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Guarantee Function of Corn Futures to the Development of Corn Planting Industry

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Abstract: With the development of the market economy, the corn planting industry needs to establish a complete futures system to enter the market safely and steadily. At the same time, due to multiple factors, the function of China's corn futures market needs to be improved. Therefore, it is the current requirement to study the guarantee role of corn futures on the development of the corn planting industry. In this paper, quantitative analysis method is used for cointegration test. The corn futures index price is used as an independent variable, and the corn price is used as a dependent variable to construct a regression model. Corresponding to the agricultural futures market price under the risk measurement model, to explore the hedging function and risk avoidance function of the corn futures market. The results of this study show that the J-B test of corn futures yields is meaningful at around 1%, while the kurtosis is significantly greater than 3 at the 1% insignificance level. The correlation coefficients of spot prices are 0.9067, 0.9243 and 0.8769 respectively. Through a comprehensive analysis, it can be concluded that the volatility in the three periods of the Chinese corn futures market is continuous, completely showing the statistical characteristics of the price of the corn futures market. By comparison, under the influence of the financial crisis, the risk avoidance function of corn futures has declined sharply, and external shocks have extended the duration of futures price changes.

1. Introduction

Corn is one of the three major grain varieties in China, and its consumption and output are widely distributed. Its annual consumption and annual output are 120 million tons. At present, China's corn purchase and sales have fully realized marketization, and the risks of corn production, planting and operation have become increasingly prominent. In order for the corn industry to enter the market safely and steadily, it is necessary to establish a complete corn futures system and a complete price formation mechanism and a safe production mechanism for agricultural products. In China, there is a huge production and consumption group of agricultural products. With the development of market economy and the growth of human consumption demand, in order to

transfer and diversify the potential risks of the development of the planting industry, it is urgent to establish a synchronized futures market.

Due to the staged function of the corn futures market, the guiding role of futures prices is becoming more and more significant. However, due to the constraints of market economy development stage and spot market regulations, the extent and scope of China's corn futures function need to be improved. Therefore, it is the current requirement to study the role of the futures market in ensuring the development of the corn planting industry. Taking corn futures as an example has reference significance to the development of China's agricultural product futures market, which is conducive to quantitatively and comprehensively evaluate the effectiveness of China's agricultural product futures market.

Xu X and others investigated the linear and non-linear causality of the Chicago Board of Trade corn futures price series and Iowa, Illinois, Indiana, Ohio and other seven regional cash series over a period of time. The test results of Xu X et al showed that in the binary vector difference autoregressive model (Bi VAR-DEff), there is a bidirectional linear causal relationship between the cash price and the futures price. Although the methods of Xu X and others have high accuracy, they are not feasible [1]. Bebout A G studied the efficiency of the agricultural product futures market through different asset pricing models, and tested the market efficiency and fairness of four agricultural products such as corn. Use the Johansen cointegration procedure to test long-term market efficiency and unbiasedness, while taking into account constant risk premiums. Under the mean frame, the ECM model is used to model short-term price dynamics with constant risk premiums, and the ECM-GARCH model is used to model short-term price dynamics with time-varying risk premiums. Bebout A G. and others have found that the near-month futures prices and spot prices of most commodities are cointegrated. This method has high practicability, but lacks accuracy and economy [2]. Serrano A C and others studied the daily, overnight, intra-day and rolling income spillovers of the four major agricultural products in China's futures market through a newly developed quantile-related measurement method. Finally, it is concluded that the two markets have significant two-way dependence and extreme quantile dependence on commodities. The methods of Serrano, A. C. and others have high accuracy, but there are certain problems in economy and feasibility [3].

This article uses the latest historical data of corn futures and corn planting industry to obtain the latest correlation. After error correction model and GARCH model, stability test and co-integration test, more fully use the price discovery function of corn futures to develop the corn industry. At the same time, most of the investigations on the effectiveness of the futures market are individual investigations conducted within a specific period. The innovation is a comprehensive comparative analysis of the effectiveness differences of China's corn futures in different periods.

2. Futures and Corn Futures

2.1. Overview of the Futures Market and Its Functions

(1) The futures market is the main component of the capital market and has a unique function in promoting the development of the market economy and promoting international financial cooperation

Under the guidance of the "13th Five-Year" development plan, China will continue to implement regulatory innovations in the futures market and give full play to its positive role. Under the new situation, innovation in the futures market is a requirement of the times and is necessary and urgent [4]. The market vitality of agricultural product futures comes from variety innovation, which puts forward higher requirements for the innovation of agricultural product industry. Currently, there are many options for futures varieties in China, including financial options, commodity futures,

commodity options, etc., agricultural and sideline products, metallurgy, energy and other varieties of systems are constantly improving.

In the process of international economic development, the participation of the futures market has increased and its functional status has been increasing day by day, playing an increasingly important role. As an indispensable part of the modern market economy, the futures market plays an important role in finding prices and avoiding risks, and is irreplaceable compared with other types of markets [5].

At present, more and more domestic entrepreneurs recognize the role of agricultural product futures market prices in the development of planting industry, and actively participate in this futures market competition. In recent years, in order to support the opening up of the futures market, China has temporarily exempted goods and futures from opening up the bonded futures business to value-added tax. Policy support and cooperation have further promoted the development of corn futures and related industries. Correctly understanding the development of the planting industry and using the functions of the futures market reasonably are related to the survival and development of related companies in the next step.

As a financial tool, agricultural product futures not only have a good hedging function, but also play a protective role in the development of agricultural product planting. It has received more and more attention in China and has greeted a new round of risks and challenges. In the early products that constituted futures trading, agricultural products accounted for a relatively large proportion.

Agricultural futures occupies an important position in China's agricultural futures market, and is also one of the main targets of China's futures market. It has gone through a preliminary exploration stage from 1990 to 1994, a liquidation and settlement stage from 1995 to 2000, and a steady development stage from 2001 to the present. After the evolution of these three periods, the market organization system based on agricultural products in China's futures market is becoming more and more perfect, which is increasingly important for the development of the market economy and the development of the planting industry.

(2) Futures price fluctuations and their characteristics

In terms of measuring asset risk, the volatility of the futures market is a direct reflection. As the information of market participants changes, fluctuations in the price of financial assets often bring risks to the financial market. Therefore, the estimation of price fluctuations is a major goal. Changes in market yields and price volatility levels are an important indicator of market asset pricing and the main reference for market participants to make risk investment decisions [6]. A large number of financial market surveys and tests have proved that differences in internal and external parts of market participants, such as different psychological qualities and different channels for obtaining information, lead to differences in the volatility of returns. The main features are as follows:

1) Sharp peaks and thick tails. Most previous studies have assumed that the return rate of financial assets satisfies the normal distribution, but in fact this assumption has not been satisfied in a large number of empirical studies. The financial market is composed of many different investors, and the difference in risk-taking ability and professional nature has brought more variability and creativity to the futures market. At the same time, due to the different access to and response to market information, multiple factors lead to differences in market participants, resulting in the price changes of financial assets not showing a normal distribution, but showing the characteristics of sharp peaks and thick tails.

2) Fluctuation aggregation. This means that the volatility of the return on financial assets not only changes with time, but also shows a continuous high or low trend for a certain period of time. Generally speaking, the accumulation of financial market volatility is mainly caused by external shocks caused by market volatility, resulting in a continuous impact within a certain period of time.

3) The leverage of volatility. Generally speaking, when the financial market responds to the

diversification of bad news volatility, it is considered that the market has volatility leverage.

4) Volatility spillover effect. The volatility of the financial market will not only be affected by various factors of its own market, but also by other types of market volatility. The spillover of price fluctuations comes from the comprehensive effect of multiple levels and fields.

(2) Function of the futures market

Price discovery and risk transfer are the two main aspects of the function of the futures market. Among them, the price discovery function is the core and value of the future development of the futures market. The effect of price discovery greatly determines whether the risk transfer function is feasible and effective, and the risk transfer function reflects the value implementation of the futures market for each market subject. Therefore, understanding and studying the two major functions of the futures market is of great significance for promoting the positive and stable development of China's futures market.

1) Price discovery function

After passing the centralized auction, traders hope to collect floating data at reasonable futures prices. Futures prices also represent the market's forecast of future prices. In theory, the futures price should be consistent with the actual price of stock futures. When there is a new change in market supply and demand, market participants will adjust expectations appropriately according to changes in the market, which will cause corresponding changes in futures prices. As the futures contract approaches uncertainty, various uncertain factors that affect the continuous changes in futures prices will decrease, and the expected futures price and spot price will be the closest during this time. In fact, it is difficult for market participants to make predictions about the future market in a way that fully considers the market and is consistent with their actual situation. The rational expectation theory emphasizes that when the actual economy changes, it is possible to adjust expectations and market transactions in a timely manner to avoid making systematic errors. Based on this situation, futures prices and future spot prices are highly likely to maintain a high degree of consistency [7].

2) Risk transfer function

Risk is a common social phenomenon, especially in economic activities, economists define many. After introducing a variety of subjective and objective factors into the concept of risk, the concept of risk has the characteristics of diversity and variability. Risk can be measured by probability, and its size depends on the probability distribution of loss occurrence, expected value, and return variance. There are many types of risks in economic activities, mainly including price volatility risk, liquidity risk, political risk, default risk, natural risk and circulation risk [8].

Judging from the current development situation of China's agricultural product spot market, China's lack of a perfect modern agricultural and logistics system has led to increased risks in the commodity circulation process, and the spot market is flooded with a large number of defaults and debt problems.

According to incomplete statistics, China signs about 4 billion contracts each year, but the contract performance is extremely low. The 50% contract fulfillment rate resulted in the credit crisis spreading in the spot market. Generally speaking, price volatility risk, natural risk, liquidity risk, political risk, credit risk and liquidity risk are the main risk manifestations in China's agricultural product spot market. Price volatility risk is always the main risk in the futures market. These risks will result in a certain degree of loss for agricultural production operators, so they have a source of motivation and ability to avoid and transfer these market risks.

Among the above-mentioned high-frequency risks, such as natural risks and political risks are uncontrollable risks; some are artificially controllable risks, and market participants can manage or transfer the occurrence of risks through price fluctuation risk, liquidity risk and other means and methods. In the development of the modern market economy, the use of mobile futures markets or

the avoidance of market risks has become the focus of attention of commodity producers in risk management. Risk management has always been the main countermeasure against market changes [9].

2.2. Introduction to Corn Futures and Corn Futures Market

(1) General situation of corn yield

There are up to three kinds of food people eat in their daily lives, namely rice, wheat and corn. Among them, the annual corn planting area and total output rank first in the world. Corn is the most widely distributed and most widely grown cereal crop in the world. At present, the world's corn planting area exceeds 130 million hectares, and the world's total corn output is about 600 million tons, accounting for about 35% of the total global grain output. China's corn output has contributed one-third of the total grain output, and the annual corn output and consumption is about 12,000 tons. In addition to being a variety of grain, corn can also be used in many ways, such as industry, seeds, feed, and practical use. In general, corn accounts for a large proportion of compound feed and its price fluctuations are closely related to the development of feed companies. In recent years, domestic corn production has continued to increase, mainly due to the implementation of national policies and the vigorous development of animal husbandry. Reasonable use of corn futures can effectively play its price discovery and risk avoidance functions, guide the corn industry to adjust the planting structure, and promote corn producers to increase income [10].

As far as the current situation is concerned, the economic functions of agricultural futures market flow, price discovery, risk avoidance, etc. need to be improved. The corn futures contract and futures market also need to learn more from the review and learning to improve, to achieve a leap in iterative innovation.

(2) Main factors affecting the price of corn futures products:

1) The macro economy

The macro economy affects almost all futures varieties, but the degree of impact varies. Economic growth causes product prices to rise; the economy declines, it will fall; the economy has an inflection point, and product prices will also have an inflection point.

2) National policy

On the economic basis, policies play an important role; if the price increase is too large, the relevant departments will introduce a bearish policy to suppress the rise and buffer to the downward cycle; similarly, when the decline increases, it will introduce a favorable policy and rebound. The policies that can control prices at the national level in China are mainly food policies, reform of the national food circulation system, and import and export trade policies. Around 2008, Chinese corn was basically harvested every year, and the supply of agricultural products was in excess of demand. In addition, due to the impact of the financial crisis, corn prices have fallen partially, leading to difficulties in corn sales. In order to fully protect the interests of farmers, China has successively launched corn purchase and storage plans. After the implementation of relevant policies, the country began to have greater pricing power and initiative in the market.

3) Supply and demand

The relationship between supply and demand is also a major factor influencing the fundamentals of futures. Increased demand will increase the purchasing power of the market, resulting in insufficient supply and product price increases. Similarly, it can be seen that reduced demand and reduced market purchasing power will lead to excess supply and product prices. Similarly, increased supply and oversupply will cause prices to fall; reduced supply and oversupply will also cause prices to rise.

As far as the status quo is concerned, the development of China's futures market still has

shortcomings such as few participants and weak pricing power. The small number of products and the narrow scope of participation directly lead to a narrow futures market. As a component of the virtual economy, the corn futures market has demonstrated the role of serving the agricultural product economy (such as the corn industry) and promoting economic development. However, due to the lagging research on the corn futures market and the overall low market participation, the corn futures market has not yet played an active role in ensuring the healthy development of the corn industry. Therefore, it is necessary to strengthen the research on corn futures market. Combined with the specific actual situation of the current corn industry, effective methods are adopted to improve the layout of the corn futures market and enhance the core hard power of the integrated agriculture and corn processing industry. This has profound practical significance and important value for promoting the iterative innovation of the corn industry and the increase of corn production income. At present, after summarizing the problems and lessons in the past, the corn futures market in our country continues to increase in scale and the market operation is becoming more stable[11].

2.3. Development of Corn Planting Industry

In recent years, China's edible corn industry has developed vigorously. With the increasing demand for fresh corn in domestic and foreign markets, it is particularly important to increase the diversified competitiveness of China's fresh corn industry and make fresh corn products a choice for more consumers. Therefore, it is of great practical significance to investigate and analyze the production status of the corn industry, discuss the risks and opportunities in the development of the industry, and propose countermeasures to improve the development of the corn industry.

A major obstacle facing the corn planting industry is that the industry has not yet formed agglomeration. This means that industries are highly concentrated in specific geographic areas, and the agglomeration effect of related industries is greatly affected by regional differences. On the one hand, the corn industry agglomeration has formed an industrial cluster with regional characteristics, and some regions have reduced the raw material product costs and inter-enterprise transaction costs of upstream and downstream enterprises in the industrial chain, which has improved the internal collaboration efficiency of the industrial cluster. Innovation continues to increase. In addition, new marketing applications and media updates, and the trend of industry development are accumulating, which has intensified competition among enterprises. Benign competition will help enterprises improve products and services and widen the upswing of related enterprises. On the other hand, the production scale of corn-related enterprises in some regions is limited, and the level of industrialization needs to be improved. The development agglomeration of enterprises is not high. The lack of communication and the lack of technical exchanges among enterprises result in higher costs and the inability to obtain new technologies. The insufficient effect of industrial agglomeration has seriously hindered the iterative development of the corn planting industry [12].

At present, the common problems of corn planting industry in China are as follows:

(1)Difficult to adjust planting structure

The lack of knowledge of corn producers on fresh corn varieties and the lagging guidance of planting technology innovation have made many farmers believe that the risk of growing fresh corn is high. Even though the economic benefit of fresh corn is higher than that of ordinary corn, farmers are generally not enthusiastic about growing fresh corn, and traditional corn varieties are still their primary choice. In this case, the limitation of planting scale is large and it is difficult to expand, which seriously hinders the development of the entire fresh corn industry chain, resulting in low market competitiveness.

(2)Large use of pesticides and fertilizers

The most important factor in determining the price of fresh corn is product quality and

appearance. In the process of planting corn, in order to maximize profits and maintain the yield and appearance of corn, the planting process uses a lot of pesticides and fertilizers. This has led to increased production costs, a sudden drop in planting income, and serious pollution to products and the environment.

(3) Single processing product

The processing and utilization of corn has a long history. Long before Columbus discovered the New World, the Indians had used sweet corn to make sugar, brew beer, and make snacks. In recent years, China has explored new products of fresh corn and developed corn juice beverages, instant fruit corn, etc. However, the processing of fresh corn lacks in-depth processing and end products. As a result, the diversified consumer demand of consumers is still not met, and the consumer market needs to be updated urgently.

3. Research Model

3.1. Price Volatility Research

Use the ARCH model for analysis. The ARCH model is a GARCH model developed from the ARCH model. The ARCH model is usually composed of two equations:

$$y_1 = x_1 \beta + \varepsilon_1 \tag{1}$$

$$\sigma_t^2 = \mathrm{E}(\varepsilon_t^2 \mid \varepsilon_{t-1}^2 \cdots) = \alpha_o + \alpha \varepsilon_{t-1}^2 + \cdots + \alpha_q \varepsilon_{t-q}^2 \tag{2}$$

Equation (1) is the mean equation, and equation (2) is the ARCH equation.

In the actual operation process, if the ARCH model has too many lag items, considering the complexity of the calculation process, we treat the ARCH model with too many lag items as the GARCH model, which is written as $\varepsilon_t \sim GARCH(p,q)$

$$\alpha_t^2 = \alpha_o + \sum_{i=1}^{q} \alpha \varepsilon_{t-i}^2 + \sum_{j=1}^{p} \alpha \sigma_{t-j}^2 \tag{3}$$

According to the volatility characteristics of the corn futures market price in our country, this paper selects the sample data of the futures market price as the logarithmic form of the sample data and the rate of return of this study. The logarithmic form of futures price returns:

$$R_t = (\ln(P_t) - \ln(P_{t-1})) \tag{4}$$

3.2. Research on Price Discovery Function

Cointegration test method. That is, futures price refers to the unbiased estimate of the price of goods that reach the deadline. It is a highly used expression in the empirical analysis of the price discovery function of the futures market. The numeric expression is

$$S_T = a + bF_{t_1 T} + U_t \tag{5}$$

Among them, the spot price on the delivery date refers to the futures price agreed by the futures with a date of T on the time period of t, which is a deviation item.

3.3. Research on Risk Transfer Function

The vector autoregressive model and error correction model are used to calculate the hedging

rate of the corn futures market based on the financial crisis in 2008. It is calculated in three time periods, and the risk aversion function of the corn futures market in China is further studied through analysis.

Error correction calculation model:

$$\Delta LnS_1 = \alpha + \beta \Delta LnF_1 + \lambda Z_{t-1} + \varepsilon_1 \tag{6}$$

Vector autoregressive calculation model:

$$\Delta LnS_1 = \alpha + \beta \Delta LnF_1 + \sum_{i=1}^{m} \gamma_1 \Delta LnS_{t-1} + \sum \theta_j \Delta LnF_{t-j} + \varepsilon_t \tag{7}$$

4. Research Design and Result Analysis

4.1. Research Design

(1) Research content

1) By analyzing the variance and standard deviation of the return rate within a certain period, an ARCH model is established to fully reflect the price fluctuation characteristics between the crop industry and the agricultural product futures market.

2) By calculating the optimal hedging ratio of China's corn futures, he further calculated the hedging performance of China's corn futures market. Based on the comparative analysis of the hedging results of the three time periods, the risk aversion function of the corn futures market in different time periods is integrated and studied.

(2) Research methods

1) Establish the ARMA-GARCH model. Use Ljung-BoxQ statistics Ljung-Boxtest for autocorrelation testing. If there is autocorrelation, it is necessary to establish an ARMA-GARCH model for filtering. Using the sample data, the stationarity detection, correlation analysis, error correction model and GARCH model were established. Finally, a retrospective test was carried out on the basis of the sample data to check whether the corn futures price and spot price were stable.

2) Empirical research. Quantitative analysis method cointegration test was used, with corn futures index price as independent variable and corn price as dependent variable to establish regression model, and corn and corn futures index price cointegration relationship model. The risk transfer effect of the futures market mainly uses the basis analysis method and the hedging effectiveness analysis method. By measuring and calculating the basis of the corn futures market and studying the changes in basis, it reflects the hedging function and risk aversion function of the corn futures market in China.

(3) Data source

The data used in this article comes from "Price Monthly", "Time Finance", "Journal of China Agricultural University", "Agricultural Economy and Management", "Agricultural Market Weekly", "Contemporary Commercial Daily (Theory and Innovation)", "China's Circulation Economy". And other periodicals. Based on the data, analyze the role of corn futures in ensuring the development of the corn industry.

4.2. Analysis of Research Results

(1) Descriptive statistics of sample returns

Starting with the descriptive statistics of agricultural product futures sample returns, further study the relationship between futures returns and industrial development. By selecting corn, soybean oil and potatoes, the average, standard deviation and kurtosis of the three products are

calculated for data analysis. The descriptive statistical results of three sample returns of agricultural products futures are shown in Table 1:

Table 1. Descriptive statistical results of return rate of three agricultural product futures samples

	Skewness	Kurtosis	J-B	Q(5)	Q(10)
Corn	0.019	7.821**	7207.000**	24.204**	39.042**
Soybean oil	-0.420**	3.230**	760.000**	2.867	12.867
Potato	-0.220*	3.180**	-33.742**	19.818**	32.267**

As can be seen from Table 1, the J-B test of the returns of the three agricultural product futures all performed significantly at the level of 1%, which shows that the returns of agricultural product futures in China do not follow the normal distribution. In addition to corn futures, the skewness of the yield of the other three products is negative, and the yield of soybean oil futures is significantly less than 0 at the 1% confidence level. At a 5% confidence level, the output of potato futures is significantly less than 0, and at a 1% confidence level, the kurtosis of these three products is significantly greater than 3. The yields of potato futures and soybean oil futures generally show significant "biased" and "peaky thick tail" patterns. Although the skewness of corn futures' returns is greater than zero, the kurtosis value is still significantly greater than 3 at a 1% confidence level, with a clear "peaky thick tail" pattern.

In addition, by analyzing the trend changes in the average value and standard deviation of agricultural product futures returns, we can see the overall characteristics of futures returns. The average value reflects the trend of centralization of yield, and the standard deviation reflects the trend of off-center. The smaller the standard deviation, the more representative the average. The average and standard deviation analysis of agricultural output is shown in Figure 1.

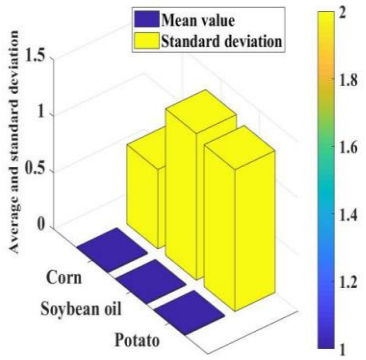

Figure 1. Analysis of the average and standard deviation of agricultural products output

Looking at Figure 1, we can see that the standard deviations of the three agricultural products change with time, the standard deviation of corn futures is relatively small, and the average value is good. In general, the average value of the three agricultural products is relatively stable, with small fluctuations. Using corn futures as a reference index has profound significance for the research of various data of China's agricultural product futures and its planting industry.

(2) Cointegration test between futures price and agricultural product price

Futures prices and agricultural product prices are related to the stable development and iterative innovation of the futures market. Johansen is used to test whether there is a long-term cointegration relationship between corn futures price and corn spot price, and whether the corn futures market effectively exerts its price discovery function. The cointegration test of futures prices and agricultural product prices is shown in Figure 2:

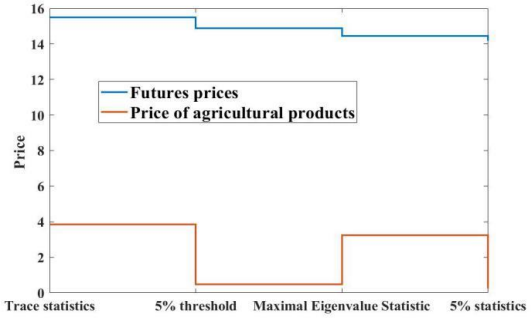

Figure 2. Cointegration test of futures price and agricultural product price

As can be seen from the tracking statistics and maximum feature statistics in Figure 2, at a 95% confidence level, there is a cointegration relationship between futures prices and agricultural product price series. The conclusion shows that the long-term stable equilibrium relationship exists between the corn price and the futures price, and the corn futures market has a certain price discovery function for the agricultural product market.

(3) Characteristic analysis of price volatility

By collecting data on corn output and futures prices in the three periods before and after the financial crisis, the trend of corn output changes and futures price changes in different periods are analyzed and studied. The corn production data collection chart and corn futures price fluctuations are shown in Figures3 and Figure 4:

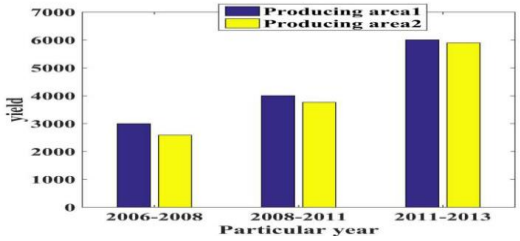

Figure 3. Corn yield data collection chart

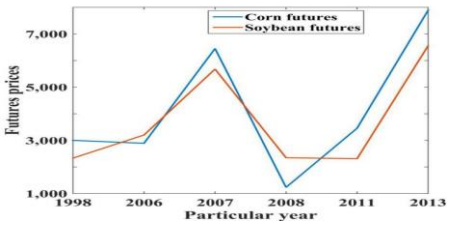

Figure 4. Fluctuatipn chart of corn futures price

Looking at Figure 3, it can be seen that the agglomeration of corn production changes with time. It can be clearly seen from Figure 4 that corn futures prices have accumulated volatility in different time periods. Comprehensive analysis shows that the fluctuations of China's corn futures market have sustained power in three time periods, indicating the aggregation of prices in the corn futures market. Through the comparison of sample data, it is found that after the financial crisis, the price of corn futures market in China has local fluctuations and lasts for a long time, indicating that external shocks have a profound effect on the futures price fluctuations.

(3) Descriptive statistical analysis of risk transfer function

Taking the financial crisis as a time node, it is divided into three periods: the middle, the latter, and the period. The correlation between corn futures prices and spot prices in China is empirically tested. The data integration analysis of corn futures price and spot price is shown in Table 2, Table 3 and Table 4:

Table 2. Correlation coefficient between futures price and spot price 1

	Corn spot price	Corn futures price
Corn spot price	1.0001	0.9067
Corn futures price	0.9067	1.0001

It can be seen from Table 2 that the correlation coefficient of China's corn futures price and spot price before the financial crisis was 0.9067. The higher correlation indicates that it is more feasible to use corn futures to hedge the spot price during this period.

Table 3. Correlation coefficient between futures price and spot price 2

	Corn spot price	Corn futures price
Corn spot price	1.0001	0.9243
Corn futures price	0.9243	1.0001

It can be seen from Table 3 that under the influence of the financial crisis, the correlation coefficient between China's corn futures price and spot price reached 0.9243, indicating that corn futures have sufficient conditions to hedge the spot price during this period.

Table 4. Correlation coefficient between futures price and spot price3

	Corn spot price	Corn futures price
Corn spot price	1.0001	0.8769
Corn futures price	0.8769	1.0001

It can be seen from Table 4 that after the financial crisis, the correlation coefficient between China's corn futures and spot prices is 0.8769, indicating that this period of time has sufficient conditions to hedge the spot with corn futures.

In summary, the correlation coefficients of corn futures prices and spot prices in China were 0.9067, 0.9243, and 0.8769 in the three time periods with the financial crisis as the dividing point. It can be seen that under the impact of the financial crisis, China's corn futures market has a high hedging effectiveness, which makes the corn futures market's hedging function and risk aversion function decline. Limitations and lags.

5. Conclusion

The corn industry is closely related to its futures market at different times. Based on the 2008 international financial crisis as the time node, this article investigates and studies the effective overview and development prospects of China's corn futures market from three perspectives: the price volatility characteristics, price discovery function and the risk transfer of corn planting industry.

Combined with the law of actual price changes, the sample data of three time periods are used to empirically analyze and verify the effectiveness of China's corn futures market. From the perspective of futures price volatility, the ARCH and GARCH models were used to analyze the volatility of corn futures price data in three periods. From the perspective of the price discovery function in the futures market, based on the cointegration test method, an empirical analysis of the relationship between the corn futures price and the spot price is conducted.

First, corn futures prices have a high-order arch effect in all three time periods, and futures price returns have significant cluster volatility characteristics. Secondly, under the impact of the financial crisis, there is an extremely uneven relationship between the price of corn futures and the spot price in China, resulting in impaired price discovery. Finally, from the perspective of risk avoidance, in the three periods with the financial crisis as the time node, the corn futures market price and the spot market price trend maintained a high consistency. In summary, this article believes that changing people’s wrong understanding of the futures market and using the price discovery function and risk avoidance function of the futures market in a reasonable manner can better play the real role of the futures market as an important financial instrument to protect agricultural products and their cultivation. The development of the industry promotes iterative innovation.

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Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Conflict of Interest

The author states that this article has no conflict of interest.

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