THE EFFICIENCY OF SOYBEAN NO.1 FUTURES MARKET IN CHINA

By

BEIBEI LIU

An Independent Study
Submitted in partial fulfillment of the requirements
for the Degree of

MASTER OF SCIENCE IN FINANCE AND ECONOMICS

MARTIN DE TOURS SCHOOL OF MANAGEMENT AND ECONOMICS
Assumption University
Bangkok, Thailand

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MARTIN DE TOURS SCHOOL OF MANAGEMENT AND ECONOMICS
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ASSUMPTION UNIVERSITY

This Study by: Ms. Beibei Liu

Entitled: "A Weak-Form Efficiency Test of Futures Market in China: A Case of Soybean"

has been approved as meeting the independent study requirement for the:

DEGREE OF MASTER OF SCIENCE IN FINANCE AND ECONOMICS

Dr. Phassawan Suntraruk, Chairperson

Asst. Prof. Dr. Nopphon Tangjitprom, Member

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Date of Defense November 14, 2013

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I, **Beibei Liu**

declare that this thesis and the work presented in it are my own and has been generated by me as the result of my own original research.

THE EFFICIENCY OF SOYBEAN NO.1 FUTURES MARKET IN CHINA

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I confirm that this thesis has been carried out under my supervision and it represents the original work of the candidate.

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Dr. Suppanunta Mookkakul, Advisor

Date:

1 8 DEC 2013

ACKNOWLEDGEMENT

I have taken efforts in this paper, however this research paper depends largely a lot of peoples' encouragement and guidance. I would like to take this opportunity to express my gratitude and appreciation towards them for their generous help and invaluable guidance, assistance and support.

First of all, I would like to acknowledge the enthusiastic supervision of my advisor, Dr. Suppanunta Romprasert, who has always inspired me to work this project, for the valuable guidance and advice, as well as for providing necessary information and examples related to the project. I also wish to express my gratitude to Dr. Wiyada Nittayagasetwat, Dr. Phassawan Suntraruk and Dr. Nopphon Tanjitprom, since without their knowledge and assistance, this study would not have been successful. My deepest gratitude is also given to the members of the supervisory committee, Dr. Suppanunta Romprasert, Dr. Phassawan Suntraruk and Dr. Nopphon Tanjitprom for their valuable advices and guidance. I also like to convey thanks to the Ministry and Faculty especially Khun. Gop and Khun. Mon for providing necessary information and support. I would also like to thank also to all my graduate friends, for sharing experiences and invaluable assistance.

I wish to express my love and gratitude to my beloved Family; for their understanding & endless love, through the duration of the studies. I would like to express my gratitude to my dear friends for encouragement which helped in the completion of this project.

Without the help of these people, I would not have completed the study. I really would like to extend my sincere thanks to all of them.

Beibei Liu

November, 2013

ABSTRACT

The objective of this research was to test whether Chinese soybean No.1 futures market is efficient or not. A Johansen cointegration methodology was adapted to research the Chinese soybean futures market efficiency from January 2009 to July 2013. The prices of soybean No.1 were regarded as prices of soybean product in this paper. The futures contract months in DCE are Jan, Mar, May, Jul, Sep, and Nov. The weekly futures price data was obtained from DCE website. The futures prices were taken five forecasting horizons. This includes one-week before maturity, two-week before maturity, two months before maturity, four months before maturity and six months before maturity respectively. The cash prices are the national soybean acquisition prices collected from CNgrain online database were the third-week prices of contract in related maturity month. There is a total of 168 observations.

The results show that there is no cointegration that existed between the futures price and cash price of soybeans. The study also revealed an inefficiency of the soybean futures market.

Results from the study may help producers or marketers to hedge, arbitrage, operate in an attempt to manage price risks inherent in commodity ownership. Investors who are searching market profits can handle new information and act thorough analyses. If the price of soybean futures on the DCE provides a reliable forecast of spot prices in the future, producers can manage their risks in production and trading effectively.

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CHAPTER I

GENERALITIES OF THE STUDY

1.1 Background of the Study

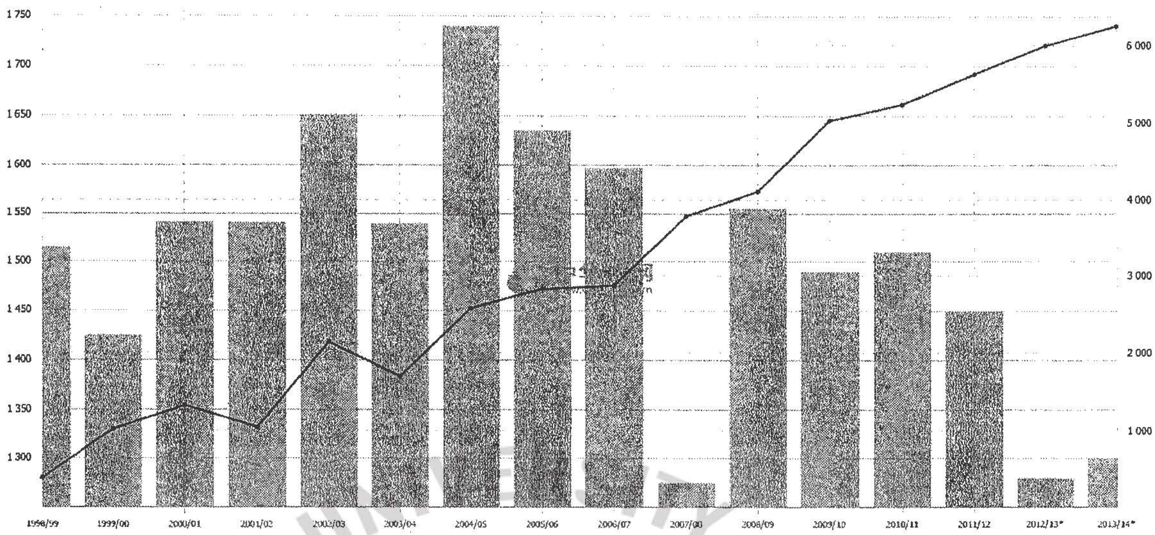
Futures market is used for arbitrage, operational, and anticipatory hedging in an attempt to manage price risks inherent in commodity ownership. The futures market efficiency is the premise and foundation of risk management and price discovery. When futures market has a high effectiveness, the whole market would be balanced. Hedgers and speculators can take what they need; mutual trade and transfer risks. However, if there is a lack of efficiency for the futures market, then the market price will run out of rational pricing ranges. Thus, it creates an impact on safety, stable operation of the market. even the entire macro-economy operation. The study of efficiency test in Chinese spot-futures markets is very important to the Chinese farmers, importers, domestic traders. Futures market efficiency is one of the most important indicators to measure maturity of the market.

There were many studies conducted to research on Chinese commodities futures markets efficiency, including H. H. Wang and Ke (2003), H. H. Wang and Ke (2005), Chen and Firth (2006), Liu and Wang (2006), Xin, Chen, and Firth (2006), Chongfeng (2007), testing the equilibrium relationship between spot and futures prices, to reveal whether the futures market is efficient or inefficient based on the analysis results. In an efficient futures market, the prices have "fully reflected" all the available information, no traders can arbitrage in the efficient commodity futures market. It also means that an efficient commodity futures market is a signal of the spot price. The equilibrium price for suppliers and demanders will also be reflected in efficient market. If the futures market is inefficient, risk premium and/or transportation cost will exist, and the price of futures market would predict the price on the related cash market. Fama (1991) analyzed the price spreads between different contracts of CZCE, revealing that the sign of inefficiency is arbitrage.

Why DCE? There are three commodity futures exchanges and only one security futures exchange: Zhengzhou Commodity Exchange (CZCE, 1993), the Shanghai Future Exchange (SFE, 1999), the Dalian Commodity Exchange (DCE, 1993), and Financial Futures Exchange (CFFEX, 2006) in China. The CZCE and the DCE exchanges mainly trade agricultural commodities. According to the trade volume of futures and options, the three biggest commodity exchange of mainland China all ranked top 20 in the global 52 exchanges at the end of 2008. The trading volume of mainland China futures market has shared 1/3 of the global commodity futures market. DCE has become the second largest commodity futures market in the world as the trading volume in DCE is 3.8 times higher than that in Chicago Board of Trade (CBOT) (Food China, 2001).

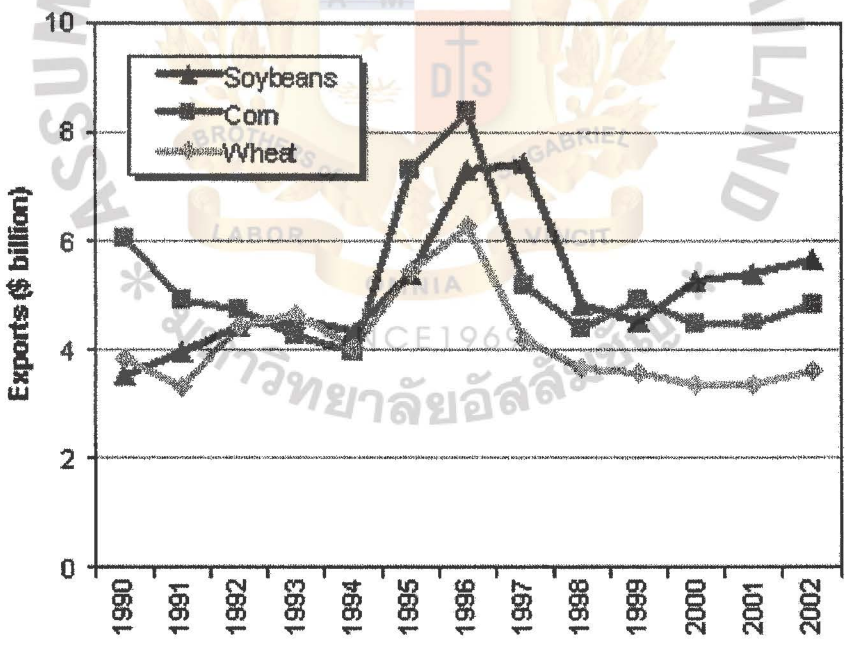
Why choose soybeans? Agricultural commodities have added risk, as they are typically seasonal. They tend to attract lower prices during the harvest season. Soybean futures are the major agricultural futures varieties in the world. The production amount in China can't capture its consumption even China is the fourth-largest soybean consumers (Figure 1.1). The United States is the largest soybean supplier and the leading exporter in the world (Figure 1.2). China has become the biggest soybean importer in the international soybean market, exceeding corn and wheat, due to limited land resources, income growth, increasing population, urbanization and recent policy changes (Zhao, Yang, Zhang, & Qi, 2010) (Figure 1.3). Import volume and prices of China have great influence on the domestic market soybean prices. Therefore, the large contract volume is not the standard of market maturity but the market brisk. We can test market maturity by testing its efficiency.

Figure 1.1: Volume domestic soybean imports (Red line)



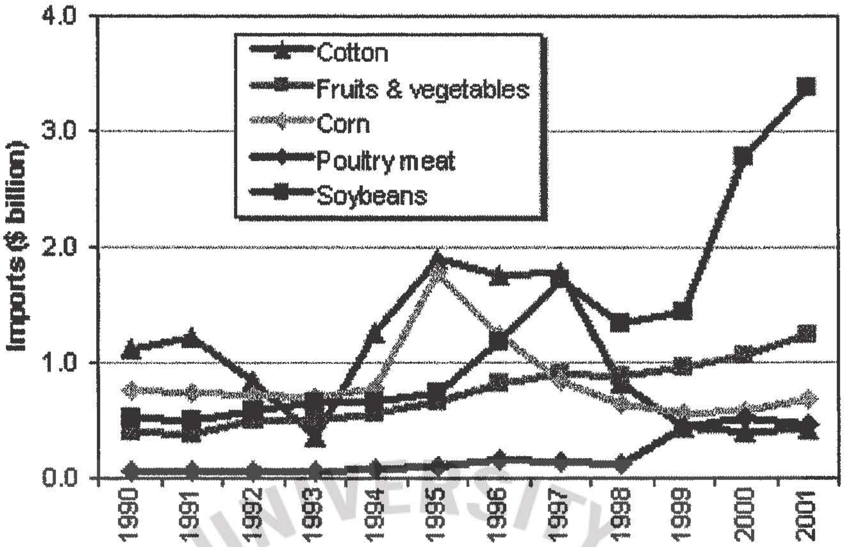
Note: Yellow bar chart: Domestic soybean productions (Ten thousand tons)
Source: www.cngrain.com

Figure 1.2: Leading US bulk exports during 1990-2002.



Source: Foreign Agricultural Trade of the United State database, 2003.

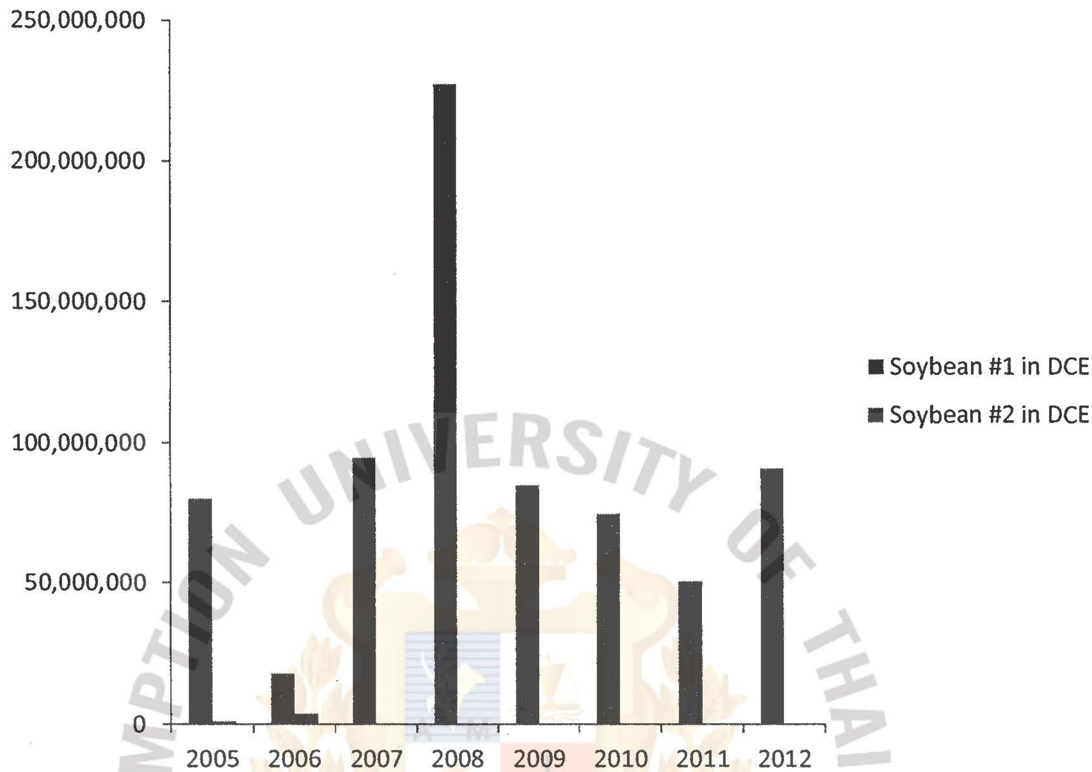
Figure 1.3: China's leading imports during 1990 to 2002.



Source: Food and Agriculture Organization of United Nations (FAO) database, 2003

Why Soybean No.1? There are two soybean products in DCE named Soybean No.1 and Soybean No.2. However, the trading volume of Soybean No.1 takes a huge percentage compared to Soybean No.2 (Figure 1.2). Soybean No. 1 contract in CDE on behalf of the domestic soybean prices, reflecting characteristics of the domestic soybean quality, CDE is the price discovery center of domestic non-genetically modified soybean, and soybean No.1 is the largest non-genetically modified soybean futures varieties in the world. On the international market, the price of soybean futures on the Dalian Commodity Exchange has become an indicator of the market price of soybeans and an important factor to format the world soybean prices.

Figure 1.4: Volume of Soybean No.1 and Soybean No.2 in DCE



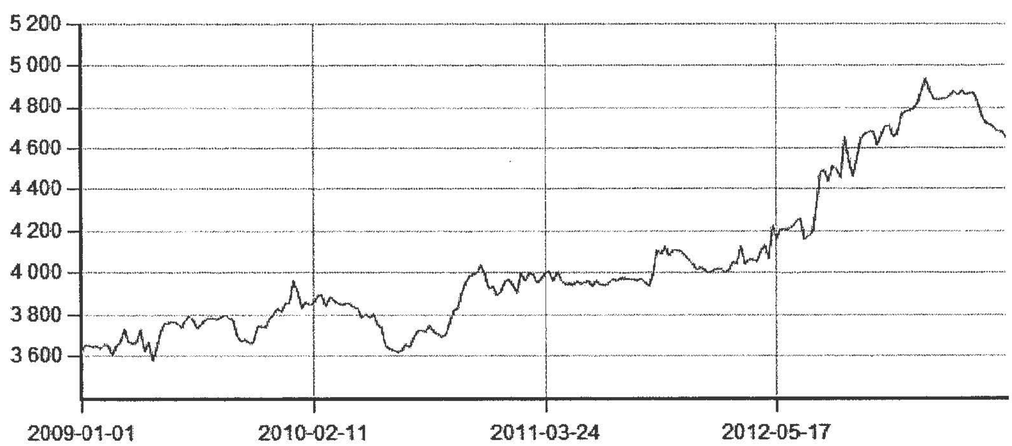
Note: Unit: 10 ton / contract
Source: www.DCE.com

The price index of soybean No.1 from 2009-2013 has constantly fluctuated (Figure 1.5). The spread between futures price and spot price is also fluctuated (Figure 1.6). It caused the decline in commodity transactions. Changes in commodity prices originate in shocks to demand and supply. It has generally been supposed that price volatility for food crops owes more to supply shocks while volatility for industrially consumed commodities is driven primarily by demand shocks. Agricultural commodities price is an ongoing concern. Cashin & McDermott (2002), Deaton & Laroque (1992) for instance focused on the behavior of commodity prices. Some authors have already tried to measure agricultural price fluctuation. Gilbert (2006) showed that agricultural price volatility fluctuated between 1960s and 1990s. Gilbert & Morgan (2010) found that volatility has generally been lower of 19 commodities prices from 1970-2009 than the early years, except for rice. Balcombe

(2009) finds persistent volatility in agricultural price series. Sumner (2009) who studied price data for wheat and maize over an extended period from 1866-2008, found out that the price also fluctuated. A number of studies have researched the factors which may explain the evolution of recent price changes (Abbott & de Battisti, 2011; Gilbert, 2010; Gilbert & Morgan, 2010).

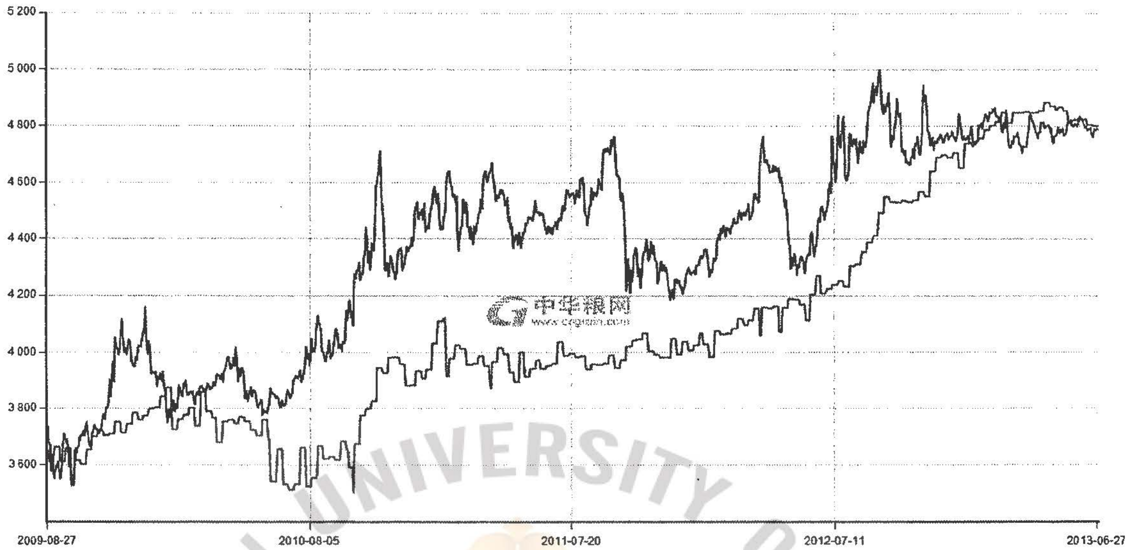
The reason for price fluctuations is economic cycles, including domestic price instability. Therefore, the instability lead to speculation, unstable international prices and unstable commodity exports. The future contracts can be considered to be an efficient risk minimizing tool which insulate traders from the unexpected changes in future prices. The DCE formed a perfect breed arbitrage system for arbitrage investors to lower risk and stable income arbitrage. All participants need to hedge and investment as existing factors such as price volatility, long industrial chain, many participating companies and wide range of influence. These contracts enable farmers, and producers, anticipatory to lock-in the prices of the products well in advance. Therefore, it is very helpful for producers, buyers, and investors of agricultural products to consider the effectiveness of Chinese agricultural futures prices using soybean futures on the Dalian Commodity Exchange.

Figure 1.5: National Soybean acquisition price



Source: www.cngrain.com

Figure 1.6 Spread between futures price and spot price



Note: Red line: DCE soybean no.1 futures price; Blue line: Soybean market average spot price; unit: Yuan/Ton

Why test weak-form efficiency? The Efficient market hypothesis (EMH) mentions that the futures market price has fully reflected all information available. No traders can arbitrage in this market. There are forms of efficiency, defined as Strong-form efficiency, Semi-strong efficiency and Weak-form efficiency (Malkiel & Fama, 1970). If an investor can earn abnormal returns based on past price, the market is regarded as a Weak-form efficient market. If prices also reflect new publicly available information, the market is Semi-strong efficient; and except past price, public price, if also contain available publicly or privately, the market is Strong-form efficient. In this paper, we will test weak-form EMH as we want to know whether the past price data can predict future price changes. If the market was tested as semi-strong weak-form or not, there is a need force further test, such as calendar effect and event effect.

According to the information revealed earlier, focused on studying on soybean No.1 in the futures market, it will help to reduce the risk on price fluctuated and it corresponded to the objective on the market efficient.

1.2 Statement of the Problem

A large number of papers regarding testing on efficiency of futures market were reported, that may be different on futures market chosen, commodities chosen development, horizon chosen, or methodology chosen. For different objectives, Lean, McAleer, and Wong (2010) researched the efficiency of the oil commodity futures market by using mean-variance (MV) and stochastic dominance (SD) methodologies from 1989-2008, finally conduced futures oil markets are efficient. Miclăuş, Lupu, Dumitrescu, and Bobircă (2008) examined the European futures market efficiency of the Carbon using Event-Study methodology, and found out that futures markets are not efficient. For form of EMH, semi-strong form test of efficiency was examined for livestock futures market, utilizing alternative methods of evaluation, and an inefficient market was proved (Leuthold & Hartmann, 1979). For methodology, most of the people adopt traditional econometric model. Their conclusions are different. For example, Bigman, Goldfarb, & Schechtman (1983) use a simple linear regression model to test the CBOT market efficiency. The results of F tests show that the futures prices provide inefficient signal to spot price. However, a few years later, researches showed that the result is invalid. Maberly (1985), Elam and Dixon (1988), Shen and Wang (1990) found different results of F tests.

In the context of China, there are many studies that tested weak-form efficiency of futures market for soybeans. H. H. Wang and Ke (2005) studied the Chinese futures markets efficiency of wheat and soybean with Johansen's cointegration approach. The futures forecasting horizons ranging from 1 week to 4 months, and conclusion revealed that soybeans futures market is weak-form efficient. However the wheat futures market is inefficient.

When people classify whether the market is efficient or inefficient, assessment of the degree is also important, which is also a limitation. From results of the foreign researches, the efficiency of the futures market at different time period will exhibit different characteristics, which can reflect the market gradually maturing process.Therefore, this paper investigated the soybean market efficiency with updated data from January 2009 to July 2013, and larger horizons ranging from 1 week to 6 months.

1.3 Research Objective

The objective of this research was to test whether Chinese soybean futures market is weak-form efficient or not.

1.4 Research Question

Is China's soybean futures market weak-form efficient?

1.5 Scope of the Research

In this paper, a Johansen cointegration methodology was adapted to research the Chinese soybean futures market efficiency from January 2009 to July 2013. The prices of soybean No.1 were regarded as prices of soybean product in this paper. The futures contract months in DCE were Jan, Mar, May, Jul, Sep, and Nov. The weekly futures price data were obtained from the DCE website. The futures prices are taken five forecasting horizons. This includes one-week before maturity, two weeks before maturity, two months before maturity, four months before maturity and six months before maturity respectively. The cash prices were the national soybean acquisition prices collected from CNgrain online database were the third-week prices of contract in related maturity month. There is a total of 168 observations

1.6 Limitations of the Research

1) **Proper statistical model**

In testing the futures market efficiency, a proper model is very important. The statistical model chosen suitable or not can affect the test results directly. Furthermore, some models have limitations. For example, Grossman and Stiglitz (1980) pointed out that Fama's efficient market can't exist without sophisticated marketers or producers. Otherwise, the result will present be inefficient even it is efficient. Moreover, Durham and Si (1999) researched the DCE and the CBOT efficiency and their relationship by using the law of one-price models. The results showed that the relationship may not be well represented by only a single model.

2) Data consequence

In DCE, the futures contracts are not consequence, data collection methods are different in different literatures. It affects the results directly. As a method to match futures price and spot price, it still poses a problem. In DCE, there are six futures contracts in each year: January, March, May, July, September and November. Getting a consequence series data was still a limitation.

3) International Futures market effects

Soybeans commodity is largely dependent on importing from the international market. Observation of DCE and CBT soybean prices showed that the soybean futures price of CBT has a significant influence on soybean price of DCE (Durham & Si, 1999). Furthermore, Chinese importers and traders may buy CBT futures to balance short futures contracts in China. The changes in policies should be considered to permit Chinese traders to utilize foreign futures markets for hedging and arbitrage. These activities would affect the efficiency of the Chinese market. In this paper, there was a need to consider the Chinese futures market's responsiveness to the world market conditions (Durham & Si, 1999).

1.7 Significance of the Research

The futures market of China has become the first biggest agricultural futures market and the second largest commodity futures market of the world. It's important to study the futures market efficiency both for Chinese and foreign investors who are interested in investment on futures market and getting knowledge on doing investment. Farmer, producer, anticipatory can lock-in the prices of the products by signing futures contracts, in order to hedge risk or arbitrage in the market. Investors who are searching market profits can handle new information and act thorough analyses. If the price of soybean futures on the DCE provides a reliable forecast of spot prices, producers would control their risks in the production and trading process effectively. What's more, in international market, foreign countries export the major grain commodities to China. This aim of this paper was to provide information to international exporters or importers regarding the relationship between agricultural futures market and spot market.

1.8 Definition of Terms

DCE	DCE is stand for Dalian Commodity Exchange which is established in 1993 and located in Northeast of China. DCE belongs to the four futures exchanges in China. It is approved by the China Securities Regulatory Commission (CSRC). (Dalian Commodity Exchange, 2013)
EMH	Basic theory of the behavior of efficient markets. The information is available and free to all knowledgeable investors who react quickly, and prices can adjust quickly and on average. (Gitman & Joehnk, 2008)

Random Walk Theory	The theory that stock price are unpredictable, participates can't know where prices are headed(Gitman & Joehnk, 2008). And is also mentioned that price changes are independent of each other (R. A. Brealey, Myers, & Allen, 2005).
Semi-strong Efficiency	Form of EMH. Traders cannot arbitrage using publicly available information. (Dimson & Mussavian, 2000)
Soybean No.1	Non-genetically modified soybean futures in DCE. No. 1 soybeans are defined by the FGIS Grading standards for soybeans. Soybean No. 1 (non-genetically modified) contracts began trading from 2002 in the DCE. Soybeans traded at the DCE named "Soybeans" in prior. (Dalian Commodity Exchange, 2013)
Soybean No.2	Modified soybean futures in DCE. No. 2 Soybean contracts traded at the DCE in 2004. It was previously traded under the general heading "Soybeans". (Dalian Commodity Exchange, 2013)
Strong-form Efficiency	Form of EMH. Abnormal profits cannot be earned using information, public and private. (Dimson & Mussavian, 2000)
Weak-form Efficiency	Form of EMH. There is no use for past price data on stock prices to predict future prices. Price on weak form efficient market has fully reflected all the historic price information, including trading price and volume The prices change randomly with the information arrives randomly. (Fama, 1991).

CHAPTER II

REVIEW OF RELATED LITERATURE

2.1 Theories Related to the Study

1) Random Walks theory

The random-walk theory hypothesis (RWH) was first stated and tested by Bachelier (1900), and had a practical development in finance Eugene Fama (1965) and Burton Malkiel (1973). Random-walk theory proposes that the current market prices are independent and not related to the past history market price (Fama, 1995). The random-walk theory states that no serial correlation exists between past price trends and futures price change, and the price in the future is impossible to predict. If current prices follow a random walk, then price changes over time are random. Today's price change is unrelated to previous steps. Radom-walk theory is consistent with the EMH and implies an efficient market where there are no systematic over-valuations or under-valuations of the stock. The presence of randomness in stock movements indicating the market is weak-form efficiency. No traders are able to predict future market price solely based on past price and gene profit.

A number of empirical literatures regarding the random walk theory have been tested. A. W. Lo and MacKinlay (1988) proposed that the random walk model should strongly rejected.by testing the RWH of weekly stock market returns during 1962-1985. Urrutia (1995) examined the Lartin American equity markets random walk and market efficiency from 1975-1911. The tests indicated that the RWH is rejected and the markets are weak-form efficient. Frennberg & Hansson (1993) researched the Swedish stock market from 1919-1990. The results showed that Swedish stock prices did not follow a random walk.

2) EMH theory

The efficient market hypothesis (EMH) was derived from the random walk theory of asset prices (Samuelson, 1965) and was first mentioned in the 1970's (Fama, 1965). EMH has been widely accepted and applied by academic financial economists. Before Fama formally proposed the concept of market efficiency, many foreign scholars have taken many empirical researches on it.

It's a controversial topic for the ability of future markets to predict subsequent spot prices. Empirical research results are mixed. For example, Larson (2012) researched on the corn futures in US market by closing price from 1949-1958, and find that the corn futures price is random walk. The results show a weak-form efficient market. But following researches by Stevenson and Bear (1970) examined the corn and soybean futures markets from 1951-1968, and found out that investors can gain profit by making investment strategy, then denying the weak-form market efficiency hypothesis. In 1980s, Bigman (1983) studied the corn, grain and soybean futures prices efficiency, the weak-form efficiency was proved again. The reason for differences is differences are the various periods analyzed and the method chosen for testing.

3) Price Discovery Theory

Price discovery is one of the most important functions for futures markets. The price discovery function is that the new information is reflected first in changed futures prices or in changes cash prices (Hoffman, 1932). It commonly defined that people use futures price to forecast cash/spot market, and is very crucial to people in the market (Schroeder & Goodwin, 1991; Working, 1948). Price-discovery theory is considerably controversal against EMH futures prices or in charged cash prices (A. Lo, 2007).

Large numbers of researches are on the test of relationship between the futures prices and spot prices. However, majority of literatures proved that futures price lead spot prices. For example, Kawaller, Koch, and Koch (1987) tested the lead-lag relationship between S&P 500 futures and index with three-stage least-squares regression. They concluded that futures price movements lead the index change. K. Chan (1992) investigated the lead-lag relationship between returns of cash index and returns of Index futures and S&P 500 futures, and found out that futures index change leads the cash index change. Lead and lag relationship were also tested in the Nikkei Stock Average, and it concluded that lagged changes in the futures price affected the short-term adjustment in the spot index (Tse, 1995). Hernandez and Torero (2010) found that changes in futures prices lead changes in spot prices, by investigating the dynamic relationship between spot and futures prices of agricultural commodities using the Granger causality method. Helbling, Huidrom, Kose, and Otrok (2011) used 10 commodity futures to assess relationship of the spot prices and futures prices. Silvapulle & Moosa (1999) researched the relationship between the spot and futures prices of WTI crude oil with linear causality methodology. The results showed futures prices lead spot prices. The research for Brooks, Rew, and Ritson (2001) examined the lead-lag relationship between the FTSE 100 index and index futures price from 1996-1997. It was found out that futures price lagged changes which would help to predict spot price changes. Finding from Asche and Guttormsen (2002) concluded that futures prices lead spot prices with Engle and Granger cointegration methodology.

2.2 Empirical Studies on Futures Market

In recent years, there were several researches regarding futures market for varieties commodities in China or even in different markets.

1) Agricultural Commodities

Nicole (2011) studied the growth and impact of agricultural futures market traders. There are 3 important and representative commodities corn for field crops, live cattle for livestock, and coffee for soft commodities are selected and the data spans from 2000 to mid-2009. The results showed that futures markets lack risk premium. Randy (2005) studied the price determination of wheat, soybeans, corn, rice, and cotton in major U.S. agricultural commodity markets. For the onions markets, Hieronymus (1960), Working (1960), Gray (1963), and Cox (1976); for the wheat market; Hooker (1901), and Tomek (2012), for the cotton market; Emery (1896); for the cattle market, such as Powers (1970), Taylor and Leuthold (1974) and Cox (1976); Other authors find that there is no essential gain in stability, for the onions market, as Johnson (1973); for the hessian market, as Naik (1970). These are just a small sample of what has become a vast literature.

Williams, Peck, Park, and Rozelle (1998) analyzed the efficiency of mungbean CZCE futures market in China, and found out that the condition for arbitrage existed on the CZCE. It's is a sign of inefficiency market. Zhao, Zhang, and Zou (2011) researched the Chinese soybean long-term markets, and the results showed that Chinese soybean futures market is not weak-form efficient.

Chen and He (2010) investigated the nonlinear dynamical relationship in China's agricultural futures markets, and they found complex results for Hard Winter wheat, Strong Gluten wheat Soybean meal and Soybean No.1. He and Chen (2010a) applied MF-DFA method to study wheat, soybean, corn, and soybean meal futures markets. They concluded that these futures markets above show multifractal properties except US soybean market (He & Chen, 2010b). Moreover, they performed a new statistical test to detect cross-correlations and applied an efficient algorithm. (He & Chen, 2011)

2) Other Industry Commodities

Chaoqun (et al.2012) tested the inefficiency of China's stock index futures market, and the results showed that this market is not efficient. Christos and Dimitrios (2006) examine the effect of futures trading of the underlying spot market. It was revealed that the FTSE/ASE-20 index futures trading have led to a negative effect and

FTSE/ASE Mid 40 index has led to a positive effect. Many studies have indicated the departure from market efficiency. Pant and Bishnoi (2001) examined random walk hypothesis of Indian Sock market Indices. The analysis revealed that the Indian stock market indices do not follow random walk. Brooks, Rew, and Ritson(2001) tested the lead-lag relationship of the FTSE 100 index futures market by using many time series models. The results showed that the futures lagged can predict spot price changes.

Table 2.1: Summary of the empirical evidences from the prior studies

	Author	Product/Market	Published year
Efficiency	Bigman	corn, grain and soybean	1983
	Urrutia	Lartin American equity markets.	1995
	Kastens & Schroeder	Kansas City Wheat futures market	1996
	Graham - Higgs, Rambaldi, & Davidson	Wool futures market in Australia	1999
	H. H. Wang & Ke	Soybean in China	2003
	H. H. Wang & Ke	Soybean in China	2005
	Cao	Gold, Silver, Copper	2007
	Larson	Corn	2012
	Kumar & Pandey	India commodity futures market	2013
Inefficiency	**Author**	**Product/Market**	**Published year**
	Stevenson & Bear	Corn and Soybean	1970
	Farrell & Olszewski	S&P 500	1993
	Williams, Peck, Park, & Rozelle	Mungbean in China	1998
	H. H. Wang & Ke	Wheat in China	2003
	Miclăuş, Lupu, Dumitrescu, & Bobircă	Carbon in European	2006
	Yu & Chunjie	Soybean in China	2010
	Zhao, Zhang, & Zou	Soybean in China	2011

CHAPTER III

RESEARCH METHODOLOGY

The data collection, methodology, and hypotheses testing are explained in this chapter.

3.1 Data Collection

3.1.1 The weekly futures price of soybean No.1

The weekly futures price data of soybeans in this case was collected from the DCE Database during the period of January 2009 to July 2013. There are six contracts each year: January, March, May, July, September, and November for contracts in DEC market (Table 3.1). Soybean No.1 (non-genetically modified) contract is the first trading contract and also the domain contract. Soybean No.1 was under the general title "Soybeans" before. The prices of soybean No.1 were regarded as prices of soybean product in this study.

Table 3.1 DCE Soybean No.1 Futures Trading during 2012

Contract	Open	High	Low	Close	Settle	Chg	Volume	OI	OI Chg	Turnover
a1001	4, 107	4, 108	4, 107	4, 107	4, 107	38	10	0	-52	0. 42
a1003	4, 080	4, 200	3, 972	4, 011	4, 011	-94	698	20	-126	28. 57
a1005	4, 177	4, 244	4, 010	4, 022	4, 033	-109	53, 496	38, 348	-7, 028	2, 200. 54
a1007	4, 202	4, 285	4, 015	4, 015	4, 031	-157	2, 424	1, 226	-186	100. 54
a1009	4, 080	4, 194	3, 837	3, 853	3, 868	-173	7, 629, 876	264, 630	-12, 676	303, 393. 61
a1011	3, 970	4, 133	3, 822	3, 850	3, 850	-127	1, 150	252	90	45. 62

Note:

(1) Price = RMB/ton

(2) Volume, OI(Open Interest) = contract(bilateral)

(3) Turnover = RMB millions(bilateral)

(4) Chg = Close - Prev Settle

Monthly prices are published every trading day after all settlements are complete, around 3:30PM Beijing Time. The system automatically extracts monthly data from a specified date. Historical data starts from May 8, 2000. a1001 stand for January 2010.

Source: Dalian Commodity Exchange, 2013

The futures prices were taken from five forecasting horizons. They are one week before maturity, two-week before maturity and two months before maturity, four months before maturity and six months before maturity separately. Choosing closing price data of each trading month is in a continuous sequence of each trading futures. The advantage of selecting data is that continuous futures contract data generated is close to the last trading day, and thus futures and spot prices will have various interval to help test forecast price for various maturity, but also overcome shortcomings like delivery month trading volume small, the data unstable.

3.1.2 The weekly spot prices of soybean No.1

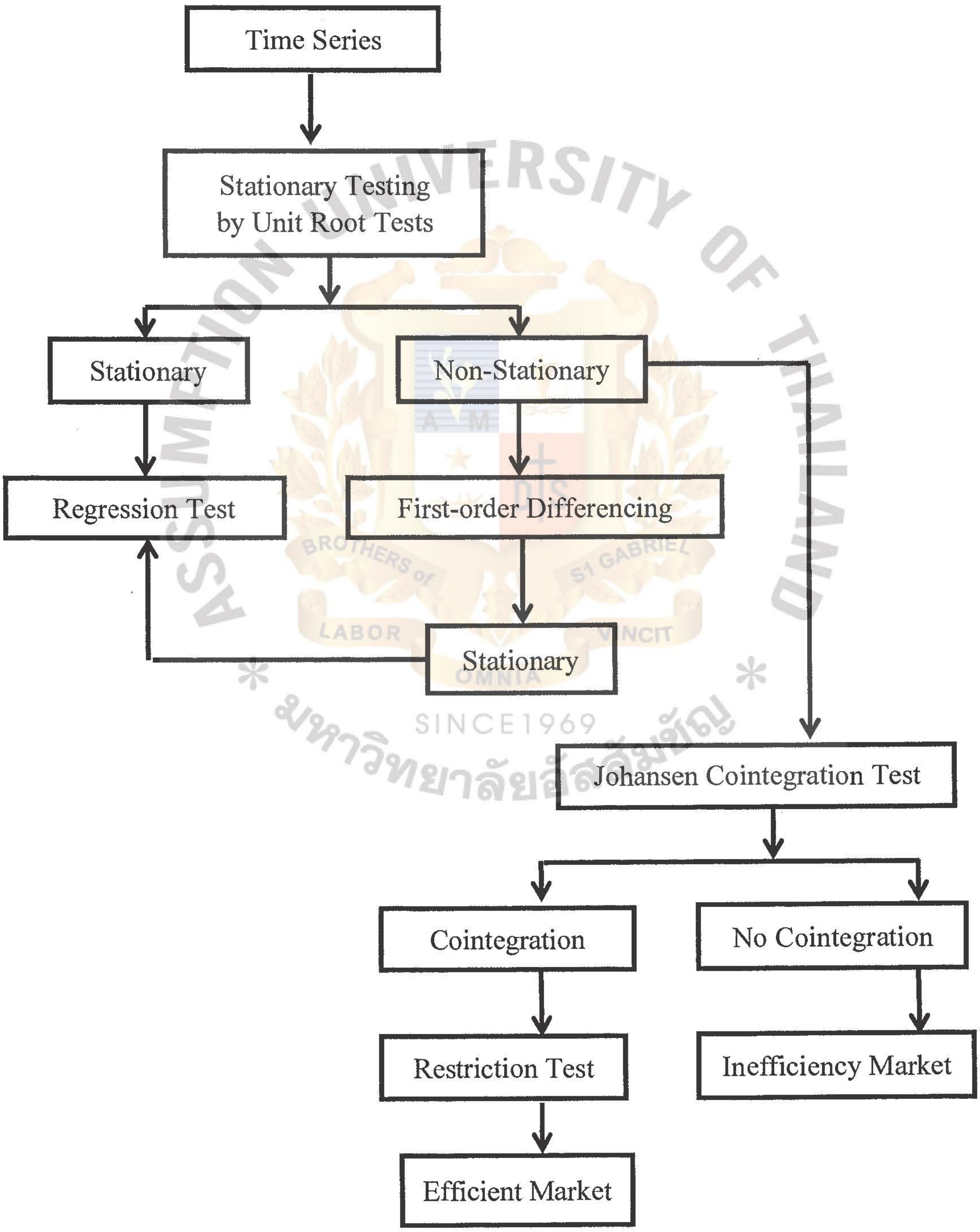
The sample of cash prices were the national soybean acquisition prices collected from CNgrain online database were the third week prices of the contract in each maturity month. The national average wholesale price stands for the cash market price index in this paper. Data used in the paper were the returns of dominant contracts, which are used to reflect returns of representative contract in soybean futures markets.

3.2 Methodology

In this paper, Johansen cointegration techniques which contain maximum eigenvalue and trace tests, were used to test relationships between futures and spot prices from January 2009 to July 2013. An Augmented Dickey-Fuller (ADF) unit root test was tested first for time series variables as it was the precondition of Johansen cointegration test. If the variables are stationary each other, then the Johansen cointegration test was used. However, if spot prices and futures prices were both non-stationary, all variables are required differencing to make them stationary in the same order, then Johansen cointergration test was used. After the unit root test, a test of restrictions on cointegration vectors should be used for biased test if the cointergration has been proved.

3.2.1 Testing Procedure

Figure 3.1 Testing Procedure



3.2.2 Unit Root Tests

Unit root tests were used to classify series whether time series data were stationary or non-stationary. Dickey and Fuller (1979) tested for a unit root in time series previously. Unit root test is widely used in many literatures, such as Perron (1988), Dolado, Jenkinson, and Sosvilla - Rivero (1990), Holden and Perman (1994), Ayat and Burridge (2000), Enders (2008), and. In Elam & Dixon (1988) 's research, these studies that financial price series are not stationary and contain a unit root.

The most popular of these tests are the Augmented Dickey-Fuller (ADF) test and the Phillips-Perron (PP) test. These two methods are similar. PP test always show same results with ADF test, but it's more complicated than ADF. The reason for starting with the Dickey-Fuller test is that it is simple and there are no other tests can be better used.

This is the least restricted ADF model:

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \alpha_i \sum_{i=1}^{m} \Delta Y_{t-i} + \varepsilon_t \qquad \text{(Eq.1)}$$

At first, Spot prices data and futures prices data were transformed to natural logarithms as they are both time series data. If unit root null hypothesis (H_0: $\pi = 0$) is rejected, due to a significant π, we can know that the time series does not contain a unit root, it means the log data is I (0) or stationary, then we may not use the Johansen cointegration test. However if the results show that there is unit root (or log data is not stationary at level), we would transform the data to be differenced and test for a further unit root until we rejected H_0 with a deterministic trend, and then we would go to the Johansen cointegration test to examine the long-run relationship between futures prices and spot prices. The alternative hypothesis is H_1: $\pi < 0$, if H_1 is not rejected, thus the data is stationary. The time series are should be integrated the same order in order to make variables have long-term relationship.

3.2.3 Cointegration Test

The cointegration theory was developed for more than twenty years, is first provided by Engle and Granger (1987). Central points of the efficiency tests were developed by Lai and Lai (1991), following Johansen (1991) and Johansen and Juselius (1990) test cointegration by using the maximum likelihood method. Cointegration is an appropriate model to test the long-run behavior of prices or expected returns by using short spans of high frequency data. Cointegration test is necessary in checking meaningful relationships modeling. If variables have the same trends, time series variables will keep a long-run equilibrium relationship.

The efficiency of China futures market with Cointegration model was examined in this study. This cointegration between time series is a necessary condition to market efficiency (Lai & Lai, 1991). If time series variables are non-statonary, the Johansen cointegration test can be uesd for testing. Usually, three methods are used to test cointegration. They are Engle Granger, Engle and Yoo, and Johansen test. If variables are not cointegrated, the futures price would just provide little information about cash price. If *St* and *Ft-i* time series are cointegrated, or that the futures price provides a predictive signal for the cash price i periods ahead, a specific linear combination of variables will be stationary. There will exist a and b such that z_t is stationary with mean 0:

$$z_t = S_t - a - bF_{t-i}. \qquad \text{(Eq.2)}$$

St = the spot price at time t

i = the number of time periods

F_{t-i} = futures price which is i periods before the contract maturity

z_t = the error term

a,b = coefficients

3.2.3.1 Johansen's Methodology for Modeling Cointegration

The Johansen's approach has been widely applied in many literatures (Fortenbery & Zapata, 1993; McKenzie & Holt, 1998; and Kellard, Newbold, Rayner, & Ennew, 1999) and used to test market efficiency in US by Johansen's approach. In this paper, the cointegration relationship by Johansen's maximum eigenvalue and trace test was examined.

Below is the general k_{th} order VAR model:

$$\Delta \boldsymbol{Y}_t = \boldsymbol{D} + \Pi \boldsymbol{Y}_{t-1} + \sum_{i=1}^{k-1} \Gamma_i \Delta \boldsymbol{Y}_{t-i} + \boldsymbol{\varepsilon}_t \qquad \text{(Eq.3)}$$

Where, Y_t = an (n x 1) vector to be tested for cointegration, and $\Delta Yt = Yt - Yt\text{-}1$; $\Gamma_i = (\sum_{j=1}^{i} \beta_j) - I_g$ And $\Pi = (\sum_{j=1}^{k} \beta_i) - I_g$. D = the deterministic terms; t = 1,…,T; and ε_t = a

Coefficient matrix Π stands for the number of cointegration vectors. We examined the rank of Π so as to test the cointegration relationship. If Π = 0, it means the cointegration relationship does not exist. $\Pi = \alpha \beta'$ is stationary. The futures prices and spot prices was tested using two time series variables Yt= (St,Ft-i)', n = 2, the cointegration relationship conducted only when Π=1 (Johansen and Juselius, 1990).

Johansen (1988) suggested two test statistics to test the null hypothesis there are at most r cointegration vectors. The null hypothesis can be equivalently stated as the rank of the coefficient matrix, Π, is at most r, for r = 0, 1,...n-1.

The two test statistics are based on trace and maximum eigenvalues, respectively. The Trace test is a joint test. the hypothesis:

H_0: $r = r_0$

H_1: $r > r_0$

$$\lambda_{trace} = -T \sum_{i=r+1}^{g} \ln(1 - \hat{\lambda}_i) \qquad \text{(Eq.4)}$$

The Maximal Eigenvalue test conducted separate tests on each eigenvalue. The hypothesis:

H_0: $r = r_0$

H_1: $r = r + 1$

$$\lambda_{\max}(r,r+1) = -T\ln(1-\hat{\lambda}_{r+1}) \qquad \text{(Eq.5)}$$

As shown above, the null hypothesis would not be rejected if r = 0, implies no cointegration exists. On the other hand, if r = 1 cannot be rejected but r = 0 is rejected, implies variables are stationary as full rank so a cointegration relationship exist.

3.2.4 Tests of Restrictions on Cointegration Vectors

If the result show the future prices and spot prices were not cointegrated, we would conclude that the market is inefficiency. However, if they were cointegrated, we would test restrictions on the cointegrating vector β in (2) was tested, such that $\beta' Yt^*$ is stationary, where in equation (1), $\beta' = (1, -b, -a)$ *and* $Yt^* = (St, Ft\text{-}i, 1)$. The restricted model is to test the elements of β when testing market efficiency hypothesis. The tests of restrictions on cointegrating vectors wheter relevant restrictions rejected or not can reduce the spurious rejection rate. Including testing on cointegration factors is a good econometric practice.

$$L_r = T\sum_{i=1}^{r}\ln\{(1-\lambda_i^*)/(1-\hat{\lambda}_i)\} \qquad \text{(Eq.6)}$$

Besides cointegration, the efficiency also requires the futures price to be an unbiased predictor of the cash price, a = 0 and b=1 in equation (1). Three hypotheses were tested: a=0 and b = 1 jointly, and each individually. If the null hypothesis a=0 and b=1 is rejected at the significant level, this means the soybean futures price is not an unbiased predictor for cash market. A non-zero risk premium or a transportation cost may exist between futures market and spot market. Tests on a=0 and b=1 separately may give more contribution to the joint test hypothesis. If the null hypothesis cannot be rejected at the significant level, it can be concluded that the market is efficient.

3.3 Research Hypothesis

The hypotheses of this study are as follows:

Unit root hypothesis:

Unit root hypothesis is to classify series as stationary and non-stationary.

H_0: The spot time series has an unit root

H_1: The spot time series does not contain an unit root

H_0: ONEWEEK time series has a unit root

H_1: ONEWEEK time series does not contain a unit root

H_0: TWOWEEK time series has a unit root

H_1: TWOWEEK time series does not contain a unit root

H_0: TWOMONTH time series has a unit root

H_1: TWOMONTH time series does not contain a unit root

H_0: FOURMONTH time series has a unit root

H_1: FOURMONTH time series does not contain a unit root

H_0: SIXMONTH time series has a unit root

H_1: SIXMONTH time series does not contain a unit root

Cointegration hypothesis:

In order to test whether there is a long-term relationship between spot and futures prices after checking time series, and then the next step is to test cointegration.

H_0: Long-run relation between spot prices and ONEWEEK futures prices.

H_1: No long-run relation between spot prices and ONEWEEK futures prices.

H_0: Long-run relation between spot prices and TWOWEEK futures prices.

H_1: No long-run relation between spot prices and TWOWEEK futures prices.

H_0: Long-run relation between spot prices and TWOMONTH futures prices.

H_1: No long-run relation between spot prices and TWOMONTH futures prices.

H_0: Long-run relation between spot prices and FOURMONTH futures prices.

H_1: No long-run relation between spot prices and FOURMONTH futures prices.

H_0: Long-run relation between spot prices and SIXMONTH futures prices.

H_1: No long-run relation between spot prices and SIXMONTH futures prices.

Tests of Restrictions on Cointegration Vectors Hypothesis

H_0: a=0 and b=1

H_0: ONEWEEK futures price of Soybean is not an unbiased predictor for spot prices

H_1: ONEWEEK futures price of Soybean is an unbiased predictor for spot prices

H_0: TWOWEEK futures price of Soybean is not an unbiased predictor for spot prices

H_1: TWOWEEK futures price of Soybean is an unbiased predictor for spot prices

H_0: TWOMONTH futures price of Soybean is not an unbiased predictor for spot prices

H_1: TWOMONTH futures price of Soybean is an unbiased predictor for spot prices

H_0: FOURMONTH futures price of Soybean is not an unbiased predictor for spot prices

H_1: FOURMONTH futures price of Soybean is an unbiased predictor for spot prices

H_0: SIXMONTH futures price of Soybean is not an unbiased predictor for spot prices

H_1: SIXMONTH futures price of Soybean is an unbiased predictor for spot prices

H_0: a=0

H_0: ONEWEEK futures price of Soybean is not an unbiased predictor for spot prices

H_1: ONEWEEK futures price of Soybean is an unbiased predictor for spot prices

H_0: TWOWEEK futures price of Soybean is not an unbiased predictor for spot prices

H_1: TWOWEEK futures price of Soybean is an unbiased predictor for spot prices

H_0: TWOMONTH futures price of Soybean is not an unbiased predictor for spot prices

H_1: TWOMONTH futures price of Soybean is an unbiased predictor for spot prices

H_0: FOURMONTH futures price of Soybean is not an unbiased predictor for spot prices

H_1: FOURMONTH futures price of Soybean is an unbiased predictor for spot prices

H_0: SIXMONTH futures price of Soybean is not an unbiased predictor for spot prices

H_1: SIXMONTH futures price of Soybean is an unbiased predictor for spot prices

H_0: b=1

H_0: ONEWEEK futures price of Soybean is not an unbiased predictor for spot prices

H_1: ONEWEEK futures price of Soybean is an unbiased predictor for spot prices

H_0: TWOWEEK futures price of Soybean is not an unbiased predictor for spot prices

H_1: TWOWEEK futures price of Soybean is an unbiased predictor for spot prices

H_0: TWOMONTH futures price of Soybean is not an unbiased predictor for spot prices

H_1: TWOMONTH futures price of Soybean is an unbiased predictor for spot prices

H_0: FOURMONTH futures price of Soybean is not an unbiased predictor for spot prices

H_1: FOURMONTH futures price of Soybean is an unbiased predictor for spot prices

H_0: SIXMONTH futures price of Soybean is not an unbiased predictor for spot prices

H_1: SIXMONTH futures price of Soybean is an unbiased predictor for spot prices

CHAPTER IV

PRESENTATION AND CRITICAL DISCUSSION OF RESULTS

Part 1 reports the results of ADF Unit root test. Part 2 displays the results of Johansen cointegration test. Part 3 discusses the results of Restrictions on Cointegration Vectors.

4.1 ADF test

All variables were taken logarithms first as they are time series data. There are two ways to analyze the results. First, is using the p-value. Second, is by using the critical value. All the p-value is larger than all specified significance level, 5%, 1% and even 10%. Thus, failed to reject the null hypothesis in all these cases, or there are unit root exist. In the other way, all the absolute values of ADF statistic results were smaller than the 1% critical value, so the null hypothesis was not rejected. The ADF test results show that all original variables contain unit root or are non-stationary. The unit root test results as showed in table.4.1 revealed that, price series data were not stationary at the level. Therefore we got the result that each of the price series is non-stationary, and then preceded to Johansen's cointegration tests.

Table 4.1: ADF Unit Root Test results of LOG data

	ADF	1%	5%	10%	Prob.	Results
LOGSPOT	-0.650128	-3.699871	-2.976263	-2.627420	0.8429	Non-Stationary
LOGONEWEEK	-1.380421	-3.699871	-2.976263	-2.627420	0.5767	Non-Stationary
LOGTWOWEEK	-1.337940	-3.699871	-2.976263	-2.627420	0.5969	Non-Stationary
LOGTWOMONTH	-1.158627	-3.769597	-3.004861	-2.642242	0.9967	Non-Stationary
LOGFOURMONTH	-0.775636	-3.699871	-2.976263	-2.627420	0.8100	Non-Stationary
LOGSIXMONTH	-1.796923	-3.699871	-2.976263	-2.627420	0.3739	Non-Stationary

Notes:

SPOT=log (SPOT)

ONEWEEK=log (ONEWEEK)

TWOWEEK= log (TWOWEEK)

TWOMONTH= log (TWOMONTH)

FOURMONTH= log (FOURMONTH)

SIXMONTH= log (SIXMONTH)

As the original is non-stationary, the data was transformed to be differenced and tested for a further unit root as it is safe to proceed with Johansen Cointegration Test. The time series were integrated in the same order in order to make variables have a long-term relationship. The test results are reported in table 4.2. All the p-value is smaller than all specified significance level, 10%, 5% and even 1%. So we can reject the null hypothesis in all these cases, or there was existing unit root. In the other way, all the absolute values of ADF statistic results were larger than the 1% critical value, so the null hypothesis was rejected. The ADF test results show that all original variables contain unit root or are non-stationary.

Table 4.2: ADF Unit Root Test results of RLOG data

	ADF	1%	5%	10%	Prob.	Result
RSPOT	-4.4921	-3.7115	-2.9810	-2.6300	0.0015	I(1)
RONEWEEK	-5.8105	-3.7241	-2.9862	-2.6326	0.0001	I(1)
RTWOWEEK	-7.6016	-3.7115	-2.9810	-2.6299	0.0000	I(1)
RTWOMONTH	-4.1719	-3.7696	-3.0049	-2.6422	0.0041	I(1)
RFOURMONTH	-6.8928	-3.7115	-2.9810	-2.6299	0.0000	I(1)
RSIXMONTH	-5.7670	-3.7115	-2.9810	-2.6299	0.0001	I(1)

Notes:

RSPOT=dlog(SPOT)

RONEWEEK=dlog(ONEWEEK)

RTWOWEEK= dlog(TWOWEEK)

RTWOMONTH= dlog(TWOMONTH)

RFOURMONTH= dlog(FOURMONTH)

RSIXMONTH= dlog(SIXMONTH)

4.2 Johansen's Cointegration Test Results

After the Unit root, the Johansen cointegration methodology was tested in order to know whether there is an equilibrium relationship existing between the spot prices and futures prices. Each group was tested by both using Johansen's maximum eigenvalue and trace test.

4.2.1 One week

After testing cointergration between LOGSPOT and LOGONEWEEK the result is reported and reflected in table 4.3. The null hypothesis r = 0 was not rejected at a significant level 5% by both test statistic for each price series as the p-value is larger than 0.05. It can be concluded that the futures price one week prior to its maturity is not cointegrated with spot price.

Table 4.3: Johensen Cointegration Test results between LOGSPOT and LOGONEWEEK

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic			Max-Eigen Statistic		
		Trace Statistic	0.05 Critical Value	Prob.**	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.361918	11.83386	15.49471	0.4117	11.68151	15.49471	0.3382
At most 1 *	0.005842	0.152346	3.841466	0.7455	0.152346	3.841466	0.7455

Note:

Trace test and Max-eigenvalue test indicate no cointegration exist at the 0.05 level.

* stands for rejection of hypothesis at the 5% level.

**MacKinnon-Haug-Michelis (1999) p-values

4.2.2 Two weeks

Table 4.4 shows the result after testing cointergration between LOGSPOT and LOGTWOWEEK. The null hypothesis r = 0 cannot be rejected at a significant level 5% by both test statistic for each price series as the p-value larger than 0.05. It can be concluded that the futures price two weeks prior to its maturity is not cointegrated with spot price.

Table 4.4: Johensen Cointegration Test results between LOGSPOT and LOGTWOWEEK

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic			Max-Eigen Statistic		
		Trace Statistic	0.05 Critical Value	Prob.**	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.302810	9.726049	15.49471	0.3024	9.378147	14.26460	0.2560
At most 1 *	0.013292	0.347902	3.841466	0.5553	0.347902	3.841466	0.5553

Note:

Trace test and Max-eigenvalue test indicate no cointegration exist at the 0.05 level.

* stands for rejection of hypothesis at the 5% level.

**MacKinnon-Haug-Michelis (1999) p-values

4.2.3 Two months

Table 4.5 shows the results after testing cointergration between LOGSPOT and LOGTWOMONTH. The null hypothesis r = 0 cannot be rejected at a significant level 5% by both test statistic for each price series as the p-value larger than 0.05. This shows that the futures price two month prior to its maturity is not cointegrated with spot price.

Table 4.5: Johansen Cointegration Test results between LOGSPOT and LOGTWOMONTH

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic			Max-Eigen Statistic		
		Trace Statistic	0.05 Critical Value	Prob.**	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.290940	9.002426	15.49471	0.3651	8.939189	14.26460	0.2913
At most 1 *	0.002429	0.063237	3.841466	0.8014	0.063237	3.841466	0.8014

Note:

Trace test and Max-eigenvalue test indicate no cointegration exist at the 0.05 level.

* stands for rejection of hypothesis at the 5% level.

**MacKinnon-Haug-Michelis (1999) p-values

4.2.4 Four months

Table 4.6 shows the results after testing cointergration between LOGSPOT and LOGTWOMONTH. The null hypothesis r = 0 cannot be rejected at a significant level 5% by both test statistic for each price series. It can be concluded that the futures price four month before prior to its maturity is not cointegrated with spot price.

Table 4.6: Johensen Cointegration Test results between LOGSPOT and LOGFOURMONTH

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic			Max-Eigen Statistic		
		Trace Statistic	0.05 Critical Value	Prob.**	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.276453	8.518682	15.49471	0.4117	8.413322	14.26460	0.3382
At most 1 *	0.004044	0.105360	3.841466	0.7455	0.105360	3.841466	0.7455

Note:

Trace test and Max-eigenvalue test indicate no cointegration exist at the 0.05 level.

* stands for rejection of hypothesis at the 5% level.

**MacKinnon-Haug-Michelis (1999) p-values

4.2.5 Six months

Table 4.7 shows the results after testing cointergration between LOGSPOT and LOGTWOMONTH. The null hypothesis r = 0 cannot be rejected at a significant level 5% by both test statistic for each price series as the p-value is larger than 0.05. It can be concluded that the futures price six month before prior to its maturity is not cointegrated with spot price.

Table 4.7: Johensen Cointegration Test results between LOGSPOT and LOGSIXMONTH

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic			Max-Eigen Statistic		
		Trace Statistic	0.05 Critical Value	Prob.**	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.396632	13.17355	15.49471	0.1086	13.13592	14.26460	0.0748
At most 1 *	0.001446	0.037633	3.841466	0.8461	0.037633	3.841466	0.8461

Note:

Trace test and Max-eigenvalue test indicate no cointegration exist at the 0.05 level.

* stands for rejection of hypothesis at the 5% level.

**MacKinnon-Haug-Michelis (1999) p-values

4.4 Discussion of Results

Results based on Johansen's cointegration test suggest that there is no equilibrium relationship existing between soybean futures prices in DCE and the national average cash price published on CNgrain. This result show similarity in all forecasting horizons. The soybean futures market is not cointegrated with soybean cash markets. Therefore, market inefficiency is concluded by the data for the soybean futures market in terms of predicting the price on the CNgrain as cointegration is the necessary condition for efficiency.

The reasons for the existence of market inefficiency are over-speculation problem, market manipulation and the government policy. As soybean is the important strategic commodity, the Chinese government considers it by using government policies and regulations as it relates political stability and economic development. Government policy is a significant factor influencing the price of soybean. Futures market plays an important role in allocating scarce resources effectively combined with the spot market. The price discovery function which can help investors to achieve hedging and speculation. The establishment of China's futures market is a little late. It has been around for twenty years only. There are still many deficiencies for operation mechanism in China's futures market compared to developed countries with matured futures market. In addition, soybeans commodity is largely depend on importing from international market. The world soybeans commodity markets and futures markets would decide the soybeans prices, so as to affect the performance of China's soybean futures market. Furthermore, Chinese importers and traders may buy CBT futures to balance short futures contracts in China. The changes in policies should be considered to permit Chinese traders to utilize foreign futures markets for hedging and arbitrage. These activities would affect the efficiency of the Chinese market.

CHAPTER V

CONCLUSION, IMPLICATION AND FURTHER STUDY

5.1 Conclusion

The aim of this paper is to test the Chinese soybean futures market efficiency from January 2009 to July 2013 by using Johansen's cointegration approach. The futures prices from China DCE are taken from five forecasting horizons, separately at one week, two weeks, two months, four months and six months prior to the maturity of each contract. The cash prices and the national soybean acquisition price, are taken on the third week of each maturity month of the futures contracts, and were obtained from CNgrain online database.

The results of Johansen cointegration shows that no equilibrium relationships exist between the soybean futures price and cash price in DCE. The inefficiency is proven by the data for the soybean futures market in terms of predicting the price on the cash market.

Results from the study may help producers or marketers to hedge, arbitrage, operate in an attempt to manage price risks inherent in commodity ownership. Investors who are searching market profits can handle new information and act thorough analyses. If the price of soybean futures on the DCE provides a reliable forecast of spot prices in the future, producers can manage their risks in the production and trading effectively.

Stevenson & Bear (1970) examine the corn and soybean futures markets from 1951-1968, and found out that investors can gain profit by making investment strategy, then denying the weak-form market efficiency hypothesis. Zhao, Zhang, & Zou (2011) showed that the Chinese soybean futures market is not weak-form efficient. Yu &

Chunjie (2010) proved the statement of "Chinese soybean futures market is efficient" is false and concluded that soybean futures market is not weak efficient either. This study revealed towards the same direction with previous studies. Yao (1998) examined the historical development of futures markets in China, and argued that China futures market is under control of government over many prices. It's useless for futures market to determine prices, and much less hedge against price fluctuations.

However, where H. H. Wang & Ke (2003, 2005) also tested the soybean futures market and suggested a long-term equilibrium relationship between the futures price and cash price for soybeans and proved the market is weak short-term efficient. Q. Liu & Zhang (2006) show that there is long equilibrium relationship between the futures price and the last delivery spot price futures prices in the soybean markets.

5.2 Implication

The results of the study may benefit Chinese farmers, domestic traders and importer, especially in watching soybean futures prices on the Dalian exchange and eventually makes a decision. After twenty years in operation, soybean futures trading in China developed quickly, the DCE has become one of the most significant commodity futures exchanges in China. The soybean futures price of DCE has become the most important price signal for China's soybean farmers, soybean crushers, other soybean users, importers and market participants.

5.3 Further Study

The follow up this study, it is recommended to solve the limitation of this study. First is which focusing only on soybean No.1 commodity in DCE. Further studies should focus on other soybean products such as soybean No.2, soybean oil and soybean meal which will help to fulfill the contribution of soybean market efficiency analysis. Furthermore, the time period spread should be lager since the data in this study cover only 2009 to 2013. The number of observations would then be larger, and thus the results would be more reliable. For instance, even if the futures market inefficiency has been tested, it can only prove that the history market is inefficient, but not the same conclusion can be drawn from present and future markets.

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