COMMODITY INDEX INVESTMENT AND WHEAT FUTURES MARKET

By

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To mom and dad, the most important persons in my life

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ABSTRACT OF THESIS PRESENTED TO THE GRADUATE SCHOOL
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COMMODITY INDEX INVESTMENT AND WHEAT FUTURES PRICES
By

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Chair: Richard Weldon
Major: Food and Resource Economics

The turmoil in futures market in recent years becomes intense concern to the industry, the exchanges and the Commodity Futures Trading Commission (CFTC). In my thesis, I examine the role of speculation in the wheat markets and the effective regulatory system to prevent excessive speculation. First, I summarize wheat market performances during the 2006 to 2010. Second, I develop methods to examine how the activities of speculators in aggregate, have led to the wheat market disruption.

The quantity methods find that firstly, the volatility of wheat futures has preformed strong heterosckedascity and the volume and open interest provide the powerful explanation of volatility when enter separately. Second, the speculator trading activities have led to the change of wheat futures return while the hedger activities show a comparative steady and little impact on the price changes. Third, futures and cash prices do not cointegrated in long term and the futures price does not contain much information to reflect the cash price.

In addition, the derivatives trading through over-the-counter (OTC) market become more dynamic and dominate. Commodity index trader through purchase of commodity index could directly affect the futures price fluctuation. In my thesis, I also analyze the

impact of index trader activity on the wheat futures market. The empirical tests show that the injection of index funds does cause the recent volatile in wheat futures market.

CHAPTER 1
INTRODUCTION

The futures market in the United Stated experienced an extremely volatile period in recent years. The wheat futures traded on Chicago Mercantile Exchange (CME), for example, increased from $3.00 per bushel in 2006 to $11.00 per bushel in the mid-2008, and afterwards declined sharply back to $3.00 per bushel at the end of 2008. Moreover, many other commodities endured the similar performances. First, trading volume and open interest increased tremendously. The prices of commodities, such as oil, wheat and soybean have reached unprecedented levels. Second, the cash and futures prices failed to converge during the expiration month. Third, large amount of index have been observed in the commodities derivative markets.

The unexpected changes in commodity prices has led to intensive investigations by the Commodity Futures Trading Commission (CFTC) and has been widely debated by academia. Many recent testimonies and Congress reports show that the distortion of the futures market and even the financial recession are because of the failures of the regulatory structure and agencies. Since 2000, the U.S. congress has continuously deregulated the over-the-counter (OTC) market, in order to make the U.S. futures market more flexible and competitive in the global market. The commodity index traders are exempt from position limits when purchase commodity futures contracts to offset their business risk.

In this thesis, firstly, it provides a comparative description of the wheat futures market, price change and volatility, market depth and liquidity, cash and futures prices and trader position. After market analysis, this thesis will go in detail to investigate the speculation behaviors in wheat futures market during extreme volatility period. I am

trying to find evidence to examine whether the speculators activates cause the distortion of wheat futures market.

In addition, I differentiate the speculators into index speculators and traditional speculators, since there are somewhat different from each other. I tried to examine the role of the commodity index trading and investigate casualty relationship between commodity index trade and wheat futures price.

CHAPTER 2
THE DESCRIPTION OF WHEAT FUTURES MARKET

The first organized futures market in U.S. Chicago Board of Trade was established in 1848. At that time, because of its unique location and access to the Great Lakes, Chicago became the transportation and distribution pivot for agriculture commodities. Initially, it severed as a market place for farmers to sell their products, including grain, wool, pork, beef and lumber before delivering to lock in a price. At the beginning, the trading was a type of forward contract. In 1865, standardized futures contracts were introduced. The original trading activates were carried on the floors, known as “floor trading”. The traders stood on the floor, shouting the price they were willing to pay or accept. They simply reached an agreement on the price and number of contracts. The clearinghouse, which established in the 1920s and guaranteed against default, is a significant development for the modern futures market.

Since its establishment, the futures market in U.S. has achieved great development in less than 200 years. The Chicago Board of Trade, the New York Mercantile Exchange, Kansas Board of Trade and Intercontinental Exchange developed into the world’s leading futures exchanges. Meanwhile, the futures market exceeded the agricultural commodities range. Numerous new futures and options based on such things as foreign exchange rates, interest rates, equity index and even credit ratings are listed on the exchanges. The number of future contracts expanded from 266 in 2000 to 1730 in 2009 (Figure 2-1).Since 2000, volume growth on futures market has increased sevenfold (Figure 2-2).

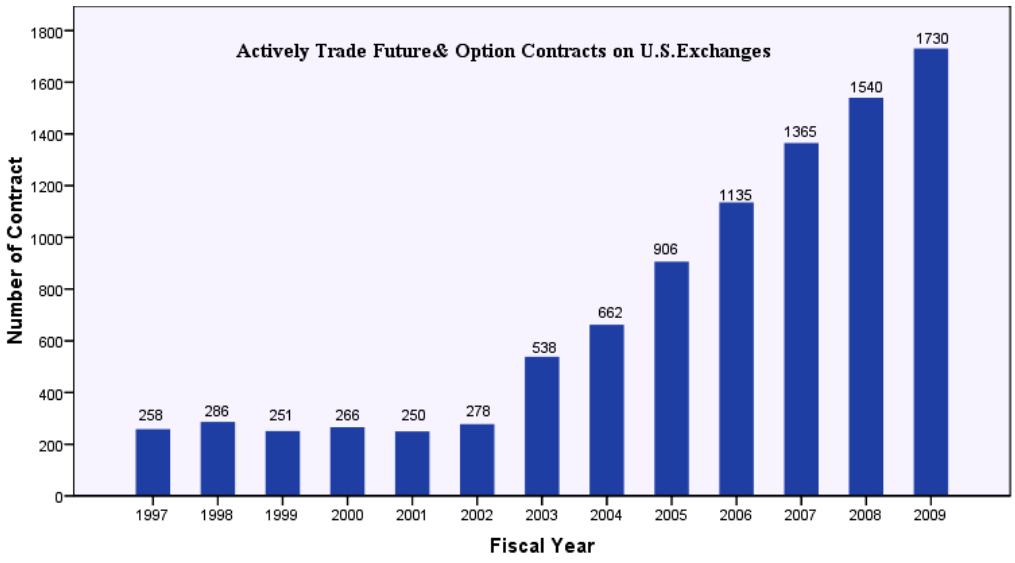

Figure 2-1. Actively Trade Future and Option Contracts 1997-2009 Source: FY 2009 President's Budget & Performance Plan

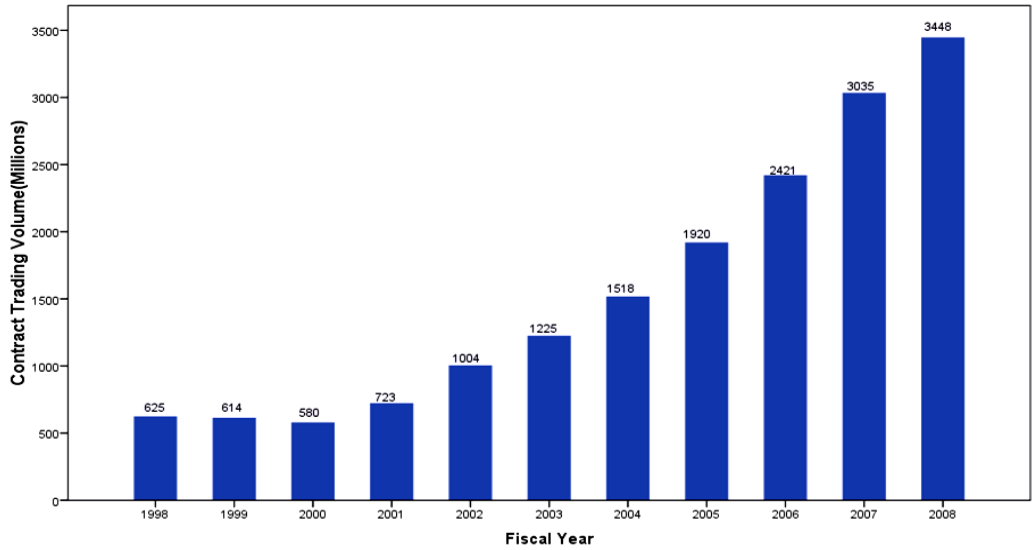

Figure 2-2. Growth in Volume of Futures and Option Contracts Traded, 1998-2008 Source: FY 2009 President's Budget & Performance Plan

There are five basic types of wheat growing in the United States: hard red winter, hard red spring, soft red winter, durum and white. Figure 2-3 illustrates the percentage of production for each type of wheat during 2009. Nowadays, in the United States, three major futures exchanges specialize in a particular type of wheat. These wheat futures contracts specify the type and quality of the wheat to be delivered, period for delivery, the possible locations for delivery and the required price at the time of delivery. The soft red winter wheat is traded on the Chicago Mercantile Exchange (CME), hard red winter wheat is traded on the Kansas City Board of Trade (KCBT) and hard red spring wheat is traded on the Minneapolis Grain Exchange (MGE).

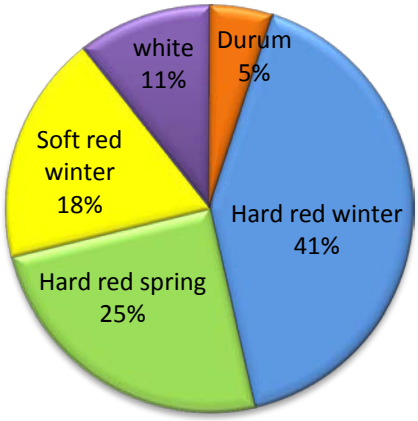

Figure 2-3. U.S. Wheat Production. Types and amounts of wheat grown in the United States in 2009-2010.Source: USDA, Economic Research Service and Wheat Data: Yearbook Tables, Table 6.

The CME soft red winter wheat contract provides sale and delivery of #2 soft red winter wheat. Currently, there is one warehouse in Chicago and two facilities in Toledo. Delivery usually takes a multi-step process several days prior to the expiration of the contract. Wheat futures contracts usually expire on the first business day prior to the 15th calendar day of the contract month. About one month prior to the expiration, an

approved firm gives notice of the plan to make a delivery. On next day, the exchange will examine the outstanding long open interest and selects those positions that have been held for the longest period to accept delivery. On that day, the holder of the long position may either accept the delivery or pass it on to another buyer. The following day is called delivery day, when both the long and short open interests are closed.

Delivering wheat under contract from an approved warehouse does not require the physical movement. Instead, it is through exchanging the right in the form of a shipping certificate. Under the request by certification holder, the warehouse should have to load the grain within a period specified by the rules of exchange.

Through this delivery process, traders do not necessarily physically handle any wheat. Then traders may store grain in grain elevators, in the form of shipping certificates. They could hold these shipping certificates, pay the storage fees, and sell the wheat when price increases.

CHAPTER 3
PROBLEMS OF THE WHEAT FUTURES MARKET

In this chapter, we will first evaluate wheat futures market performances from the following perspectives: price change and volatility, market depth and liquidity, cash and futures prices and trader position

Price Change and Volatility

To look at the trend of futures price, we have to create a series of futures price. Since at any particular date, more than five futures contracts on wheat may be traded. For example, futures with expiration in July this year and July next year may be traded simultaneously. I took the price of nearby expiration contract as the reference price and created a continuous futures price for each contract. Figure 3-9 shows the trend of wheat futures prices from 2006 to 2010.During the past three years, the wheat futures price has experienced the spike and collapse. First, wheat futures price continue to surge high form $4.83 per bushel to $12.99 per bushel in a year. It reached the peak at $12.99 per bushel in the February 2008. Then the wheat contract price fell from $12.99 per bushel to $5.12 per bushel.

Figure 3-1. Continuous Futures Price, Source: Bloomberg.

In addition, the volatility of wheat futures price has reached unprecedented level. Data are from Jan 1, 2006 to Feb 28, 2010. Return volatility is calculated by the standard deviation of daily return.

Volatility=$(\boldsymbol{X_t} - \overline{\boldsymbol{X}})^{\mathbf{2}}$

Where X_t= $100ln\left(\frac{F_t}{F_{t-1}}\right)$

Daily futures return is defined as $100\times\ln({}^{F_t}/_{F_{t-1}})$, where F_t is the futures settlement price at a given day t. The logarithm transformation improves the statistical properties, because it provides a clearer tendency of the variable than untransformed series. Most macroeconomics time series data are estimated based on logarithmic scale over time. Being a squared quantity, volatility calculated will be high in periods when there are big changes in the prices and comparatively small when there are modest changes in price compared to the previous year, the volatility of price has increased drastically since 2008 (Figure3-2).

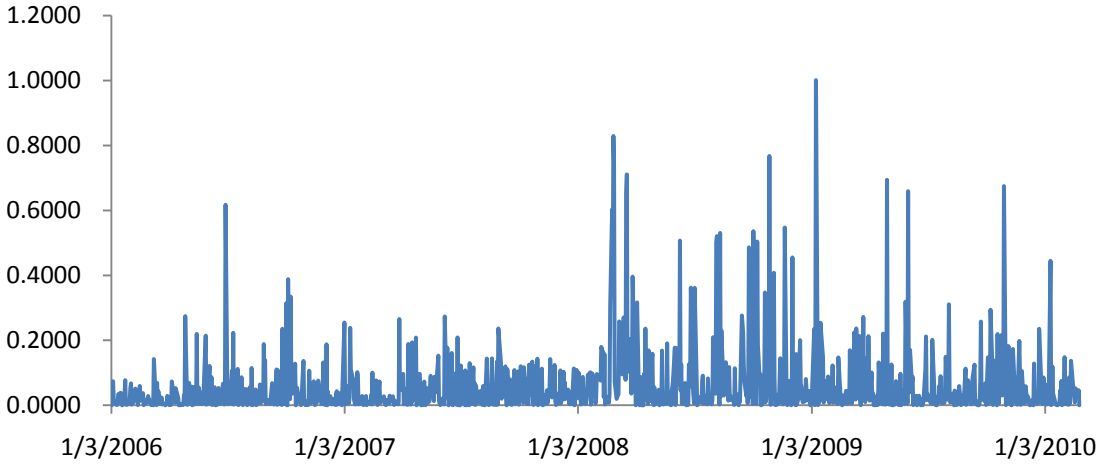

Figure 3-2. Volatility of Chicago Wheat Futures. Source: Bloomberg

Traditionally, when a farmer, or a grain elevators uses the futures contract to hedge their business risks, they are required to maintain working capital as margin and. If they fail to make a margin call as needed, their futures positions are immediately liquidated. During the extremely volatility period, hedgers has incurred a large margin calls on a daily basis, which require hedger to have much larger working capital than ever before for their futures positions. According to National Grain and Feed Association, the hedging cost has tripled since 2008.

Open Interest and Volume

Open interest refers to the total number of contracts that are not exercised, offset or delivered and an appropriate measure of participant activities. For every long or short trade, there must be a counterpart trade, or the contract is considered “open”. An increasing open interest usually indicates new money flowing into the market.

Volume measures market intensity. It represents the total amount of trading activity in a given day. The greater the amount of trading activities, the higher will be volume. Figure 3-3 shows the trading volume and open interest in the Chicago wheat

market from 2001 to 2010. Before 2005, both volume and open interest maintained a lower move. However, after 2005, the drastic increase in volume and open interest have been observed.

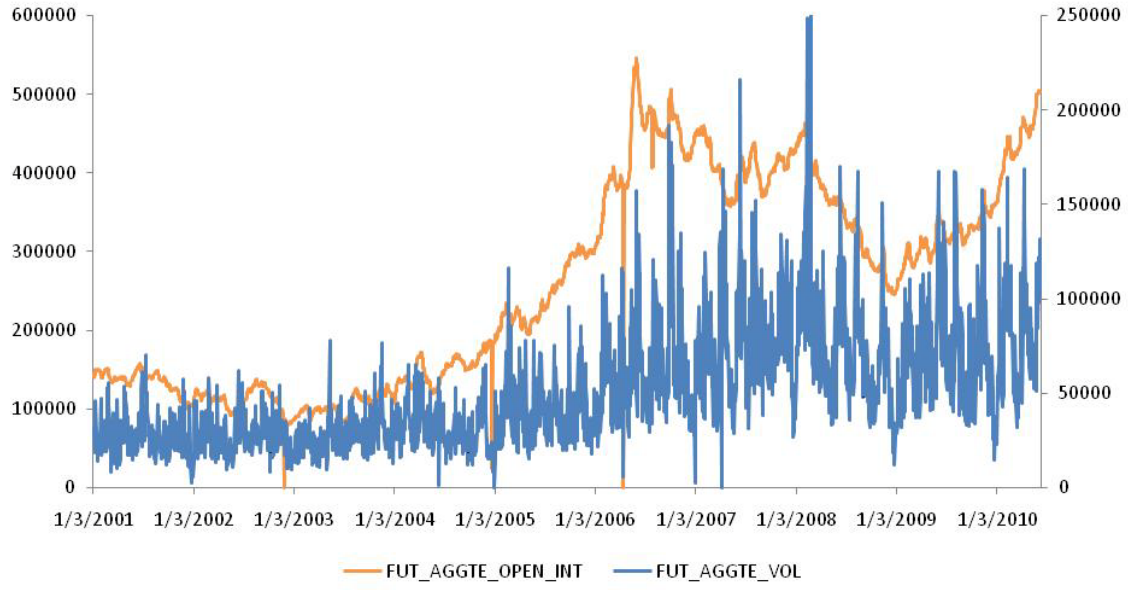

Figure 3-3. Volume and Open interest Growth-Chicago Wheat. Source: Bloomberg

Convergence Problem

Basis is the current cash price of a given commodity at a location minus the price of a particular futures contract for the same commodity. Several features of this need to be explained. First, basis depends upon a cash price of a commodity at a specific location. The cash price of wheat, for example, might differ between Kansas City and Chicago, so that the basis for those two locations will be different. If wheat had two different prices in two locations, a speculator could potentially buy the commodity in the cheaper market and sell it in the market with the higher price until arbitrage profit disappear. However, prices for wheat in Chicago and Kansas City can base on the expense of transporting wheat from one market to another. If wheat is grown near Chicago, then we might reasonably expect the price of wheat in Chicago to be lower

than the price of wheat in Kansas City. For CBOT wheat, the key delivery area is in Toledo, Ohio. The cash price I use to analyze is based on the wheat price reported in Toledo, Ohio.

Usually, when a futures contract gets closer to expiration, the futures price will converge to the price in the cash market. However, over the past three years, the futures prices for wheat were abnormally high. They also failed to converge with the cash price as the futures contract neared expiration. The CBOT wheat futures have five expiration months: March, May, July, September, and December. From Figures3-4 to Figure 3-8 ,they suggest that the basis for five delivery months of wheat future contract. The data of futures price were obtained from Bloomberg and the spot prices are from the USDA, Agricultural Market Service. The last observation for each contract every year is the expiration day, usually around the 15th of the calendar month. The figures suggest that the poor convergences exist in all five wheat contracts. If a futures contract fails to converge at the expiration, it will severely impair the ability of the farmers, grain elevators or other merchants use the futures markets to hedge their exposure to price risk over time.

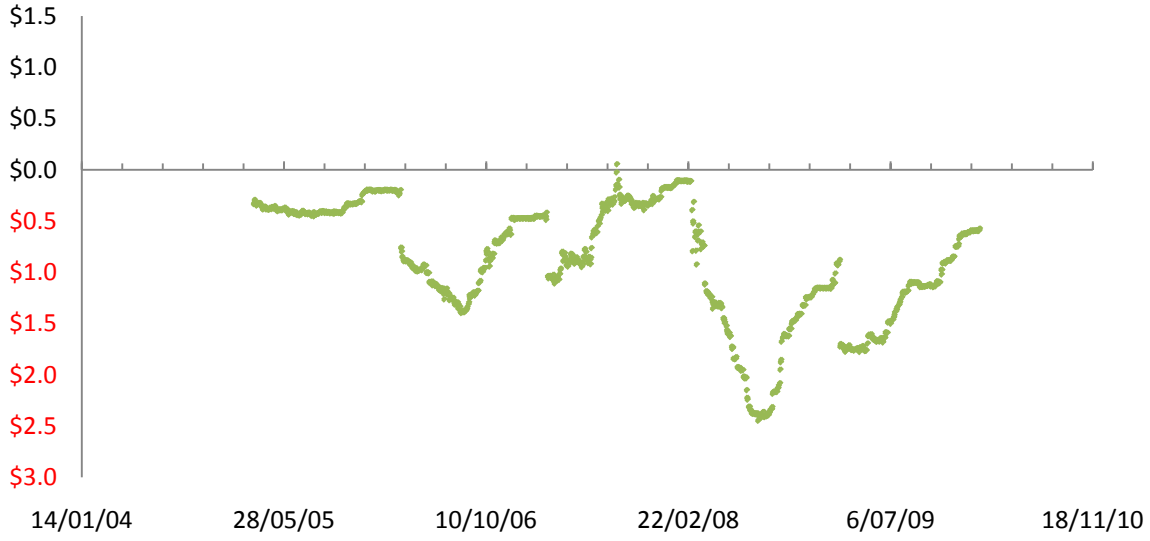

Figure 3-4. March Wheat Basis (Toledo, OH cash less wheat CBOT futures)

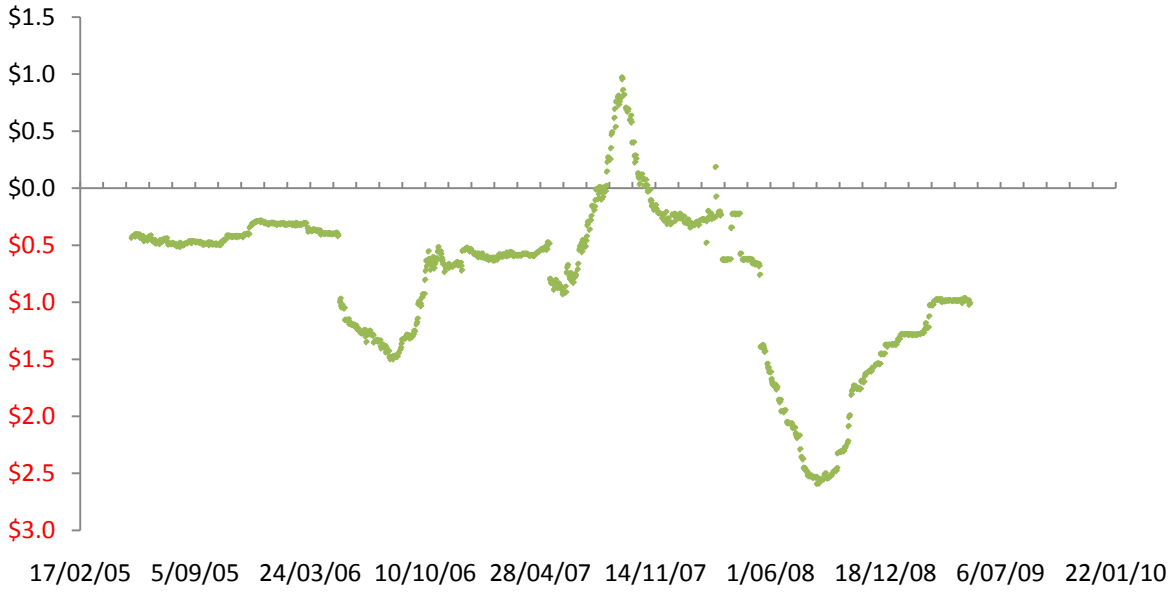

Figure 3-5. May Wheat Futures Basis (Toledo, OH cash less wheat CBOT Futures)

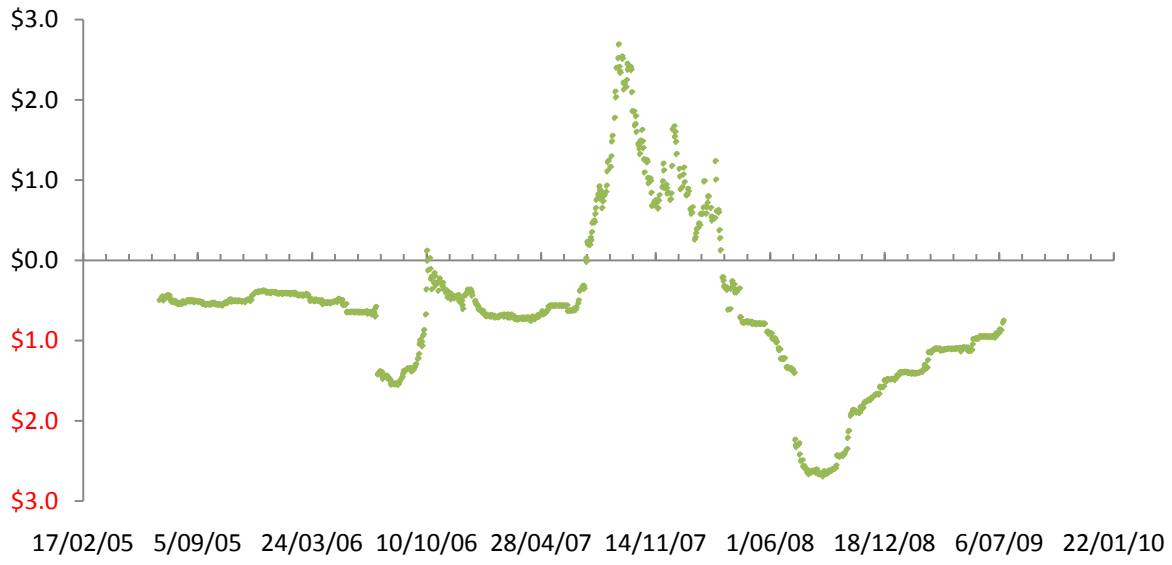

Figure 3-6. July Wheat Basis (Toledo, OH cash less Wheat CBOT futures)

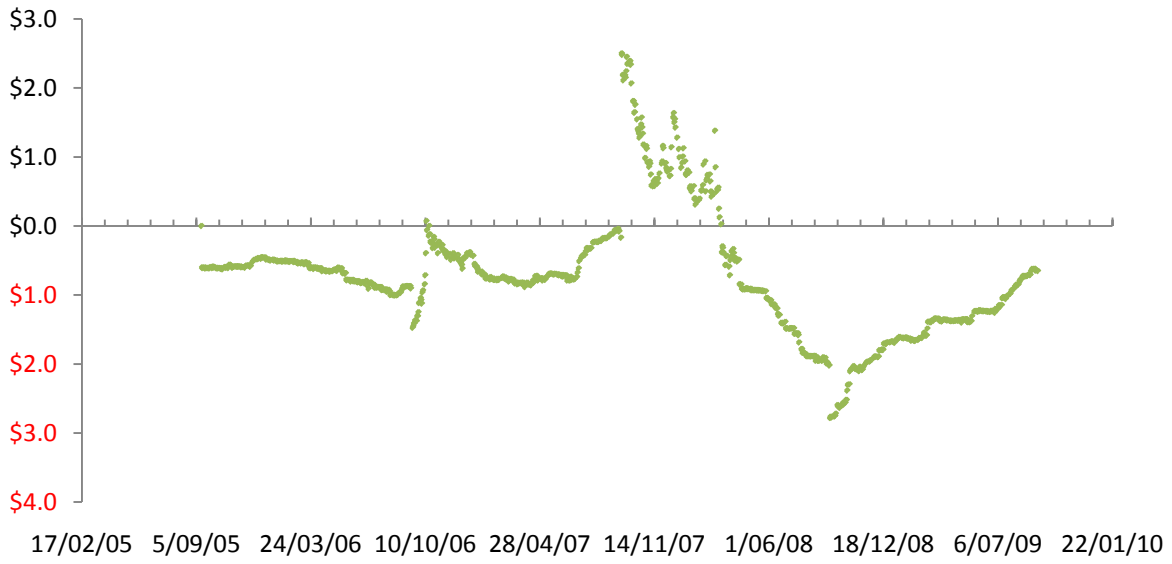

Figure 3-7. September Wheat Basis (Illinois Cash Less Wheat CBOT Futures)

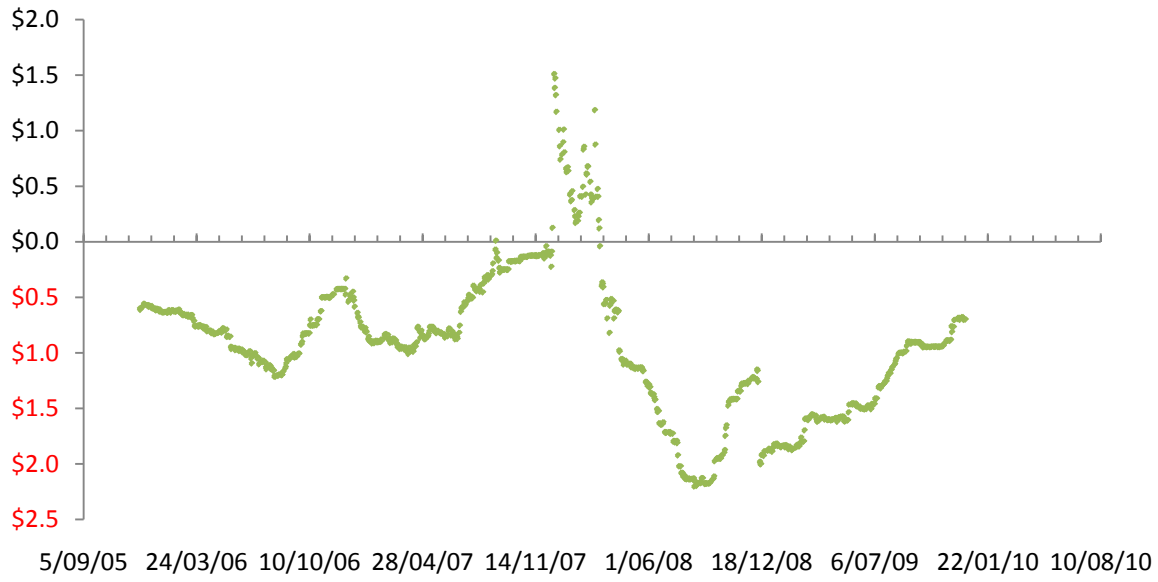

Figure 3-8. December wheat Basis (Toledo, OH cash less Wheat CBOT futures)

Speculations in the Wheat Futures Market

Figure 3-9 illustrates the relative trader's position in the Chicago wheat futures market. The data were obtained for Commitment of Traders (COT) on the CFTC website. The Commitment of Traders (COT) report provides a breakdown of each Tuesday's open interest for markets with 20 or more traders' positions equal to or more than the reporting level set by the CFTC. The CFTC collects data from the clearinghouse and classifies traders into either commercial or non-commercial. The commercial category represents traders using futures market to hedge. The non-commercial category generally includes pension funds, hedge funds and other type of fund who profit from the prices changes in the futures market.

Historically, the demand by the hedger has exceeded the demand by speculator in the futures market. Since there is difference in the number of hedgers and speculators, hedgers have to make an attractive offer to get the speculators to take the other side of the transaction. However, in Figure 3-9 it obviously shows that speculators have

dominated the futures market. They have taken more than 50 percent of open interest in the futures market over the past three years. Michael Master in his one testimony has proposed that the appropriate open interest taken by speculator should be in the range of 25%-35%. It believed that this excess speculation has undermined the integrity of market.

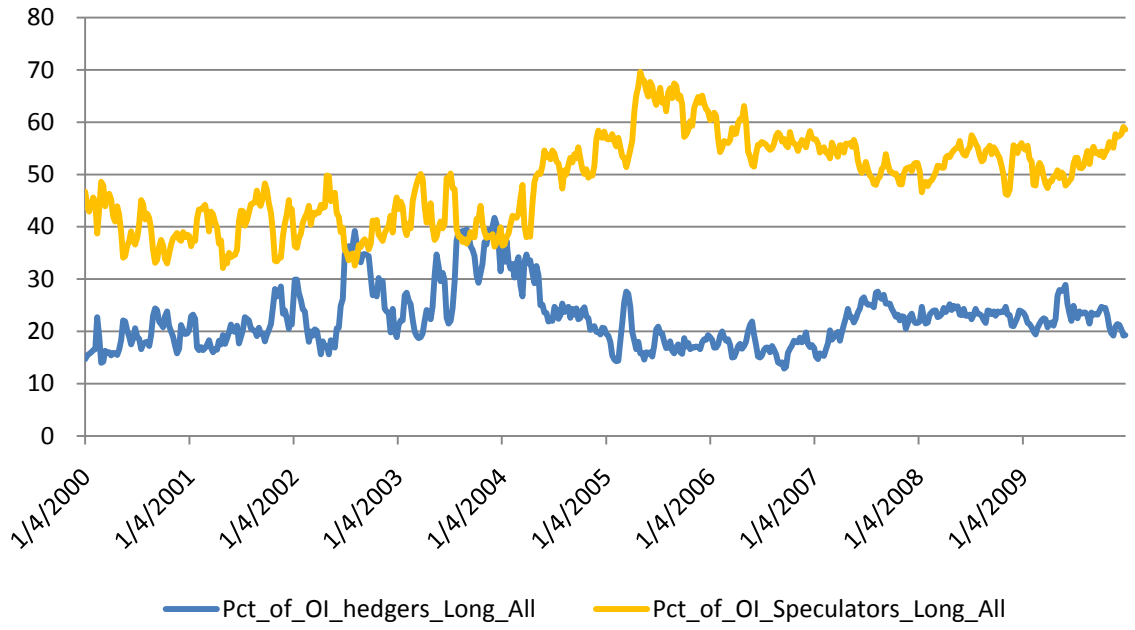

Figure 3-9. Percentage of Open Interest for Chicago Wheat Market Held by Participants (%)

CHAPTER 4
RELATIONSHIP AMONG VOLATILITY, VOLUME AND OPEN INTEREST

Literature Review

In the Chapter 3, we have found several problems in the wheat market. From the Chapter 4 to Chapter 7, we will continue to analyze these problems separately by using quantity methods. We begin with investigating the relations between among volume, open interest and volatility to uncover the source of variability in the wheat futures prices. The trading volume and open interest are two important indices of performance measurement for futures market. Their relationship are utmost importance for one reason, that is a well understanding the link could contribute to a superior speculation and hedge strategies. Most empirical researches found the positive relationship between trading volume and price volatility. Conell (1981) Tauchen Pitts (1983) and Karpoff (1987) find the positive relations between trading volume and price volatility. Bessembinder and Seguin (1993) study the impacts of volume and open interest on price volatility. They differentiated the volume and open interest into expected and unexpected categories. They find that both of them have positive effects on price volatility. However, the unexpected volume tends to have a larger impact on volatility than expected volume. Girma and Mougoue (2001) investigate the relation between the petroleum futures spread variability, trading volume and open interest. Their study shows the contemporaneous weighted average of volume and open interest provide significant explanation for futures spread volatility.

Methodology

Table 4-1 provides summary statistics for daily return of wheat futures. The mean of 0.036 is very close to 0 and Standard deviation is 2.57. The skewness and kurtosis

are 0.1796 and 2.6398 respectively. The kurtosis is less than three, the distribution has thicker tails and a lower peak compared to a normal distribution. However, these descriptive statistics do not provide conclusive information about normality. SAS provides four different statistics for testing normality. Shapiro-Wilk W of .979 (P-value<0.0001), which rejects the null hypothesis of normality distribution. Similarly, Kolmogorov-Smirnov, Cramer-von Mises, and Anderson-Darling tests reject the null hypothesis. Therefore, we can conclude that the variable is not normally distributed.

Table 4-1. Summary Statistics for Daily Return

	N	Mean	Std Dev	Skewness	Kurtosis	Shapiro-Wilk	Kolmogorov-Smirnov	Cramer-von Mises	Anderson-Darling
Daily Reutn	1023	0.036	2.57	0.1796	2.6398	<0.0001	<0.0100	<0.0050	<0.0050

The return series on wheat futures in Table 4-1 shows that it is characterized by excess kurtosis and exhibit heteroscedasticity (Akgiray 1991, Hall 1989, Harvey and Siddique 1999).Therefore, the Generalized ARCH model is appropriate to employ. Engle first introduced the autoregressive conditionally heteroscedastic (ARCH) model in 1982 and Bollerslev developed a more general structure GARCH model in 1986.The variance in the model is assumed to follow an autoregressive model. The approach to GARCH (p, q) models is to set up an error term $\varepsilon_t$in terms of white noise.

$\varepsilon_t = \sqrt{h_t}\, e_t, e_t \sim (0,1)$ where h_t is assumed to follow an autoregressive model:

$$h_t = a_0 + \sum_{j=1}^{p} \alpha_j h_{t-j} + \sum_{i=1}^{q} \gamma_i \varepsilon_{t-i}^2$$

In the papers of Lamoureux and Lastrpes 1990 and Najand 1991, the GARCH (1,1) have been proved to be adequate model to test the relations between price volatility and volume. Since then, the GARCH and ARCH models have been widely used in financial forecasting and derivatives pricing. Bollerslev (1986) using the GARCH model more accurately describes the phenomenon of volatility clustering and related effects.

Foster(1995) uses the GARCH(1,1) and GMM model to investigate the relationship between trading volume and price volatility in crude oil futures market. He finds the contemporaneous volume is positively related to the price volatility. Fujihara and Mougoue(1997) use the GARCH(1,1) model to study the crude oil, heating oil and unleaded gasoline futures market. They conclude that the volume is a significant explanatory in explaining the price volatility.

Volume is the number of buy and sell of futures contract for the Chicago wheat. While the trading volume also represents the daily activities of hedger and long-time trader, which is more transitory (Chang, Chou and Nelling2002). I analyze daily data from January 1, 2006 through February 28, 2010. The sample consists of 1040 observations. Data on futures price, open interest and volume come from Bloomberg DataStream. The returns are calculated as 100 times the natural logarithm of the first differences of daily futures settlement prices $R_t = 100 \times \ln(\mathrm{F_t}/\mathrm{F_{t-1}})$.The open interest and volume are not adjusted.

ARCH-LM Test for ARCH Effect

A method proposed by Engle (1982) to test the lag length of ARCH errors is the Lagrange Multiplier test. This procedure is to first estimate the best fitted AR(q) to obtain the squares of the errors, ε_t^2 and regress them on a constant and lagged values in the following equation:

$$\varepsilon_t^2 = w + \sum_{i=1}^{q} \alpha_i \, \varepsilon_{t-i}^2$$

The null hypothesis is that α_i = 0 for all i=1,2,3…n. The alternative hypotheses is that at least one of the estimated α_i coefficients is not equal to zero. Under the null

hypothesis of no ARCH errors, the test statistic TR^2 follows $\chi 2$ distribution with q degrees of freedom. If TR^2 is greater than the Chi-square table value, we reject the null hypothesis and conclude the presence of an ARCH effect in the AR model. Otherwise, we fail to reject the null hypothesis. Table 4-1 illustrates the descriptive statistics for daily return. These tests strongly indicate that return series is characterized by significant heteroscedasticity, with $p < 0.0001$ for all lags.

Table 4-2. Summary Statistics for Futures Returns

		Q and LM Tests for ARCH Disturbance				
Daily return		Order	Q	Pr > Q	LM	Pr > LM
N	1040	1	25.5900	<.0001	25.6121	<.0001
Mean	0.02974	2	37.8803	<.0001	33.1802	<.0001
Sum Weights	1040	3	58.4281	<.0001	46.4873	<.0001
Sum Observations	34.9258	4	71.8117	<.0001	51.6899	<.0001
Variance	6.0539	5	86.7485	<.0001	57.6692	<.0001
Kurtosis	1.09832	6	89.7813	<.0001	57.6698	<.0001
Std Deviation	2.4605	7	99.7232	<.0001	61.1580	<.0001
Skewness	-0.0690	8	102.6048	<.0001	61.1621	<.0001
Uncorrected SS	6290.8752	9	108.1520	<.0001	62.6076	<.0001
Coeff Variation	8274.2457	10	111.2476	<.0001	62.7274	<.0001
Std Error Mean	0.07630	11	114.9901	<.0001	63.4837	<.0001
		12	120.2228	<.0001	64.4779	<.0001

Relations between Return Volatility and Open Interest

The following model is a GARCH(1,1) model when open interest is entered. The origins of analyzed technique can be traced back to Paul Girma and Mbodja Mougoué (2002).

$$r_t = \mu + \varepsilon_t$$

$$\varepsilon_t = \sqrt{h_t}\, e_t$$

$$h_t = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \alpha_2 h_{t-1} + \vartheta_1 OP\_INI_t$$

Where r_t is the futures return, OP_INI are open interest. Table 4-3 shows the result of GARCH (1,1), when the open interest is used as an explanatory variable in the conditional variation equation. The data suggests that the coefficient of open interest in the equation is statistically significant at 5% level. Furthermore, the persistence shock is $\alpha_1 + \alpha_2$=0.9897, which remain highly volatility when the open interest was calculated in the model. Besides, the estimator of α_2(0.9570) is larger than that of α_1(0.0327) represents long persistence of volatility.

Table 4-3. GARCH(1,1) Estimate for Volatility and Open Interest

Variable	DF	Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	0.0622	0.0716	0.87	0.3846
$\boldsymbol{\alpha_0}$	1	1.0537E-8	5.924E-11	177.85	<.0001
$\boldsymbol{\alpha_1}$	1	0.0327	0.007866	4.16	<.0001
$\boldsymbol{\alpha_2}$	1	0.9570	0.009734	98.31	<.0001
OP_INI	1	1.6216E-7	6.1293E-8	2.65	0.0082

Relations between Return Volatility and Volume

The following model is a GARCH(1,1) model when volume is entered.

$$r_t = \mu + \varepsilon_t$$

$$\varepsilon_t = \sqrt{h_t}\, e_t$$

$$h_t = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \alpha_2 h_{t-1} + \theta_1 V_t$$

V represents the daily volume for wheat futures. Table 4-4 shows the result of GARCH(1,1) when the volume is used as explanatory variable in the conditional variation equation. The data shows that the volume is significant power explanatory for explaining the return volatility. Furthermore, the persistence shock decrease from 0.9897 to $\alpha_1 + \alpha_2$=0.9752, which a slight lower than the model 1. However, the persistence shock maintains a high level.

Table 4-4. GARCH (1,1) Estimate for Volatility and Volume

Variable	DF	Estimate	Standard Error	t Value	Approx Pr > |t|
Intercept	1	0.0506	0.0719	0.70	0.4819
$\boldsymbol{\alpha_0}$	1	1.0541E-8	5.718E-10	18.44	<.0001
$\boldsymbol{\alpha_1}$	1	0.0336	0.008998	3.74	0.0002
$\boldsymbol{\alpha_2}$	1	0.9416	0.0134	70.22	<.0001
Volume	1	2.0028E-6	6.2309E-7	3.21	0.0013

Relations between Return Volatility, Volume and Open Interest

The following model is a GARCH (1,1) model when open interest and volume are entered simultaneously.

$$r_t = \mu + \varepsilon_t$$

$$\varepsilon_t = \sqrt{h_t}\, e_t$$

$$h_t = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \alpha_2 h_{t-1} + \theta_1 V_t + \vartheta_1 OP\_INI_t$$

Table 4-5 shows the result of GARCH (1,1), which the volume and open interest have the significant effect on price volatility. The persistence of volatility reduced to $\alpha_1 + \alpha_2$ =0.8615.

Table 4-5. GARCH (1,1) Estimate for Volatility, Open Interest and Volume

Variable	DF	Estimate	Standard Error	t Value	Approx Pr > |t|
$\boldsymbol{\mu}$	1	0.0193	0.0728	0.26	0.7912
$\boldsymbol{\alpha_0}$	1	0.9336	0.4369	2.14	0.0326
$\boldsymbol{\alpha_1}$	1	0.0666	0.0229	2.91	0.0036
$\boldsymbol{\alpha_2}$	1	0.7949	0.0597	13.32	<.0001
Volume	1	9.5364E-6	2.8907E-6	3.30	0.0010
OP_INI	1	-2.158E-6	8.4214E-7	-2.56	0.0104

Through this chapter, we could find that the contemporaneous volume and open interest provide the power explanations for the volatility when enter separately. The coefficients of open interest to volatility are negative and statistically significant. The

result confirm the Bessembinder and Seguin (1993) conclusion that greater market depth is lower the volatility, given a trading volume. Besides open interest has a relative little impact on volatility than a trade incurs a high trading volume without a corresponding changing in open interest.

CHAPTER 5
SPECULATION BEHAVIORS IN THE WHEAT FUTURES MARKET

Since the open interest and trading volume, to certain extent, have led to the price volatility, this chapter will go further to analyze the different participants on the price movement. In Figure 3-9, it shows that the non-commercial long position takes a much larger part than the commercial position. Meanwhile, Figure 5-1 indicates that the commercial position maintains a slower and more stable change than non-commercial position during the sampling period. The commercial long positions increased steadily, however, not so much volatile as the non-commercial positions did.

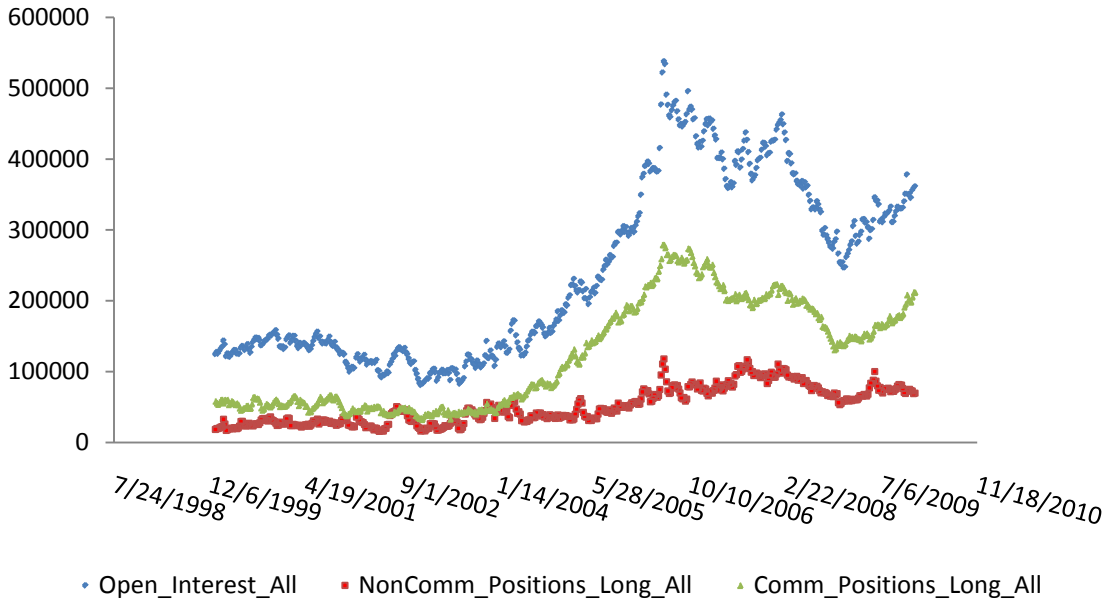

Figure 5-1. Open interest: Wheat in Chicago Board of Trade

Literature Review

The relationship between price volatility and types of market participants has been of interest to both scholars and regulators. Peck (1981) finds the relationship between speculators and price volatility in three agriculture commodities. His study finds the negative relationship between speculation activities and price volatility. Bryant, Bessler

and Haigh (2006) investigate the activities of specific types of traders as causes of price volatility. They analyze eight futures: corn, crude oil, Eurodollar deposits, gold, Japanese Yen, coffee, live cattle, and S&P 500 through vector autoregression (VAR). They also estimate the causal relationships among return, volume, large hedgers' activity, large speculators activity, and small hedger activity, small speculator activity. They find that activity of particular types of traders in futures market did not affect levels of price volatility, either positively or negatively.

Shalen develops the noisy rational expectations (NRE) model in 1993. He divides the traders into two categories. He postulates that informed traders have private information while the uniformed speculators have no private information. Therefore, the uninformed traders will attempt to extract price signals from observed futures price changes. His study shows that the uninformed speculators cause the increased price volatility.

Daigler and Wiley (1999) examine various financial futures markets. They conclude that trading activities taken on the trading floor are associated with the decreased price volatility. However, the trading activity through electronic platform are associated with increased volatility. Chang, Chou and Nelling (2000) investigate the S&P 500 futures market. Their empirical study suggests that the large hedging activity causes the increased volatility. They conclude that the large hedging trading activities are correlated with volatility. The demand side of hedging increased, the volatility increased as well.

Swanson and Granger(1997) study the causal relationship among the variables in a vector autoregression. Reale and Wilson (2001) and Moneta (2004) research on

monetary policy issues by using a VAR model. Akleman, Bessler and Burton (1999) investigate causal relationships among corn exports and exchange rates also using this model. Haigh and Bessler (2004) research on price discovery in cash grain markets and a related transportation market, again using this model. Bryant,Bessler and Haigh (2006)tests causal hypotheses emanating from theories of futures markets through VAR model

Methodology and Data

This study explores nonlinearities in the response of speculators' trading activity to price changes in wheat futures markets. I analyze weekly data from January 1, 2006 through February 28, 2010. The sample consists of 216 observations. Data on futures price come from Bloomberg DataStream. The returns are calculated as 100 times the natural logarithm of the first differences of weekly futures settlement prices. The trader position data are from Commitments of Traders (COT) reported on the official website of Commodity Futures Trading Commission (CFTC). All of the traders' reported futures positions are classified as commercial if a trader uses futures contracts for hedging or as noncommercial if a trader uses the futures contract for profit.

Rothig and Chiarella (2007) defined changes in hedger and speculator's position as 100 times the natural logarithm of the first differences of position respectively. This method could effectively reflect the changes of position. Thus, I use VAR model to measure the changes in hedger and speculators long positions.

Table 5-1 shows the summary statistics for the return and changes in speculator and hedger positions. The distributions of speculators indicate significant positive skewness. Furthermore, the speculator shows evidence of slightly excess kurtosis

compare to the normal distribution. Harvery and Siddique (1999) shows that the excess skewness and kurtosis potentially indicate the presence of heteroscedasticity.

Table 5-1. Summary Statistics

	N	Mean	Std	Skewneww	Kurtosis	Shapiro-Wilk	Kolmogorov-Smirnov	Cramer-Von Mises	Anderson-Darling
Speculator	216	0.1175	6.5002	0.1141	1.9833	< 0.0001	<0.0100	<0.0050	<0.0050
Hedger	216	0.1342	2.6175	0.1377	0.2140	0.3116	>0.1500	0.2290	0.1861
Return	216	0.1627	5.3436	-0.0240	0.02101	0.9182	>0.1500	>0.2500	>0.2500

To avoid the spurious regression problem, I took the stationarity test for the three categories. The Dickey and Fuller (1979) have developed a method to test the stationary series. The method has become very popular over the past thirty years. The method is also known as Augmented Dickey-Fuller (ADF) test. The ADF test consists of estimating the following equation;

$$\Delta \mathbf{X_t} = \mathbf{b_0} + \mathbf{b_1 X_{t-1}} + \sum_{\mathbf{j=1}}^{\mathbf{n}} \boldsymbol{\gamma}_{\mathrm{j}} \left(\Delta \mathbf{X_{t-j}}\right) + \boldsymbol{\varepsilon}_{\mathbf{t}}$$

Where $\Delta \boldsymbol{X_t}$ is the first difference value of X, $\boldsymbol{X_{t-1}}$ is the first-lagged valued of X. $\Delta \boldsymbol{X_{t-i}}$ is the $\boldsymbol{j}$th lagged of first differenced of values of X. The null hypothesis of non-stationary is $\boldsymbol{b_1} = \mathbf{0}$. Dickey and Fuller have shown that the *t* value for the $\boldsymbol{b_1}$ follows the $\boldsymbol{\tau}$ statistics. The Table 5-2 shows that the $\boldsymbol{\tau}$ statistics are -10.38 for speculator, -8.63 for hedger and -9.97 for return. All of them are significant at 5% level. Thus the speculator position changes, hedge position changes and return display stationary fluctuations.

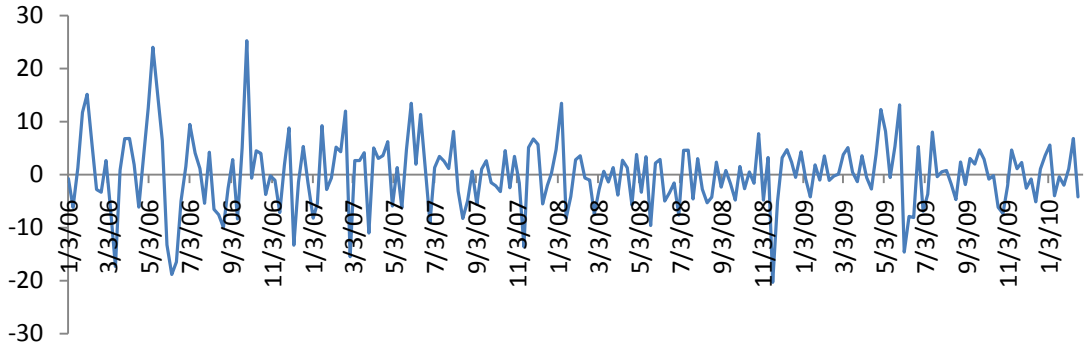

Figure 5-2. Speculators Position(%)

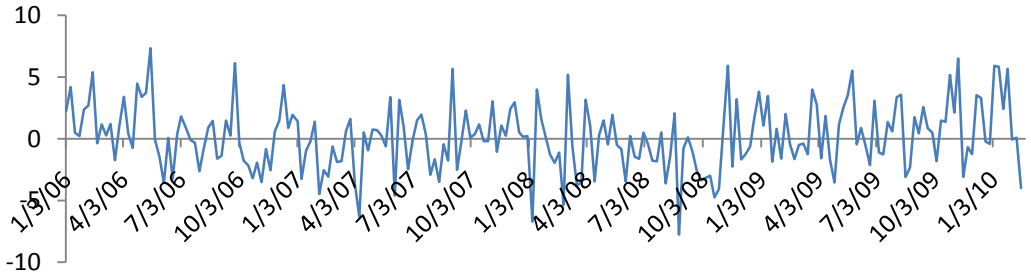

Figure 5-3. Hedgers Position(%)

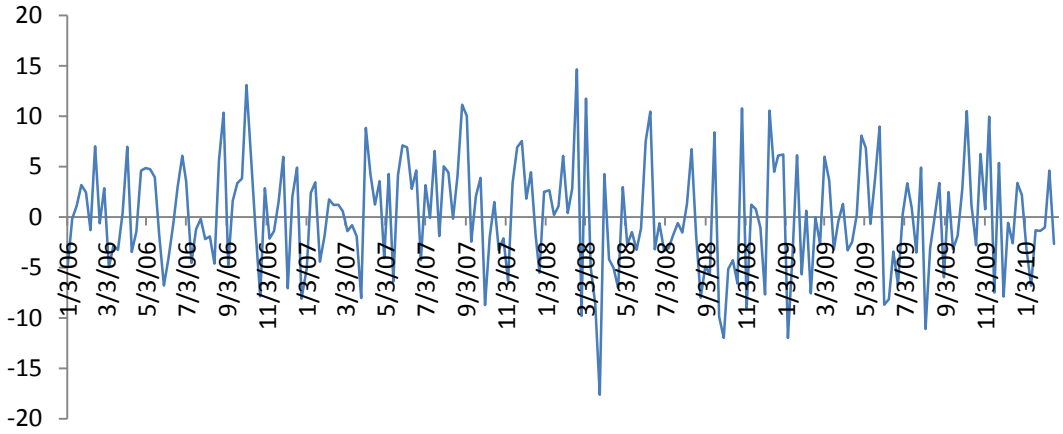

Figure 5-4. Daily Return(%)

Table 5-2. Unit Root Test and ARCH Affect Test

	Lag	Tau	Pr < Tau	Q	Pr > Q	LM	Pr > LM
Speculator	1	-10.38	<0.0001	9.8737	0.0017	9.7982	0.001
	2	-9.33	<0.0001	10.3734	0.0056	9.7998	0.0074
Hedger	1	-8.63	<.0001	0.1818	0.6699	0.1417	0.7066
	2	-7.25	<.0001	0.4774	0.7877	0.4613	0.7940
Return	1	-9.97	<.0001	8.2822	0.0040	8.2903	0.0040
	2	-8.42	<.0001	8.2986	0.0158	8.4636	0.0145

The results of the Granger causality test in my study are presented in the Table 5-4.The no causality null hypothesis can be rejected for changes in commercial hedger long positions and return. The hedging strategies did not affect the changes in futures prices. These results support the theory that hedgers hold futures positions corresponding to their spot positions. On the other hand, the test shows the significant evidence that the speculators affect the fluctuation of return. Therefore, it could conclude that the extreme volatility is caused primarily by speculators.

Table 5-3. Granger-Causality Wald Test

Test	DF	Chi-Square	Pr > ChiSq
1	1	0.13	0.7136
2	1	4.97	0.0258

Test 1: Group 1 Variables: price Group 2 Variables: Commercial

Test 2: Group 1 Variables: price Group 2 Variables: Noncommercial

The Table 5-4 presents the model diagnostic analysis, autocorrelation, normality and ARCH effect test. The normality shows that the residual has a normal distribution and no ARCH effect.

Table 5-4. White Noise Diagnostics

Variable	Durbin Watson	Normality		ARCH	
		Chi-Square	Pr > ChiSq	F -Value	Pr > F
Return	2.03170	2.54	0.2807	2.68	0.1030

In an effort to improve the transparency of the futures market, in 2006, the CFTC removed the swaps position from the hedger position to measure the trading activates through the OTC market. Therefore, by using the daily data, we calculated the correlations between market volatility and the presence of each trader type, including hedger, swaps dealers, speculators and others. The market presence represents the percentage of all open interest held by a trade group.

Volatility appears positively related to the presence of two of the four large trader groups, but is negatively related to the presence of hedger and other traders. Speculators and swaps dealers tend to move together with return.

Table 5-5. Correlation Analysis

	Volatility	Hedger	Others	Swaps dealer	speculators
Volatility	1.00000				
Hedger	-0.15506	1.00000			
Others	-0.08836	0.07001	1.00000		
Swaps dealer	0.24209	0.00001	-0.09483	1.00000	
Speculators	0.36956	-0.18371	-0.07241	0.10347	1.00000

CHAPTER 6
THE CASH MARKET AND FUTURES MARKET

In this Chapter 6, the convergence problem will be discussed. Futures market and cash market are always interacted. Under the efficient market, there exists a long-term equilibrium between cash and futures prices. In addition, the futures market has price discovery function, which helps the farmers, grain elevators and other merchants better forecast the trend of cash prices.

However, in recent years, is there still a long-term equilibrium between cash and futures market? Is there the bidirectional casualty between cash price and futures price? This chapter tries to find empirical evidence and answer the above questions. Cointegration is considered as a necessary condition for market efficiency according Lai and Lai, 1991. However, to conclude efficiency, we should also examine whether futures contracts are unbiased predictors of spot markets. If the wheat spot and futures contract prices are cointegrated, then a long-run relationship must exist between these two series.

Cointegration is an appropriate indicator of long-term co-movement. Among all cointegration tests, such as the Engle and Granger (1987) method and the Stock and Watson (1988) test, Johansen's test has a number of desirable properties, including the fact that all test variables are treated as endogenous variables.

First of all, the Augmented-Dick-fuller test has used to whether data series for wheat futures and spot are stationary. Second, through cointegration, I study whether wheat futures and cash prices have a long-term equilibrium. If both of them are cointegrated, the futures price should be the unbiased estimator of cash prices, as shown in the following equation:

$$\boldsymbol{lnS_t = \alpha + \beta lnF_t + \mu_t}$$

The data series for cash price are obtained from USDA and future prices from Bloomberg. The futures prices used in the test are the March Wheat futures prices. I created two data series from January 1, 2006 to February 2, 2010. There are total 1038 observations. Figure 6-1 shows that both of *ln* $\boldsymbol{F_t}$ and $\boldsymbol{lnS_t}$ are nonstationary, but the first differences are stationary.

Table 6-1. Unit Root Test

Type	Lags	Rho	Pr < Rho	Tau	Pr < Tau	F	Pr > F
Spot	1	-4.0151	0.5376	-1.54	0.5119	1.25	0.7498
Futures	1	-4.8218	0.4526	-1.87	0.3458	1.88	0.5898
First_dif_Spot	1	-1060.42	0.0001	-22.99	<.0001	264.18	0.0010
First_dif_Futures	1	-1114.51	0.0001	-23.57	<.0001	277.71	0.0010

Johansen's (1998) approach is used to test for co-integration. We consider a general VAR model of order k,

$$\triangle \mathbf{Y_t} = \boldsymbol{D} + \boldsymbol{\Pi Y_{t-k}} + \sum_{\boldsymbol{i=1}}^{\boldsymbol{k-1}} \boldsymbol{\Gamma_i \, \Delta Y_{t-i}} + \boldsymbol{\varepsilon_t}$$

Where $\triangle \mathbf{Y_t} = \boldsymbol{Y_t} - \boldsymbol{Y_{t-1}}$ and D is a deterministic term, $\boldsymbol{\Pi}$and $\boldsymbol{\Gamma_i}$ are matrices of coefficient. The cointergration relationship is examined by looking at the rank of the coefficient of matrix$\boldsymbol{\Pi}$, If $\boldsymbol{\Pi}$=0, there is no cointegration vector, hence no cointegration relationship. If $\boldsymbol{\Pi}$=1, the two series are cointegrated (Johanse and Juseliues,1990) The trace numbers are in the Table 6-2, which shows that there is no a long-term relationship between cash and futures prices. Neither of the series could predict its counterpart.

Table 6-2. Cointegration Rank Test

H0: Rank=r	H1: Rank>r	Eigenvalue	Trace	5% Critical Value	Drift in ECM	Drift in Process
0	0	0.0062	6.4447	12.21	NOINT	Constant
1	1	0.0003	0.0451	4.14		

The result of cointegration test shows no long-term relationship between cash and futures market. It is believed that the great volatility in wheat futures market has deteriorated the efficient of futures market

CHAPTER 7
COMMODITY INDEX AND INDEX SPECULATION

Another phenomenon in driving up the commodity futures was deregulation of index trading activates. The U.S. Senate Permanent Subcommittee in 2009 report suggested that Index speculators had contributed to the unreasonable price fluctuation in the energy and agriculture commodities and distorted the function of futures market, which could not reflect the accurate information of supply and demand in the physical market.

The index traders, to the extent, are like speculators. However, they focused on long-side exposure to duplicate an index of multiply commodities. Their trading goals are to diversify the investment portfolio. Because the returns between commodity and other securities such as stocks and bond may be negatively correlated, commodity investment may be optimal strategy for hedging purpose. Traders are commonly called the long-term investors, since they seek exposure to commodities through passive long-term investment. This strategy could be implemented via swaps agreement or mutual funds, exchange traded funds. Usually they enter into a swap agreement for underlying asset of a specific commodity index. The counterparts swap dealers, who have the hedge exemption, enter the futures market and take long positions in commodity index.

There are two important indices: Standard Poor's-Goldman Sachs Commodity Index(S&P GSCI) and the Dow Jones-AIG Commodity Index (DJAIGCI).

Standard Poor's-Goldman Sachs Commodity Index

The Figure 7-1 following shows the weight composition of each sector. One of the famous commodities indices, GSCI was created by Goldman Sachs in July 1992 and acquired by Standard &Poor's in 2007. It includes 24 commodity futures contracts

traded on U.S. exchanges: six energy products, five industrial metals, eight agricultural products, three livestock products and two precious metals. Futures contracts on the GSCI are traded at the Chicago Mercantile Exchange (CME).There is no limit on the number of contracts that may be included in the S&P GSCI. Its returns are calculated based on the arithmetic average of long positions in futures contracts (S&P GSCI Index Methodology 2010 edition). Goldman Sachs has calculated the historical value of the GSCI and normalized to a value of 100 on January 2, 1970, in order to permit comparisons of GSCI values over time.

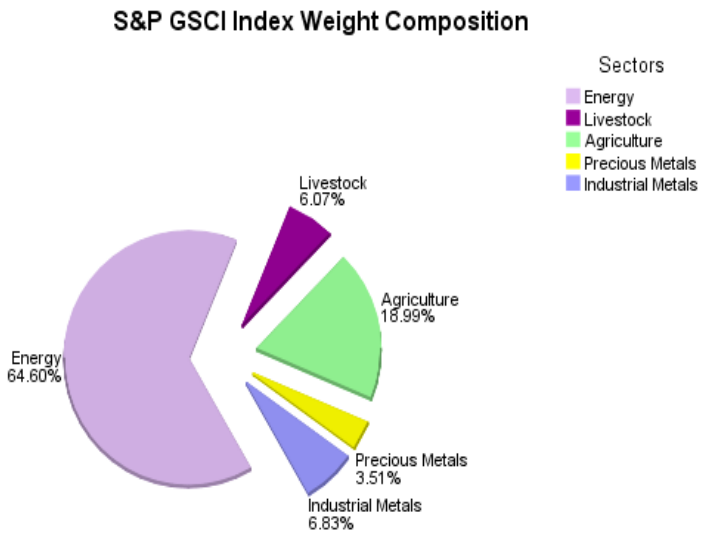

Figure 7-1. S&P GSCI Index Weight Composition

The contract value of each GSCI futures position is $250 times the GSCI index. When futures contracts in the GSCI are close to expiration, they are rolled forward to the next nearest contracts at the beginning of their expiration months. The rollover period is from the fifth through the ninth business day of each month. During this period, the GSCI portfolio is shifted from the existing to the next nearby futures contract at a rate of 20% per day. This means that on the fifth business day, the GSCI is adjusted to

consist of 20% of the second nearby contracts and 80% of the existing contracts. Likewise, on the sixth business day, the GSCI include 40% of second nearby contracts and 60% of the existing contracts(S&P GSCI Index Methodology 2010 edition). On the last day of the rolling period, the GSCI only include the second nearby contract. Therefore, the GSCI will always have contracts with two maturities for each of the 10 commodities between the fifth and ninth business day of each month. For other commodities with fewer futures, such as livestock, they are rolled forward less frequently.

Wheat Market and S&P GSCI

Related search includes Stoll and Whaley 2009, they analyze the price co-movements of index commodities and Granger-Causality between index inflow and wheat future recent. They found that “commodity index rolls have little futures price impact”,” the failure of the wheat futures price to converge has not undermined the futures contract’s effectiveness as a risk management tool” and correlation of commodities price levels that include in the commodity index of are quite low. Another research is carried by Irwin, Sanders and Merrin 2009. They also use the Granger-Causality Test to analyze the commodity index and price change and come up with the same results as Stoll and Whaley. What is more, they also conclude that when price low, seller complains the speculators, while when price are high, buyer complain the speculators. Actually, “it is the historical pattern of attacks upon speculation”.

In 2009, Congress published staff report titled “Excessive Speculation in the Wheat Market”. The report shows in detail about how commodity index traders affected the price of wheat contracts traded on the Chicago Mercantile Exchange over the past three years. The report pointed out around one-third and one-half of all of the

outstanding wheat futures contracts purchased by index traders offsetting part of their exposure to commodity index instruments sold to third parties. The report also finds that there are significant evidences that commodity index traders were one of the major causes of “unwarranted changes” in futures market.

Through correlation analysis, it is worthy noticing that in the Table 7-1 the significant relationship between S&P GSCI and wheat futures.

Table 7-1. Pearson Correlation Coefficients Prob > |r| under H0: Rho=0

	Wheat	S&P GSCI
Wheat	1.00000	0.43409
		(<.0001)
S&P GSCI	0.43409	1.00000
	(<.0001)	

Figure 7-2 and Figure 7-3 are the daily return of S&P GSCI futures and wheat futures traded on Chicago Mercantile Exchange (CME). The returns are measure by $100*\ln(F_t/F_{t-1})$. We observed the increased return variability in the recent years. Date series are obtained from the Bloomberg.

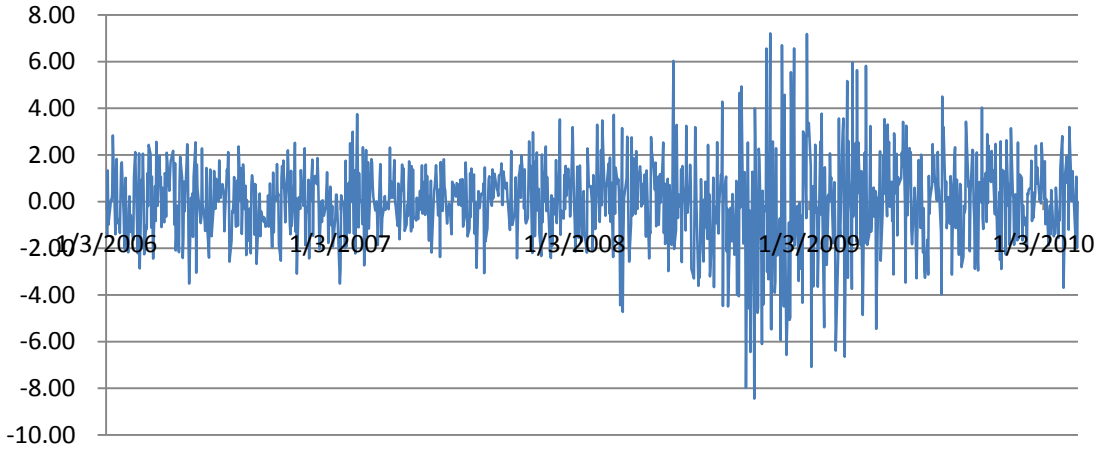

Figure 7-2. Daily Return of GSCI Futures(%)

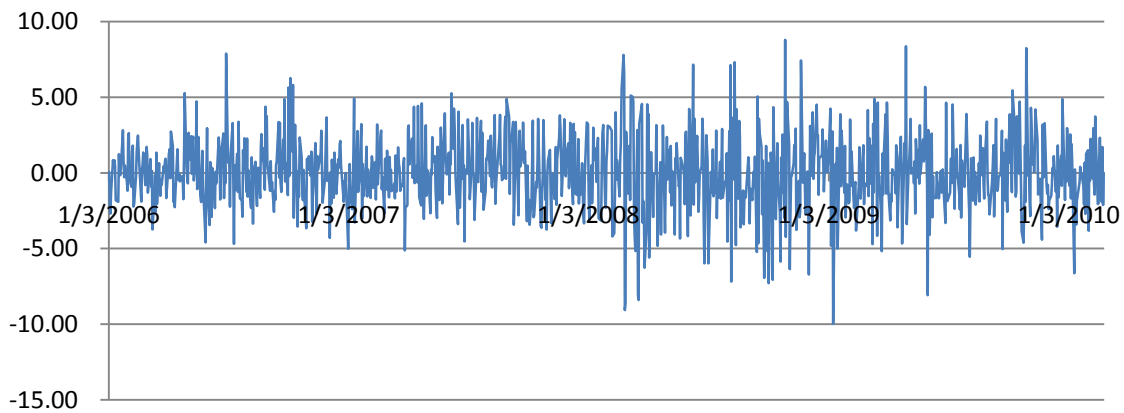

Figure 7-3. Daily Return of Wheat Futures(%)

Using the same method from the Chapter 6, I analyze the casualty between S&P GSCI futures contract and Wheat futures contract. The model can be written in matrix form as:

$$\begin{pmatrix} y_{GSCI,t} \\ y_{wheat,t} \end{pmatrix} = \begin{pmatrix} C_1 \\ C_2 \end{pmatrix} + \begin{pmatrix} b_{1,1,} & b_{1,2} \\ b_{2,1} & b_{2,2} \end{pmatrix} \begin{pmatrix} y_{GSCI,t-1} \\ y_{wheat,t-1} \end{pmatrix} + \begin{pmatrix} e_{1,t} \\ e_{2,t} \end{pmatrix}$$

Where the *e* is stochastic error term, call shocks in the VAR model. Before estimate the equation, we should judge the lag length. Including too many lagged terms will consume degrees of freedom and potentially induce multicollinearity. One way of deciding the lag length is to use a criterion such as Akaike and Schwarz rule. Using option=ESACF ,MINIC and SCAN, SAS program provides us the optimal lag length. In this study, the lag length one is appropriate suggested by SAS output. The ADF test in the Table 7-2 suggests both of the variables are stationary.

The Table 7-4 presents the VAR results based on one lag of each variable. The parameters tests given in the table are to test the hypothesis that collectively the various lagged coefficients are zero. The test shows that the first equation is not statistically different from zero, but the second equation is significant. Based on the result the wheat

is dependent on GSCI fluctuations. Next, the granger-causality confirms the VAR result. The no causality null hypothesis is rejected for GSCI and Wheat futures. The changes of wheat futures did not affect the GSCI fluctuation. However, the GSCI significantly influence the wheat price fluctuation.

Table 7-2. Summary Statistics and Unit Root Test

Variable	N	Mean	Std.Dev	Skewness	Kurtosis	Q(6)	Pr>ChiSq	ADF	Pr < Tau
GSCI	1044	0.0142	1.8819	-0.2479	2.0730	6.57	0.3625	-23.68	<.0001
Futures	1044	0.0333	2.4618	-0.0663	1.0890	5.23	0.05143	-23.27	<.0001

Table 7-3. Causality Wald Test

Test	DF	Chi-Square	Pr > ChiSq
1	1	0.04	0.8322
2	1	11.24	0.0008

Test 1: Group 1 Variables: GSCI
Group 2 Variables: wheat

Test 2: Group 1 Variables: wheat
Group 2 Variables: GSCI

Table 7-4. Model Parameter Estimates

Test	DF	Chi-Square	Pr > ChiSq
1	1	0.04	0.8322
2	1	11.24	0.0008

Test 1: Group 1 Variables: GSCI
Group 2 Variables: wheat

Test 2: Group 1 Variables: wheat
Group 2 Variables: GSCI

Equation	Parameter	Estimate	Error	t Value	Pr > |t|	Variable
GSCI	CONST1	0.01497	0.05827	0.26	0.7973	1
	AR1_1_1	-0.05999	0.03437	-1.75	0.0812	GSCI(t-1)
	AR1_1_2	0.00557	0.02627	0.21	0.8322	wheat(t-1)
wheat	CONST2	0.03514	0.07589	0.46	0.6435	1
	AR1_2_1	-0.15011	0.04477	-3.35	0.0008	GSCI(t-1)
	AR1_2_2	0.01522	0.03422	0.44	0.6566	wheat(t-1)

Testing of the Parameters

Test	DF	Chi-Square	Pr > ChiSq
1	2	3.41	0.1816
2	2	12.49	0.0019

Correlations of Residuals

Variable/ Lag	0	1	2	3
GSCI	++	..	..	..

Information Criteria				wheat	++ .. .. ..
AICC	2.857007	SBC	2.885449	+ is > 2*std error, - is <	
HQC	2.867775	AIC	2.856974	2*std error, . is between	
FPEC	17.40877				

CHAPTER 8
REGULATORY SYSTEM AND POLICY RECOMMENDATION

Development of Futures Regulation

Through the empirical analysis, we have found that the speculators, especially index speculators have tremendously influenced wheat futures market. Now we turn our focus to the federal regulatory system. We will look at the evolvement of futures regulation and research on whether the current regulatory system is effective to prevent excessive speculation.

The first complete regulatory framework for futures market in U.S. history is Commodity Exchange Act (CEA), which passed in 1936. The Commodity Exchange Act (CEA) required that all regulated agriculture commodities had to be traded only on the federal designated markets. Also, the Act authorized the Commodity Exchange Commission as an agency in the Department of Agriculture to oversight of the futures market. In addition, the Commodity Exchange Act required Commodity Exchange Commission to set up speculative position limits to prevent excessive speculation.

In 1974, the Commodity Futures Trading Commission (CFTC) was founded as an independent regulatory agency to oversee futures market. The CFTC was empowered more jurisdiction than ever before. Previously, the Commission could only regulate agricultural commodities listed in the Commodity Exchange Act, whereas CFTC have authorized to regulate all types of futures trading in all commodities.

The 1980s saw a rapid development of derivatives market. Financial derivatives became common and served as effective risk-management tools. Numerous types of financial derivatives had been created, such as foreign exchange, interest rate and even credit rating. At the same time, regulatory burdens were blamed for retarding the

progress of the OTC derivatives market. Particularly, in 1990s, the legal uncertainty has been a great problem when financial institutions developed a new instrument, which was potential to reduce the flexibility and competitiveness of U.S. financial markets. To keep the competitive advantage of U.S futures markets and ensure integrity and efficiency of the market, the Congress passed the Commodity Futures Modernization Act (CFMA) in 2000. The CFMA of 2000 incorporated much more flexible standards into the act and greater legal certainty in the OTC market. The CFTC established a new regulatory framework with the guidance of innovation of the OTC market and elimination of excessive burden on sophisticated institutions or wealthy participants. Later on, the CFMA has caused a series of serious consequence for OTC market. Since the CFMA clarified that derivatives transactions was outside of its jurisdiction, which has been believed to contribute to the turmoil in futures market.

The CFMA created three categories of commodities: agriculture commodities, excluded commodities and exempt commodities. The excluded commodities are defined as interest rates, exchange rates, currencies, credit risk, debt instruments, measures of inflation, or other macroeconomic index. The exempt commodities are neither excluded commodities nor agriculture commodities. Particularly, the energy and metal contracts are categorized as exempt commodities.

Exempt commodities have two specific provisions. First, a contract or agreement enters into between eligible contracts participants and not traded on trading facilities is outside of the CFTC jurisdiction. Second, the contract or transaction entered between the eligible contracts participants traded or executed on an electronic trading facility is also exempt from the CFTC regulation, which is also known as Enron Loophole.

Before 2000, there only existed the Designated Contract Market (DCM). The CFMA in 2000 established another two regulated markets: Derivatives Transaction Execution Facilities (DTEF) and Exempt Market. The three types of exchanges, based on the nature of futures traded and knowledgeable participants, are subject to the varying levels of regulation.

The Designated Commercial Markets open to all types of market participants and any type commodity and has the highest level of regulatory oversight. The exchange should report to the CFTC the larger trader positions on daily basis. Besides, the CFTC was required to continuously keep this kind of market under surveillance. The Chicago Board of Trade (CBOT), Chicago Mercantile Exchange (CME) and New York Mercantile Exchange (NYMEX) are Designated Commercial Markets.

The Derivatives Transaction Execution Facilities receives an intermediate level of regulations. This kind of market is divided into another two categories, Regular and Commercial. This trading facility is limited to eligible commercial entities. Any commodity other than an agriculture commodity can be traded. However, some agriculture commodities could be trade if approved by the commission. In addition, the Derivatives Transaction Execution Facilities must comply with some requirements, for example, establishing the compliance and surveillance, monitoring of trading activates and having a record keeping system.

Unlike the Designated Commercial Market and Derivatives Transaction Execution Facilities, the third Exempt Market is exempted from most provisions of CEA. There are two types of exempt markets, Exempt Board of Trade (EBOT) and Exempt Commercial

Market (ECM). The commodities eligible to be traded on an Exempt Board of Trade (EBOT) are excluded commodities.

The CFMA established separated exemptions for Exempt Commercial Market (ECM). To be qualified for these exemptions, the contracts and transactions must be traded or executed on electronic trading facilities between eligible commercial entities. In addition, the commodities traded on the Exempt Commercial Market are restricted to the exempt commodity. This trading facility operating as an Exempt Commercial Market (ECM) must limit trading to eligible commercial entities

Speculative Position Limits

To prevent excessive speculation, an effective regulatory system is the guarantee. There are two important and effective practices for futures market regulations: position limit and daily reporting system.

The speculative position limits have been believed to be an effect tool for the commission to impede the manipulation of U.S. futures markets and prevent unreasonable price fluctuations. From its inception, this rule was little changed until 1981 that the CFTC required exchanges to adopt position limits for all the contracts not listed on the federal position limits

Currently, the position limits are regulated under two frameworks (Table 8-1). One is the federal position limits for agricultural commodities in futures and option market, which are enumerated in the federal regulations (Table 8-2). The other is exchange-set speculative position limits. Both the CFTC and the Designated Commercial Market take on the enforcement of the exchange-set speculative position limits.

Table 8-1. Current Practices in Setting Speculative Position Limits and Position Accountability Levels In selected Futures Contract Market as of July 24, 2009 Source: Federal Regulation

Category	Sample Contracts	Speculative Position Limits(√) or Position Accountability(PA)		
		Spot Month	Single Month	All Months Combined
CFTC Speculative Position Limits				
Federal Limits	Corn, oats, soybeans, Soybean oil, Soybean meal, wheat and Cotton	√	√	√
Limits and Levels Set by Exchanges				
Other Agricultural	CME Frozen Pork Bellies; ICE U.S. Frozen Concentrated Orange Juice	√	√	√
	CME Livestock and Milk	√	√	√
	ICE Cocoa, Coffee and World Sugar	√	√	-
Energy	NYMEX Crude Oil, Natural Gas, Heating Oil, and Gasoline; ICE U.K.WTI	√	PA	PA
Metal	COMEX Gold and Silver	√	PA	PA

Table 8-2. Speculative Position Limit (2010) in Contract Units Source:Federal Regulation

Contract	Spot month	Single month	All months
Chicago Board of Trade			
Corn and Mini-Corn	600	13,500	22,000
Oats	600	1,400	2,000
Soybeans and Mini-Soybeans	600	6,500	10,000
Wheat and Mini-Wheat	600	5,000	6,500
Soybean Oil	540	5,000	6,500
Soybean Meal	720	5,000	6,500
Minneapolis Grain Exchange			
Hard Red Spring Wheat	600	5,000	6,500
New York Board of Trade			
Cotton No. 2	300	3,500	5,000
Kansas City Board of Trade			

Hard Winter Wheat	600	5,000	6,500

Reporting System

The daily report system could be traced back to early 1920s. It required the clearing member on each exchange to report the large trader positions. This system is an important part of regulation and is still used by the CFTC today.

Commitment of Trader Report

The Commitment of Trader Report is published weekly by the CFTC and contains more detailed information about position holdings, spreading, open interest by category, and numbers of traders. The categories are:

1) producer/merchant/processor/user, who 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) speculator, who is a registered commodity trading advisor (CTA), a registered commodity pool operator (CPO). These traders are engaged in operating a fund for a commodity pool, that is, “an enterprise in which funds contributed by a number of persons are combined for the purpose of trading futures contracts or commodity options, or to invest in another commodity pool.” (National Futures Association definition).

3) other reportable, who are not falling in any of the other two categories.

Commodity Index Trade Supplement

The CFTC also published weekly Commodity Index Trade (CIT) Supplement on its website. CIT report contains 12 agricultural commodities, providing more detailed information about index trader activities, for example, long/short position, percentage open interest and number of trader and changes in their position.

Special Calls

The special calls provision could be traced back to the 1970s when the CFTC encountered the problems of regulating the individuals located outside the U.S. and trade in U.S. market. For the people in the domestic market, the large traders are required to file reports of their daily positions to the CFTC. This requirement would make it easy for the CFTC to inspect that whether the unreasonable price movement was caused by the large positions. However, the CFTC could not obtain the large positions hold by the foreign brokers' customers and their financial interests. To solve the imbalance of regulations between foreign and domestic traders, the CFTC adopted the special calls provision in which anyone receiving the special call must provide the information the CFTC asked for, such as a firm's trading and delivery activity. Although the foreign large traders do not have daily position responsibility, but they have to provide the business activities and daily positions if the CFTC issue the special calls to get those information

Enron Loophole

The CFMA allowed exempt commodities such as oil to be traded on Exempt Commercial markets, free from the most of requirement by the CFTC and speculative position limits, which are accommodated industry interests and fostered anticompetitive behaviors and market manipulations. Particularly, Enron has been reported to purposefully, improperly influence energy prices in western markets. Enron, through its Enron Online (EOL) launched in 1999, provided web-based electronic trading platform for wholesale energy, swaps, and other commodities. The daily average transactions on the platform were $2.5 billion. 2,100 products were offered to traders across four

continents based on 15 different currencies. Between 1999 and 2001, Enron Online reported the profit by derivatives trades as $920 million.

Swaps Loophole

The swaps market has grown rapidly since 1980, because it provides the participants more flexible ways to hedge their exposure risks. According to the Bank for International Settlements, the amounts of outstanding of global over-the-counter (OTC) derivatives are estimated to be $614 trillion in December 2009. In essence, a swap contract is an agreement between two parties that exchange a series of cash flows in the future. Compare to other financial market, the swaps market has it unique characteristics: 1) It affords the privacy for the swaps trading .Only two counterparties knows the swap trading. 2) The swaps market could escape the government regulation.

In the past, the CFTC believed that the swaps dealers had no incentive to manipulate futures prices. Just like bona fide physical hedger, swaps dealers used the futures market to hedge their transactions. Therefore, the CFMA of 2000 greatly swept away the legal uncertainty by significantly expanding the exemptions of swaps transactions on financial instruments and physical commodities. The CFMA allowed the swaps transactions based on the excluded commodity and exempt commodity to be exempted from the regulations of the CFTC and Securities Exchange Commission.

Nowadays, the agriculture commodities could be traded on the multiple exchanges, including the OTC market. Since swaps dealers who have hedge exemptions could enter the futures market with unlimited quantities, institutional investors investing in commodity futures do not directly trade through futures exchange. They used the swaps contracts to hold an excessive amount of futures contracts without any constrain from speculative position limits. In absence of speculative position limits, the commodities

derivatives market are exposure to excessive speculation. It was estimated that, in 2006, Goldman Sachs and Morgan Stanley had earned billions of dollars in energy trading for two years.

In the end of 2007, the CFTC issued special calls to 32 entities and their sub entities to get a comprehensive knowledge of the quantity of commodity index trading in OTC and exchange markets. The special calls of 2007 required the entities who engaged in the index trading activity to provide the notional value of their index business including in both domestic market and foreign markets. The index commodity funds should classify the positions they hold directly in the futures market and positions through swaps dealers. The data collected by the CFTC from the special calls demonstrated the conclusion that positions held by the swap clients exceed the federal speculate limits. For wheat futures, the total notional value of open contracts on June 30, 2008 was estimated to be $19 billion and the net notional index value took approximately 47 percent of this total.

The increased commodity index trading has made the CFTC reconsider whether it is appropriate to put the swap dealer trading in the commercial category, because swaps dealers are using the future market to hedge risk in the OTC market, but their client might be a speculator. In an effort to improve the transparency of the futures market, the commission publishes the commitments of trader report, which remove Swap Dealer from Commercial Category and Create New Swap Dealer Classification since Jan 1, 2006. The swap dealer in the Commitment of Trader defines as the people who deal primarily in swaps for a commodity and uses the futures markets to hedge the

risk associated with those swaps transactions. However, the swap dealer's counterparties may be speculator, like mutual funds, or traditional commercial hedger,

In addition,there is a little bit difference between index traders' position in the supplement and swap dealer position in the Commitment of Trade (COT). The swap dealer category includes some position that has nothing with commodity index business. On the other hand, the index trader category in the CIT supplement, including the institutional investors who do the index trading directly in the futures market rather than go to OTC market. The institutional investor positions are classified as managed money or other reportable in the Commitment of Trade (COT). Therefore, the index trading activities through the swap dealers still could not be precisely measured.

What is more, the CFTC published the Quarterly Index Investment Data on its website since 2008. The data was selected from the special calls issued to the swap dealers and index traders. The report includes the national values and the equivalent number of futures contracts for all U.S. markets with more than $0.5 billion of reported net notional value of index investment at the end of any one quarter.

Policy Recommendation

Today, the CFTC jurisdiction scope expands much larger than ever before. It regulates the activities of about 3000 commodity exchange members, 360 public brokerage houses and 2,500 commodity trading advisers and commodity pool operators. In addition, off-exchange transactions involving instruments with similar feature to futures contracts are also within CFTC jurisdiction. Futures contracts are so diversified that the underlying asset have expanded to precious metals, raw materials, foreign currencies, commercial interest rates, U.S. governments and so on. A number of contracts have begun to be traded on multiple exchanges, including exchanges outside

the United States. Therefore, in order to keep the pace with development of futures market, the CFTC need some amendments to maintain the integrity of the market and hedger's benefit.

The CFTC reauthorization Act of 2008 (Farm Bill 2008) expands the CFTC authority by creating a new regulatory category, which is the contract with the significant price discovery function traded on the exempt commercial market. Price discovery is an important function for futures market, since it helps people have more accurate forecasts and a better investment plan. The futures prices cannot be known with certainty today, the high level of relationship between cash and futures markets make it possible for people to estimate the future price better. The Title XIII of the Farm Bill provides standards applicable to significant price discovery contracts. Once the CFTC finds that a contract traded on exempt commercial market performs significant price-discovery function, the contract will be subject to Commodity Exchange Act and commission regulations.

Improve Transparency and Data Accuracy

In this study, we find that the index trading activities through OTC market are still not enough to judge and measure. The data collected though the special calls will take a comparative long time. The new Commitment of Trader since 2006 removes the swaps dealers from the commercial categories. However, the swaps dealer's clients might be hedge and speculators. In order to enhance the transparency of futures and options market, the Commission has to improve the weekly commitment of Trader reports by including more detail trader classification.

Improve Regulation on Index Trading Activity

The special calls of 2007 illustrated that the positions held by the many swaps dealers' client has exceed the speculative position limits. A question is raised by whether swaps dealers should receive hedger exemption from speculative position limits in consideration of the mix of commercial and noncommercial activity. In order to keep the regulatory consistency and market integrity, the CFTC should improve the evaluation of the noncommercial activity by swaps dealers and prevent the noncommercial positions from exceeding position limits.

CHAPTER 9
CONCLUSION

This thesis describes the wheat futures market and speculation behaviors. The main conclusions are

The futures market experienced a great volatile in recent years. Through the basis analysis, the large discrepancy between spot and futures market during the expiration month has been a major problem in the wheat market.

The volatility of wheat futures shows strong heterosckedascity and autocorrelation. Based on the analysis of relationship between spot and futures price, they are not cointegrated and the futures price did not contain much information to reflect the spot price and verse well. Therefore, the larger volatility of wheat futures market has lower the efficiency of price discovery functions

Based on the GARCH model, the volume and open interest provides a power explanation for the volatility when enter separately. The coefficients of open interest to volatility are negative and statistically significant. In addition, the test found that the greater market depth, the lower the volatility, given a trading volume. Besides open interest has a relative small impact on volatility than a trade incurred a high trading volume without a corresponding changing in open interest.

The granger-casualty test indicates that the speculator trading activates have led to the change of wheat return. The hedger activates comparatively shows steady and little impact on the volatility of wheat futures. Since the data are not available for the index traders and swaps dealers. That the CFTC issuing the special calls to swaps dealers and then collecting them need a long time. Therefore, casualty-test to measure

the index trader and volatility is hard to carry on. However, through special calls, there still a clear information that a large fund flow into the wheat futures.

Since 2000, the CFTC has ongoing deregulated over-the-counter market. This regulatory system makes the excessive speculation possible. Many participants through the OTC market hold more position than position limits. In addition, the Farm Bill still did not stop the index trader through OTC market to influence the futures price.

Future research may have two directions: first, the sampling period of this study is during the financial crisis, there must be some endogenous variables that might distort the futures market or even deteriorate the economy. Understanding these inner links will be better for find out the reason of extremely volatile in futures market.

Second, in order to actually measure the index traders activates, improve the futures market transparence, I will expand my to research scope to other commodities, such as soybean, cotton and grain. After acquiring the relative data about index traders' business activities, further research on this topic will be moved on.

LIST OF REFERENCES

Akleman, D.G., Bessler, D.A.,&Burton, D.(1999). Modeling Corn Exports and Exchange Rates with Directed Graphs and Statistical Loss Functions, in Clark Glymour and Gregory Cooper editors *Computation, Causation, and Discovery* Cambridge, MA: AAAI/MIT Press, 497-520.

Alexia B.,& Meredith S,.(2007). Beyond Enron: Regulation in Energy Derivatives Trading, *Northwestern Journal of International Law &Bussiness* 27,665

Abbott, P.C., Christopher H.& Wallace E.T.(2008). What's Driving Food Prices? A Farm Foundation Issue Report, July.

Babula, R.,Bessler, D.A.& Payne,W.S.(2004). Dynamic Relationships among U.S. Wheat-Related Markets: Applying Directed Acyclic Graphs to a Time Series Model. *Journal of Agricultural and Applied Economics*, 36,1-22.

Bessembinder,H.,& Seguin,P.J.(1993). Price volatility, trading volume, and market depth: Evidence from futures market. *Journal of Financial and Quantitative Analysis*, 28, 21-39.

Black, F. & Myron S. (1973). The Pricing of Options and Corporate Liabilities, *Journal of Political Economy* 81,637-659.

Bollerslev, T. (1986). Generalized autoregressive conditional heteroskedasticity.*Journal of Econometrics*, 31, 307-327.

Bollerslev,T. (1987). A conditional heteroskedastic time series model for speculative prices and rates of return. *Review of Economics and Statistics*, 9,542-547.

Bryant, H. L., Bessler, D. A.& Haigh M.S.(2006). Causality in futures markets,*Journal of Futures Market*, 26,1039-1057

Carlton, D. (1984).Future Markets: Their Purpose, Their History, Their Growth, Their Successes and Failures. *The Journal of Future Markets* 4(3), 237-271.

Chang, E. C. (1985). Returns to speculators and the theory of normal backwardation. *Journal of Finance*, 40,193-208.

Chang, E. C., Chou, R. Y.,& Nelling, E. F. (2000). Market volatility and the demand for hedging in stock index futures. *Journal of Futures Markets*, 20,105-125.

Commodity Futures Trading Commission (2008). *Agricultural Forum*, April 22.

Commodity Futures Trading Commission (2008), Office of the Chief Economist. Personal Communication with Dr. Jeff Harris, July .

Commodity Futures Trading Commission (2008). CFTC Approves Amendments to the CBOT's Wheat Futures Contract, *Press Release No. 5579-08*, December 4.

Commodity Futures Trading Commission (2008). *Staff Report on Commodity Swap Dealers & Index Traders with Commission Recommendations*, September

Commodity Futures Modernization Act of 2000

Commodity Future Trading Commission, Fiscal Year 2002 Annual Report.

Cornell, B. (1981). The relation between volume and price variability in futures markets. *Journal of Futures Markets*, 1, 303-316.

Cooper, R.N., & Lawrence. R.Z. (1975) The 1972-75 Commodity Boom,*Brookings Papers on Economic Activity* 3,671-723.

Daigler, R. T., & Wiley, M. K. (1999). The impact of trader type on the futures volatility-volume relation. *Journal of Finance*, 54, 2297-2316.

Domanski, D, &A. Heath (2007). Financial Investors and Commodity Markets, *Bank for International Settlements Quarterly Review*, 53-67.

Fortenbery, T.R,&Hauser. R.J.(1990). Investment Potential of Agricultural Futures Contracts. *American Journal of Agricultural Economics* 72(3),721-726.

Fujihara, R.A.& Mougoue, M.(1997). An examination of linear and nonlinear causal relationships between price variability and volume in petroleum futures markets. *Journal of Futures Markets* 17, 385–416.

Girma,P.B.,&Paulson,A.S.(1998).Seasonality in petroleum futures spreads.*Journal of Futures Markets*, 18, 581–598.

Girma,P.B.,&Mougoué,M.(2002).An empirical examination of the relation between futures spread volatility, volume and open interest. *The Journal of Futures Markets*, 22(11), 1083-1102

Gorton, G., & Rouwenhorst. K.G. (2006).Facts and Fantasies about Commodity Futures. *Financial Analysts Journal* 62(2),47-68.

Greenberger, M.(2007), Testimony of Energy Speculation: Is Greater Regulation Necessary to Stop Price Manipulation?

Greenberger, M. (2008).Testimony of Energy Market manipulation and Federal Enforcement Regimes,

Haigh, M. S. (1999).Cointegration, unbiased expectations and forecasting in the BIFFEX freight futures market. *Journal of Futures Market*, 20,546-571.

Haigh, M., Nomikos,N.K.&Bessler,D.A.(2004). Integration and Causality in International Freight Markets – Modeling with Error Correction and Directed Acyclic Graphs, *Journal of Southern Economic* 71,145-162.

Haigh, M. S.,& Bessler, D. A. (2004). Causality and price discovery: An application of directed acyclic graphs. *Journal of Business*, 77,1099-1121.

Irwin, S.H.,Garcia, P.,Good,D.L.,& Kunda,E.L.(2008) Recent Convergence Performance of CBOT Corn, Soybean, and Wheat Futures Contracts, *Choices*, American Agricultural Economics Association, 2nd pp. 16-21.

Irwin, S.H., Sanders D.L.,& Merrin, R.P. (2009). Devil or Angel: The Role of Speculation in the Recent Commodity Price Boom (and Bust), Invited paper at the Southern Agricultural Economics Association Meetings, Atlanta, GA.

Johansen, S. (1988). Statistical analysis of cointegration vectors. *Journal of Economic Dynamics and Control*, 12, 231-254.

Johansen, S. (1991). Estimation and hypothesis testing of cointegration vectors in gaussian vector autoregressive models. *Econometrica*, 59,1511-1580.

Karpoff, J. M. (1987). The relation between price changes and trading volume: A survey. *Journal of Financial and Quantitative Analysis,* 22,109-126.

Labys, W.C.,&Thomas H.C. (1975). Speculation, Hedging and Commodity Price Behavior: An International Comparison. *Applied Economics,* 7,287-301.

Lamoureux, C., & Lastrpes, W. (1990). Heteroscedasticity in stock return data: Volume versus garch effects. *Journal of Finance,* 45,221–229.

Lai,K.&Lai, M. (1991). A cointegration test for market efficiency, *Journal of Futures Markets*, 11, 567–575

Majority and Minority staff report,(2009), Excessive Speculation in the Wheat Market.

Mark J.& Lynn J.(2008). Speculation and Energy Prices: Legislative Response, Cunningham, *Congressional Research Service Report* RL34555.

Moneta, A.(2004). Identification of Monetary Policy Shocks: A graphical causal approach. Notas Económicas, Faculdade de Economia, Universidade de Coimbra, 20,39-62.

Randolph, W. L., & M. Najand, (1991). A Test of Two Models in Forecasting Stock Index Future Price Volatility, *Journal of Futures Markets* 11,179-190.

Park, H., Mjelde, J.&Bessler,D.A. (2008). Price Interactions and Discovery among Natural Gas Spot Markets in North America. *Energy Policy* 36, 290-302.

Peck A.E. (1981). The Adequacy of Speculation on the Wheat, Corn, and Soybean Futures Markets. *Research in Domestic and International Agribusiness Management* , 2,17–29.

Röthig,A., &Chiarella,C. (2006). Investigating Nonlinear Speculation in Cattle, Corn and Hog Futures Markets Using Logistic Smooth Transition Regression Models, Research Paper Series 172, Quantitative Finance Research Center, University of Technology, Sydney.

Reale, M.,& Wilson,G.T. (2001). Identification of vector AR models with recursive structural errors using conditional independence graphs. *Statistical Methods and Applications*, 10,49-65.

Sanders, D.R., S.H. Irwin, and R.P. Merrin.(2008) *The Adequacy of Speculation in Agricultural Futures Markets: Too Much of a Good Thing? Marketing and Outlook Research Report.*

Shalen, C. T. (1993). Volume, Volatility, and the Dispersion of Beliefs. *Review of Financial Studies*, 6, 405-434.

Staff report. (2006). The Role of Market Speculation in Rising Oil and Gas Prices: A Need to Put the Cop Back on the Beat.

Stock, J.S. &M. Watson (1988), Variable Trends in Economic Time Series. *Journal of Economic Perspectives,* 2(3)

Stoll, H. R., &Whaley, R. E. (1988). Volatility and futures: Message versus messenger.*Journal of Portfolio Management*, 14,20-22.

Stoll, H. R., &Whaley, R. E. (1990). The dynamics of stock index and stock indexfutures returns. *Journal of Financial and Quantitative Analysis*, 25,441-468.

Streeter, D.H.,&Tomek, W.G. (1992). Variability in Soybean Futures Prices: An Integrated Framework. T*he Journal of Future Markets*, 12(6),706-728.

Subcommittee report (2006), The Role of Market Speculation in Rising Oil and Gas Prices: A Need to Put the Cop Back on the Beat, S. Prt,109-165

Swanson, N. R.,& Granger, C. W. J. (1997). Impulse response functions based on a causal approach to residual orthogonalization in vector autoregressions. *Journal of the American Statistical Association*, 92,357–367.

Tauchen, G.E.,&Pitts, M. (1983). The price variability-volume relationship on speculative markets. *Econometrica*, 51,485–506.

The Enron Loophole(2008). Congressional Research Service.

Wang, C. (2002). The effect of net positions by trader type on volatility in foreign currency futures markets. *Journal of Futures Markets*, 22,427–450.

Wiley, M.,&Robert D.(1998). Volume relationships among types of traders in the financial futures markets, *Journal of Futures Markets,* 8,91–114.

Zhang, J. E.,& Zhu, Y. (2006). VIX futures. *Journal of Futures Markets*, 26,521-531.

BIOGRAPHICAL SKETCH

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