed to the rise in prices and the degree of volatility experienced in 2007-2008 (Westhoff, 2010; Baffes and Haniotis, 2010; Piesse and Thirtle, 2009; Weersink *et al.*, 2008). The stock-to-use ratio had fallen to historic lows for most crops as production levels had flattened over the years in response to continued low prices. Poor harvests then occurred in some major exporting countries in 2006-2007 and this reduction in supply happened alongside several demand-side shifts. The US dollar fell relative to other currencies increasing the purchasing power of foreign commodity buyers. These buyers were increasingly from countries such as China and India which were experiencing GDP growth that was several times the global average. In addition, renewable fuel mandates, particularly in the US, represented a new demand source that now accounts for over one-third of the US corn crop.

Speculators were and continue to be a popular target for explaining the price swings experienced in the commodity markets. The volume of activity in the CBOT for

the major crops is shown by the line at the bottom of Figures 1 and 2. The increase in the number of contracts traded mirrors the increase in price and is given by some as evidence that the activity has pushed prices above that implied by the underlying supply and demand fundamentals and increased the price volatility. It became common for political leaders and the media to argue that commodity index traders (CITs) and other large institutional investors exerted a destabilizing influence on prices, particularly after a submission by William Masters to a US Senate sub-committee in the summer of 2008 (Masters 2008). Subsequently, there have been demands for regulatory intervention to lessen the impacts of speculative trading on the assumption that the actions of index traders destabilize commodity prices.

Figure 1: Monthly Nearby CBOT Corn Prices in cents per bushel, 2001-Present



Source: <http://futures.tradingcharts.com/chart/CN/M>

Figure 2: Monthly Nearby CBOT Wheat Prices in cents per bushel, 2001-Present



Source: <http://futures.tradingcharts.com/chart/CW/M>

The debate over the role of speculators on commodity prices has been renewed in the summer of 2010. An OECD report by Irwin and Sanders (2010) released early in the summer dismissed the impact of index fund investments on commodity markets. While at the same time, other observers such as von Braun (2010) claim the doubling of wheat prices in July 2010 is partially due to the role of speculators and called for policies to dampen the volatility in agricultural markets.

The purpose of this study is to review the impacts of commodity index traders on prices in agricultural commodity futures markets. Specifically, we aim to answer the following questions:

1. How do commodity index traders operate?
2. What are the arguments of those claiming speculators have influenced commodity and in some cases food prices (Weersink et al., 2009)?
3. What are the counter-arguments made by those who claim prices have moved due to underlying market fundamentals and not from speculator activity?

4. What is the empirical evidence on the relationship between investment fund activity and commodity prices in the futures market? and,
5. What are the implications of the presence of commodity index traders for the risk management and price discovery role of the futures market?

The next section reviews the mechanics of commodity index traders and how new financial products have resulted in the “financialization” of commodity futures markets. In section 3, we present the basis for the arguments made by Masters (2008) and others that the funds flowing from index fund trading created the price bubble observed in commodity markets. The second part of section 3 presents the counter arguments of Irwin and Saunders (2010), among others, that the movement in commodity prices was not a bubble but rather the result of demand shifts and supply shocks that pushed prices higher. Section 4 gives the empirical evidence on the role of speculative activity on commodity prices. The results are generally mixed although there is more support for the view that the price changes were not a speculative bubble. The paper concludes with the implications of the findings for risk management and stabilization policy.

2.0 Speculators, Derivative Markets and Access Liquidity

The purpose of this section is to describe the concepts related to the “financialization” of agricultural commodity markets. It begins with examining the role of speculators in establishing commodity prices and the categorization of speculators by motivation and by place of transaction. We then discuss the reasons for “new” money to flow into commodity markets. The increasing attractiveness of these markets to investors was further stimulated by the development of new financial products. The major financial instrument that allowed institutions and individuals to invest in commodity markets was a commodity index fund (CIT) and the details of this long-only product is described in the final sub-section. A number of terms used in this section are unique to the futures market and are defined in the Appendix.

2.1 The Role of Speculators

The futures market is a commodity exchange where futures contracts for buying and selling commodities for future delivery are traded. The futures exchange offers standardized contracts on set amounts of many commodities. In the vast majority of cases, traders of agricultural commodity futures contracts do not take physical delivery of the commodity being traded on the futures market. The primary purpose of the futures market is to establish prices for commodities for delivery at specified times in the future, and to enable commercial market participants to protect their business activities against the risk of future price fluctuations. In the futures market, the three major types of traders are:

- (1) commercial traders¹ or hedgers who use futures to reduce the risk of future unfavorable changes in the price of commodities that they handle;
- (2) non-commercial traders or speculators who aim to benefit from future price movements; and,
- (3) arbitrageurs who attempt to profit by locking into more than one market (Hull, 2008).

Speculators have been characterized by many as both ‘bad’ and ‘good’ when market price are too low or too high. Markets are efficient if all available information is embedded into the price, which subsequently then follows a random walk. In well-functioning capital markets, rational speculators enhance market efficiency (Grossman, 1995; Stiglitz, 1980). The market efficiency role of speculators has long been recognized (Smith, 1776; Mill, 1887; Keynes 1930; Freidman; 1953). Adam Smith (1776) and John Stuart Mill (1887) indicated that speculators enhance the inter-temporal allocation of resources and stabilize asset prices. Later, Keynes (1930) argued that speculators provide liquidity to the market and underwrite the risks of price volatility in the spot market. Meanwhile, Freidman (1959) suggested that profitable speculation - buying when price is low and selling when price is high - should stabilize commodity prices. However, there are critics that question the role of speculators to enhance market efficiency and stabilize prices (Brunnermeier and Nagal, 2004).

The literature identifies two types of speculators – rational traders (Friedman, 1953) and noise traders (Black 1986). Rational or informed speculators base trading on market fundamentals and are likely to stabilize markets by reducing excess price fluctuations. Noise or uninformed traders are investors who irrationally trade noise as if it were information pertinent to the value of the assets (Black 1986; Kyle, 1985). Noise traders can drive a wedge between market prices and fundamental values (Sanders and Irwin 2009a). Friedman (1953) and Fama (1965) arguing against the importance of noise traders, point out that informed/rational arbitrageurs trade against uninformed traders and in the process drive prices close to the fundamental values; thus noise traders lose money to arbitrageurs and eventually disappear from the market.² According to this classification, speculative trading can be either stabilizing or destabilizing depending on which type of investors dominate the commodity market. While the efficient market hypothesis assumes that all trades are informed so that market fundamentals determine commodity prices, the information content of trades only become evident over time and uninformed trading based on trends in prices can significantly influence prices (Gilbert, 2010).

Another means of categorizing speculators while also highlighting the functioning of a futures market, is to differentiate commodity transactions by the place in which they occur (physical versus financial) and the agents involved (hedgers versus speculators).

¹ A “producer/merchant/processor/user” is a commercial entity that predominantly engages in the production, processing, packing or handling of a physical commodity and uses the futures markets to manage or hedge risks associated with those activities.

² De Long *et al.* (1989) provide a model of an asset market in which irrational noise traders with erroneous stochastic beliefs affect prices and earn higher expected returns.

The differentiation is summarized in Table 1 (Baffes and Haniotis 2010). Commodity transactions can involve a physical exchange, such as corn being sold by a farmer to a local elevator, or a futures exchange, such as when the elevator hedges the corn purchase with a futures contract. As noted above, hedgers are involved in commodity transactions at both places. Speculators are also involved in both transaction locations. Most farmers, rather than hedge their commodity, tend to hold on to it in the hope of garnering a higher price than the one available at harvest. Unless significant inventories are held that result in market manipulation (i.e. OPEC), this type of speculative activity tends to balance the market and reduce price variability (Baffes and Haniotis, 2010). The bottom right quadrant of Table 1 encompasses speculators who do not transact physical commodities but instead arbitrage only on the futures market. This group has grown significantly as will be discussed further in section 2.C.

Table 1: Categorization of Commodity Transactions by Agents and Place

Place of Transaction	Agents Involved in Transaction	
	<i>Hedgers</i>	<i>Speculators</i>
<i>Physical</i>	Producers/consumers Traders Banks	Holding inventories Keeping resources in ground Market manipulation
<i>Financial</i>	Producers/consumers Traders Banks	Investment funds (i.e. pension funds) Investment & diversification instruments (i.e. hedge funds) Market manipulation

Source: Baffes and Haniotis (2010).

2.2 The Attraction of Commodity Markets to Investors

Traditional speculators, regardless of the categorization, have long been a fundamental part of futures markets, but the number of investors or speculators has increased over time. Commodity markets became a more attractive investment compared to other options such as stocks or bonds in recent years due to higher expected returns, its negative correlation to other investments, and its protection against inflation. As a result of these factors, “new” money flowed into the commodity markets.

The annual returns and correlations for commodity index returns, stock returns, bond returns, and inflation are listed in Table 2. The values in Table 2 support the idea that a commodity index is an attractive, separate asset class to be considered in a portfolio. Returns on an index of commodities for a 30 year period starting in 1970, even before the recent price spike, were comparable to other asset classes. In addition, commodities tended to have positive returns more frequently than equities and, as a consequence, provide another reason for investors wanting to include commodities in equity portfolios (IMF 2006).

The higher relative returns for commodities evidenced in the last part of the previous century was enhanced by the low interest rates during most of the last decade. Rather than invest in bonds, the resulting excess liquidity flowed into other alternatives including commodity markets (Baffes and Hanriotis, 2010).

Commodity index returns also are negatively correlated with returns in other asset classes (Table 2). Global crises, such as natural disasters and geopolitical conflict, tend to raise commodity prices while affecting equities negatively, thereby making commodities an attractive risk-reducing option in a portfolio. Thus, commodity markets not only offered good returns relative to stocks and bonds, but also provided a significant diversification to typical asset classes. The diversification characteristic placed commodities in a role similar to gold and set the stage for the “financialization of commodities” (Baffes and Hanriotis, 2010).

Commodity index investments also offer protection against inflation, and positive returns when commodity prices are rising (Greer, 2000). As Robert Greer (2000: p. 45) put it “Unexpected inflation may result in negative returns to stock and equity market while often being favorable to increasing commodity prices. In addition... commodity indexes may provide exposure to long-term growth in world demand that may also result in an increasing demand and prices for certain commodity products.”

Table 2: Correlation for Commodity Index Returns, Stocks Returns, Bonds Returns and Inflation (1970-1999)

	Commodity Index	Stock	Bonds	Inflation
Commodity Index	1.00	-0.14	-0.32	0.23
Stocks		1.00	0.39	-0.43
Bonds			1.00	-0.43
Average Annual Return	12.2%	14.9%	9.6%	
Average Annual Volatility	19.6%	16.0%	12.1%	
Skewness	0.57	-0.67	0.76	

Source: Greer (2000)

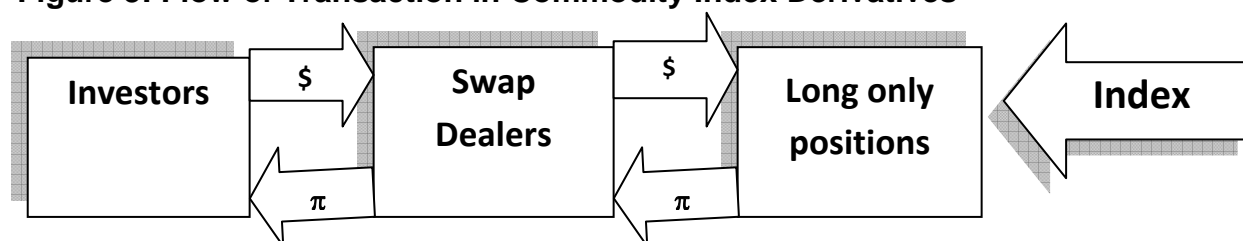
2.3 Commodity Index Speculators

The traditional approach to investing in a commodity market was through the purchase of a contract on a futures market like the Chicago Board of Trade. The volatility and margin call risks meant that such an investment was made primarily by hedgers or traditional speculators and not ordinary, risk-averse investors. The development of financial instruments, particularly commodity index funds, created a vehicle for individuals and institutions to readily invest in these markets that offer higher risk premiums and reduced portfolio risk. A new category of trader, commodity index speculators (including pension and endowment funds), have been created and are now a significant part of futures markets.

Commodity index traders (CITs) are institutional investors engaged in commodities futures trading strategies that seek to replicate one of the major commodities indices by mechanically following that index's methodology. Commodity indexes (e.g., S&P Goldman Sachs Commodity Index (S&P-GSCI), CRB-Bridge, Chase Physical Commodity Index, J.P. Morgan Commodity Index, and the Dow Jones-AIG Commodity Index) are derivatives that swap dealers package for institutional investors to invest in a basket of commodities, where funds are not directly traded on futures exchange. Figure 3 depicts the flow of transactions in the commodity index derivatives.

CITs consider commodity futures as an asset class, comparable to equities, bonds, real estate and emerging market assets. CITs take positions on commodities as a group based on the risk-return properties of portfolios containing commodity futures relative to those confined to traditional asset classes. CITs are passive traders who take on price risk, and are buyers (with a transparent buy and hold strategy). The participation by active (informed) traders and noise traders provides information about the future returns of an asset class, whereas the participation by passive investors should have no predictive power (Kelly, 1997).

Figure 3: Flow of Transaction in Commodity Index Derivatives



As opposed to traditional speculators, index traders buy exposure to commodities in futures markets and maintain their position through pre-specified rolling strategies - buy and hold (Figure 4). Index funds provide a mechanism for the average investor to hold a position in the commodity market. Commodity index traders seek exposure to commodities through passive long-term, long-only investment in commodity indexes. Passively managed investments can be attractive to institutional investors with a longer-term investment horizon, such as pension funds. As noted above, CITs earn a positive roll return if the commodity market is in backwardation.³ “Backwardating”

³ Keynes (1935) provides a theoretical explanation for the existence of returns in a passive long-only commodity futures position: “...in normal conditions the spot price exceeds the forward price, i.e., there is “backwardation” (Keynes, 1935). Keynes’ (1930) and Hicks’ (1939) theory of normal backwardation postulated that the risk premium would on average accrue to the buyers of futures. The Keynes hypothesis holds that substantial producer hedging pressure causes the forward price of certain commodity futures contracts to fall to a discount to the spot commodity price. One implication of this hypothesis is that an investor who buys discounted commodity futures contracts may expect to earn a return due to taking on price risk that inventory holders wish to lay off.

occurs if either the spot price is trading at a premium to its futures contracts or if a nearby-month futures contract is trading at a premium to distant futures contracts. In a backwardated market, contracts increase in price as they approach expiration, creating a positive roll yield. CITs profit by “rolling” into less-expensive, longer-term contracts. Suppose a current (nearby) month contract price for a commodity is \$79.02 whereas the future (distance) month contract price is \$78.40, a futures index that rolls from the current contract to the next month's contract will realize an annualized roll benefit of approximately 9.42 percent. An index investor buys the second delivery nearby futures contract and holds it until it becomes the first nearby contract (Figure 4). The index investor then sells the contract and buys the current second contract. This is called rolling the futures position (Hull 2008). This passive strategy is designed to gain exposure to commodity price movements as part of a portfolio development strategy. Roll return is one of the important components of the total returns from index trading (Erb and Harvey 2005; Feldman and Till 2006). According to Gorton and Rouwenhorst (2004), roll returns are an important explanation for why the average return on commodity index futures has exceeded the average return from holding spot commodities. The effectiveness of the long-only strategy to generate positive roll depends on the persistence of the factors that leads to backwardation, such as low levels of stock available for short selling and positive convenience yield (Domanski and Heath, 2007). Because futures price changes and roll yields are the sources of excess return for commodity indexes, long-only indexes have no way to capture the returns available from shorting futures when there is downward price pressure or a positively sloped futures price curve. Long-only indexes generate negative roll returns when markets are in contango and thus can have negative returns when commodity prices are rising.

Figure 4: Buy and Hold Strategy: In a backwardated market, contracts increase in price as they approach expiration, creating a positive roll yield

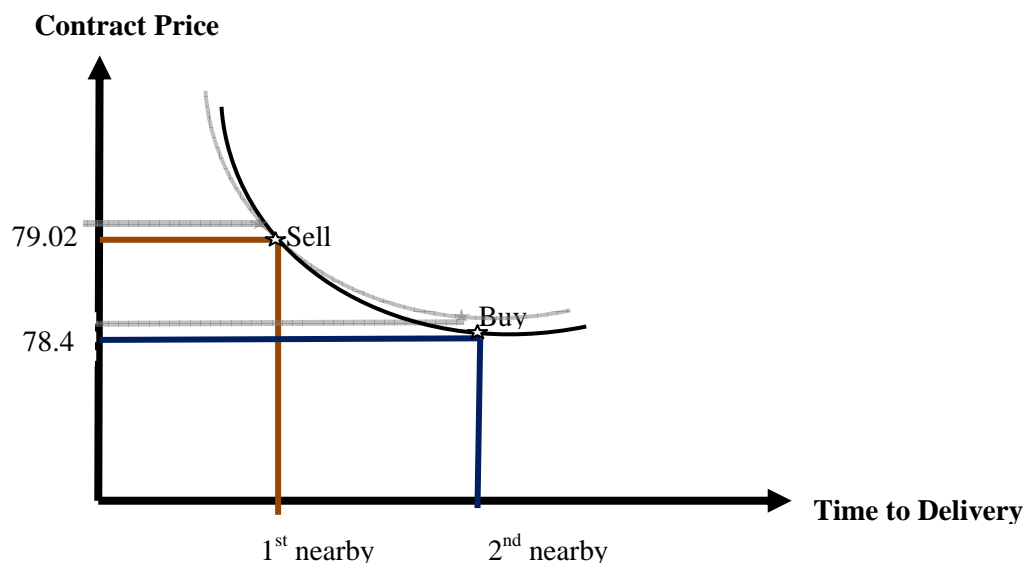


Table 3: Selected Agricultural Commodities Futures Markets Open Interest, 2008

Commodity	Long (Demand Side, %)			Price Increases 2003 -08	\$ Value of Open Interest (in million US\$)	
	Physical Hedgers	Traditional Speculators	Index Speculators		2002	2008
Corn	41	24	35	134	5435	37,427
Soy Oil	46	22	32	199	1,441	8,868
Soybeans	30	28	42	143	4,883	37,399
Wheat CBT	17	20	64	314	1,836	19,742
Wheat KC	37	32	31	276	1,304	6,253
Feeder Cattle	17	53	30	34	540	1,818
Lean Hogs	18	20	63	10	602	4,465
Live Cattle	13	24	63	23	2,670	8,764

The amount of money invested in commodity index funds has risen from \$13 billion at the end of 2003 to \$260 billion in March 2008 (Masters 2008). In terms of crop markets specifically, Masters (2008) noted that index speculators purchased over 2 billion bushels of corn contracts on the CBOT in a 5 year period beginning in 2003 (Table 3). Total investment in commodity index funds dropped slightly in 2009 to approximately \$240 billion due to lower commodity prices. Although this amount is approximately 1% of the global value of pension and sovereign wealth funds, it is large relative to the size of commodity markets ((Baffes and Haniotis, 2010). The next question is what impacts did this “new” money have on commodity markets?

3.0 Potential Effect of Index Funds On Commodity Markets

3.1 Index Funds Created a Price Bubble

The correlation between the value invested by commodity index funds (CITs) and the increase in commodity futures prices is indisputable (Figures 1 and 2). One group of CIT critics argues that the large inflow of funds into commodity markets by index investors caused prices to rise higher than justified by economic fundamentals (Gheit, 2008; Masters, 2008; Masters and White, 2008; Soros 2008). These critics contend the new money became the driving force in the market and created a price bubble, as opposed to the traditional view in which commercial hedgers determine the volume of activity and speculators follow.

The concern over CITs was ignited in part to the submission by Michael Masters to the US Senate Committee on Homeland Security and Government Affairs in July 2008. Masters noted that while traditional speculators have always been an integral part of the commodity futures market, index speculators are a relatively new component that entered after the stock market fall of 2002. As Masters (2008) testified and as discussed in the previous section, index speculators buy futures and roll their positions forward by buying calendar spreads in contrast to traditional speculators who buy and sell future positions. The “virtual hoarding” by CITs represented a new demand shock that decreased market liquidity rather than enhanced it as with traditional speculators.

As commodity prices rise, the subsequent allocation to a commodity futures index increases thereby accelerating the rate of price increase. Thus, investors betting on high prices became a self-fulfilling prophecy according to Masters (2008). Soros (2008) also argued that investment in instruments linked to commodity indices exaggerated the price rises and called these funds the “elephant in the room” with respect to the commodity price shocks.

Petzel (2009) suggested that the funds flowing into commodity markets through CITs and others represented not only a new demand but one that was too large relative to the size of the market. Petzel (2009) claims that the effect of taking a long position and continually rolling the hedge forward created a “synthetic” long position that was balanced against short positions held by commercial participants holding actual inventories of the commodity. As a result, the “synthetic” buying pressure relative to the actual stocks of the commodity pushes up prices in the short-run.

The conditions for inventory levels under which CITs can lead to a speculative price bubble are formalized by Hamilton (2009). The three conditions as described by Irwin and Saunders (2010) are: (1) CIT positions for a commodity are positively related to its futures prices; (2) the own-price elasticity for the commodity is very low so increases in the futures price are passed on mostly to consumers; and (3) inventories of the commodity do not increase. The existence of these conditions is tested by some of the studies discussed in Section 4.

3.2 Index Funds Did Not Create a Price Bubble

The view that the new money flowing into commodity futures markets from CITs and other investors drove prices upward is countered by a group of economists including Scott Irwin and Paul Krugman who claim there is no causal link between commodity trading activity and futures prices. The lack of a link is based on four counter arguments described in Irwin and Saunders (2010) and Irwin *et al* (2009): (1) physical inventories are not held by index investors; (2) new money or new demand for contracts are met by new supply; (3) index funds will sell rather than increase investment levels during rising prices acting to stabilize futures prices; and (4) the trading by CITs is predictable rather than noise trading that could possibly influence price away from fundamentals.

The first counter argument against the view that index funds fueled the price boom is that virtual hoarding does not exist (Krugman 2008). Futures markets trade contracts for buying and selling commodities for future delivery and rarely involve dealing with actual physical goods. In order to impact cash prices, the CITs must take delivery of the good after letting their long position contract expire and then hold these physical inventories off the market. While the Hunt Brothers did so a generation ago in the silver market, there is no evidence that CITs have taken possession of commodities and thus affected the cash price through hoarding.

A second argument given by Irwin *et al* (2009) is that the new demand for futures contracts by CITs can be met by a new supply of contracts. Unlike the supply of the actual physical commodity, there is no limit on the number of futures contracts that can be created. The futures market is a zero-sum game so for every long (or short position), a corresponding short (or long) position is established. Consequently, if the long positions of the CITs represent a new demand, the short positions of the same contracts represent the new supply (Irwin *et al* 2009). This new supply does not require the inducement of a higher price. Since futures markets are zero-sum games, the money inflows will not directly impact prices.

Irwin *et al* (2009) also suggest that the passive investment strategy by CITs stabilizes the market rather than creating bubbles. Masters and Soros along with others argue that index funds will invest more in commodity markets as prices rise and thus the investment is a self-fulfilling prophesy. In contrast, Irwin (2008) claims that CITs invest a certain percentage of their portfolio in commodities. Higher prices will raise index values, and thus cause the CITs to sell some of their positions to reduce the percentage back to the desired allocation. The selling during times of high prices thereby acts to reduce prices and stabilize the market.

A final argument revolves around the predictable nature of CIT trading. As discussed earlier, trading must be unpredictable for any group to consistently push prices away from its market equilibrium. Index funds follow the same passive investment strategy and do not attempt to hide their current positions or their next move. Consequently, Sandler and Irwin (2009a), argue that it is highly unlikely that other large traders would allow index funds to push future prices away from fundamental values for long when trades are easily anticipated.

4.0 Empirical Evidence

As with the theoretical debate, the empirical evidence on the impact of index funds on futures prices is inconclusive.

4.1 Index Funds Drove Commodity Futures Prices

Initial evidence for those purporting CITs created a speculative price bubble in commodity markets were largely based on the correlation between the level of funds flowing into these markets and prices (Masters 2008). Robles, Torero and von Braun (2009) note the relationship between agricultural futures prices and four proxies for speculation: (1) volume of futures contracts, (2) open interest in futures contracts, (3) ratio of volume to open interest, and (4) ratio of non-commercial positions to total positions in futures contracts. In addition to noting the correlation, this study used Granger causality testing to determine if these speculative activity indicators drove prices or vice versa. While the first two proxies do not appear to have affected commodity prices, the ratio of volume to open interest was found to forecast changes in wheat and rice prices. Since it is assumed that speculators are more likely to get in and out of the market over a short period of time in contrast to commercial traders, an increase in the relative number of trades or volume reflects speculative activity.

Similarly, an increase in the number of non-commercial positions, generally assumed to represent speculators, relative to commercial positions, assumed to represent hedgers of physical products, will proxy an increase in speculative activity. Robles, Torero and von Braun (2009) found an increase in this ratio to have driven the price up for maize and soybeans. It should be noted that these causality tests were conducted for the time period during which prices rose.

Several subsequent studies have provided more substantive evidence. In the oil market, Eckaus (2008) claims the 2008 oil price was a speculative bubble and Roubini (2009) feels that approximately half of the increase in oil price during the boom was due to “speculator and herding behavior”. Plastina (2008) estimates cotton futures prices were 14% higher than they otherwise would have been during the price boom due to the activity of CITs.

Gilbert has conducted two studies examining the impact of CITs on the price of four agricultural commodities (soybean, soybeans, corn and wheat) traded on the Chicago Board of Trade (Gilbert 2009, Gilbert 2010). Gilbert (2009) found changes in CITs’ positions had a positive and persistent effect on soybeans futures returns, but the data failed to support the hypothesis that changes in CITs’ position influenced returns for corn, wheat and soybean oil. This study concluded that there is weak evidence supporting the idea that that index investment contributed to the recent commodity price boom (Gilbert 2009).

In a subsequent study, Gilbert (2010) assessed the impacts of potential demand and supply shocks across agricultural markets rather than examining these commodity markets separately. A joint approach based on a capital asset pricing model is used since a demand shock that may appear small to an individual market can be much more important than a crop-specific supply shock if that shift in demand is common to a group of agricultural commodities. Indeed, Gilbert (2010) finds demand-side shocks related to monetary and financial developments to be the main reasons for the movements in agricultural prices rather than idiosyncratic shocks such as biofuel demand and supply reductions for individual crops. These developments included growing GDP in countries such as China, monetary expansion, and a depreciating US dollar, but index funds were the means by which these developments affected agricultural commodity prices. Gilbert feels the behaviour of CITs (i.e., long-only, position in an entire range of commodities, holding positions for a long time) differ from traditional speculators and suggests that the CITs relegated market fundamentals to a minor, supporting role and so one would expect greater price volatility (due to reduced market liquidity) and greater price correlation across markets. While Gilbert (2010) concludes CITs were the major channel through which common demand-side shocks pushed up futures prices, he cautions against more stringent regulation of futures markets since it was the underlying fundamental drivers, such as world GDP growth, that spurred the activity in index funds.

4.2 Index Funds Did Not Drive Futures Prices

While the correlation between volume of activity by index funds and the rise in commodity futures prices is given as evidence of the role of speculators, other descriptive data assessments suggests otherwise. For example, inventories of agricultural commodities declined rather than increased as should occur if speculative activity is driving the price above the equilibrium based on market fundamentals (Krugman, 2008). Others note that the presence of index funds did not have a consistent affect across commodity markets. The 2006/08 price boom happened for commodities without futures markets such as rubber, onions, and iron ore (Headey and Fan, 2008) along with apples and edible beans (Irwin, Sanders and Merrin, 2009). Similarly, commodity markets without index participation, such as fluid milk, also rose (Irwin, Sanders and Merrin, 2009). Even for markets with index participation, there was not a consistent effect as the relative concentration of index fund positions was much higher in the livestock market compared to the crop markets but the price increases were much smaller in the former.

Sanders and Irwin (2009a) tested the impact of the relative size of index fund on returns across markets; and found minimal evidence that index fund positions impacted returns across markets. In a related study, Sanders and Irwin (2009b), failed to find any link between commodity index activity and commodity futures prices using CIT position data from 2004-2009. As well, Irwin and Holt (2004) investigated the impact of trading by large hedge funds and CTAs in 13 futures markets. Consistent with the noise trader hypothesis, their findings suggest that there is a positive relationship between the trading volume of large hedge funds and CTAs and market volatility for nine of the markets (e.g., corn, soybeans, hogs, crude oil); and a positive but statistically insignificant relationship for the remaining four markets (e.g., soybeans). Irwin and Holt concluded that large hedge funds and CTAs enhanced market efficiency by bringing valuable fundamental information to the market through their trading activities.

Several studies have conducted an analysis similar to Robles, Torero and von Braun (2009) in which the direction of causality is tested between speculative activity proxies and commodity futures prices. Haigh *et al.* (2005) and IMF (2006) both concluded that price changes have led to changes in commodity index investor interest (primarily managed money traders) rather than the other way round. Using CFTC data, Haigh *et al.* (2005) studied the relationship between futures prices and the positions of managed money traders. Haigh *et al.* (2005) found index investors more often adjust their long positions after price moved and not before, which suggests that changes in CITs' positions are a reaction to price changes as opposed to a cause of price changes. The same study also noted that CITs provide liquidity to large hedgers, which subsequently has an effect on the positions of CITs.

Using an alternative measure of speculative activity (Working's speculative T-index), Sanders, Irwin and Merrin (2010) found the level of speculation not to be excessive for agricultural futures markets during the price boom of 2006-08. This study found positions held by index funds to be relatively stable and within the bounds of

historical norms. Similar results were found by Buyuksahin and Harris (2009) for crude oil futures and by Till (2009) for crude oil, heating oil, and gasoline futures. Sanders, Irwin and Merrin (2010) suggest that these results imply long-only index funds are beneficial, rather than detrimental, to markets dominated by short hedging from commercial traders.

A recent report for the OECD by Irwin and Sanders (2010) uses data on positions of index traders from the weekly Supplemental Commodity Index Traders reports which is more accurate and complete than from the Commitment of Traders reports that has been the data source for most previous studies on CITs. While there is correlation between index positions and futures prices through the price spike, there is no apparent relationship during 2009. Irwin and Sanders (2010) use this data to test for causal relationships between speculative measures (net long positions and percent of long positions by index traders and swap dealers) and futures prices. As in their previous studies, Irwin and Sanders find index funds did not cause a speculative price bubble in agricultural futures markets. While there was no relationship between index trader positions and the level of futures prices, Irwin and Sanders (2010) did find evidence that increases in index fund positions led to lower market volatility. The result is consistent with the findings of Sanders, Irwin and Merrin (2010) and suggests the problem in many agricultural futures markets dominated by short hedging is the lack of speculative activity rather than an excessive level.

The well publicized OECD report led to a backlash of supporters for the view that speculative activity by non-commercial traders is correlated with both the price of commodity futures and its volatility. For example, Frenk (2010) questioned the appropriateness of Granger causality tests for variables such as commodity futures prices that are so volatile and measured over a short period of time (Irwin and Sanders (2010) use a one week lag). Since the demand fundamentals in the oil market do not support the large price changes, Frenk (2010) feels the graphical evidence on non-commercial participation in commodity futures markets and associated price movements is sufficient to support the view that CITs created a speculative price bubble.

Although there is mixed evidence whether commodity index traders contributed to commodity markets anomalies, there is some consensus on the effects of CITs on market volatility. This contrasts with Hirshleifer (1989, 1990) who argues that speculative market activities reduce the hedging premium and price volatility. However, as noted earlier, others claim that the increased volume of trading activity in grain futures and the entry of this new group of traders has made the futures market more volatile, and difficult to predict. The empirical evidence tends to support the latter view. A positive link between trading volumes and price volatility has been found by Chang *et al.* (1997), Bollerslev and Jubinski (1999), and Irwin and Holt (2004) suggesting an increase in non-commercial positions increases futures volatility.

5.0 Conclusions and Implications

Over the years, critics have argued that futures market prices have been either too low or too high. Speculators have often been the target for the wrath of those feeling the futures price does not properly reflect market fundamentals. Recently, the criticism has been vented toward a new type of speculator that has been blamed for the dramatic changes in agricultural commodity prices experienced over the last several years. Commodity index traders (CITs) and other large institutional traders are commonly accused of exerting a destabilizing influence on commodity prices. The intensity of the debate over the role of CITs appeared to wane with the reduction in commodity prices since 2008 but the recent release of a well-publicized OECD report on the issue by Irwin and Sanders (2010) along with the doubling of wheat prices and the claim by von Braun (2010) and others that the rise was due to speculative activity has renewed the debate.

The contrasting opinions still existing highlight the lack of credible consensus that has formed on the issue of causation between index fund investments in futures markets and commodity prices. One side fueled by reports from Masters (2008) and Soro (2008) note the level of investment by CITs tracks the changes in prices. The virtual hoarding generated by this activity has pushed up prices and that the revolving long positions held by these institutional investors puts constant upward pressure on prices. The counter argument is that hoarding cannot occur with futures contracts as new supply is automatically created to meet any new demand. This group including Irwin (2008) claim that the passive and transparent investment strategy by CITs, without market power, should stabilize prices. It is highly unlikely that CITs would push futures prices away from fundamental values for long when their trades are so easily anticipated (Irwin 2008).

While both sides agree that there is a correlation between CIT activity and commodity futures prices, the direct of causation is the point of contention. The empirical evidence is mixed with very limited support for the view that higher commodity prices draws in investment activity by index funds. However, a recent study by Gilbert (2010) appears to partially reconcile the two camps by suggesting commodity index funds are a means by which a common, albeit small, demand side shifter across all markets (i.e. GDP growth in China and India) can have a large effect across those markets. There is more empirical support for the claim that CITs are associated with greater market volatility.

The controversy over the effect of CITs has prompted the regulator of futures markets, the Commodity Futures Trading Commission (CFTC), to provide additional information on agricultural markets and to consider regulations on position limits, trading limits, and margins. If the CFTC decides to set new position limits for commodities of finite supply, this response may weaken the price discovery function of futures markets and this would not serve the public interest. According to FIA (2009), imposing a rigid, inflexible position limit solely on U.S. futures trading could cause those traders who seek commodity price exposure to shift to OTC or to foreign exchanges. If price discovery shifts to the OTC markets, it is more difficult for the CFTC to oversee.

Despite the controversies around the influence of CITs, one can conclude that the rise in futures volatility will have implications on the hedging decisions of commercials. For example, if hedgers are concerned about mark-to-market risk and basis risk, they tend to hold a smaller futures position. At the same time, higher volatility on spot commodity markets calls for a need for price risk management. However, during the dramatic commodity futures price rise in the spring of 2009, the common price risk tool of forward contracting was not available to producers as some grain elevators refused to hedge a position associated with a guaranteed harvest price, to the farmer, in order to avoid the financial risks of large margin calls. Thus, an increase in commodity market volatility may lead to greater costs for managing risk: more costly insurance premiums, higher options premiums, and greater margins for hedging.

Commodity price volatility may also have implications for the volume of international agricultural commodity trade when individual countries adopt policies that restrict imports or exports (e.g., export bans) as a method of coping with price variations. Research on the effects of commodity price volatility on international trade (e.g., on volume) is limited. A few studies suggest an increase in exchange rate volatility leads to a reduction in the volume of international trade (Wolf 1996) – as higher exchange rate volatility lowers risk-adjusted expected revenue from exports, and therefore reduces the incentive to trade (Sercu and Uppal 2003). In contrast, other studies claim exchange rate volatility may not have any effect on the volume of international trade if firms can hedge using forward contracts (Baron 1996). Viaene and Vries (1992) show that the net effect of exchange rate volatility on the volume of trade is ambiguous depending on whether the country is an importer or exporter. At an institutional level, the Special Safeguard Mechanism (SSM) proposed for developing countries in the Doha Development Agenda of the World Trade Organization is aimed at reducing commodity market volatility. The initiative would allow developing countries to protect themselves from world price volatility by levying temporary additional tariffs in the face of import quantity surges (quantity trigger) or import price drops (price trigger) (Grant and Meilke 2006, 2009).

Commodity index traders are one of the reasons for the significant increase in market volatility over the last several years but not the sole cause. Demand growth associated with factors such as rising incomes in developing countries and increases in non-food uses like bioproducts, has resulted in edginess within agricultural markets. Tight stock to use ratios mean any increase in demand or reduction in supply can send prices suddenly higher. The most recent example is the July 2010 jump in wheat prices from the announcement of a decline in Russian supply. Volatile markets provide opportunities for arbitrageurs and speculative money will naturally flow into such a market. Restrictions on the level of such investment will reduce liquidity when markets are unstable and liquidity required. Rather than regulate markets, governments should consider enhancing the risk management skills and opportunities for commercial producers.

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APPENDIX GLOSSARY OF TERMS

Source: Irwin and Saunders (2010)

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Contango: Contango is the situation whereby the price of a commodity for future delivery is higher than the spot price, or a far future delivery price higher than a nearer future delivery. The opposite market condition to contango is known as backwardation.

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

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

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

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

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

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

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

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

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

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

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

Futures Option: An option on a futures contract.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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