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How Futures and Insurance Can Effectively Prevent the Risk Caused by the Price Decline of Live Pig

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Abstract. The instability and large-scale cyclical fluctuation of China's live pig prices have had a great impact on the whole live pig industry chain. In 2016, the Chinese government launched the to promote the development of the live pig futures market as an effective means to restrain prices and avoid risks, while reducing the cost pressure of pork demanders such as pork processors. This paper will start with the concept of futures and hedging, and analyze how relevant enterprises use futures hedging to avoid the risk of price reduction through China's lower live pig market, as well as how the whole market benefits.

Keywords: option, futures, risk, hedge, live pig market

1. Introduction

In recent decades, financial derivatives grow vigorously as the most cost-effective market risk management tool. As one of the most popular financial derivatives, future has been widely studied. The research shows that the trading strategy of the futures market is deepening and maturing. Especially, there were more theoretical discussions of future, either to consider the use of future to deal with the espoused of company to possible risks, or to focus on the impact of exchange rate exposure on the use of option on a company. In fact, with the continuous development of agriculture, more and more options for agricultural products have been launched to minimize the risk and impact of price decline caused by the epidemic and other factors. In China, since 2016, the government has vigorously supported the insurance and futures projects, hoping to revitalize the agricultural industry, such as the aquaculture industry, to stabilize production capacity. Therefore, the futures as the mean of profit hedge in agricultural finance have gradually become the focus of attention. Though it has been learned for a long time in the past few decades that how companies hedge possible risks with futures and insurance, there is little literature on the application of these schemes to agricultural products. China has been implementing this new policy for seven years, it will be an inevitable trend for enterprises in the agriculture products such as the pig breeding industry chain to deeply participate in pig futures and use derivatives to hedge and achieve stable operation. Facing the increasingly complex and changeable market situation, futures companies should also use futures, options and other financial derivatives to provide risk management services for enterprises, which is of great significance to help enterprises operate steadily. Building on the gaps in the existing literature, I have made the following contributions by studying the current data on the use strategy of combining futures and insurance in multiple agricultural markets in China since 2015. From the perspective of the profit

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of live pig enterprises, this paper analyzes how live pig enterprises use hedging to avoid the risk of rising and falling pig prices. At the same time, it puts forward some suggestions on how to better achieve successful hedging and realize the function of avoiding price risk and points out the development trend of live pig enterprises using hedging. This paper studied the using of hedging by pig enterprises under option plus insurance policy in China. Therefore, it involves the influence of the policy in China. The analysis gives obviously image on hedging and the suggestions in the paper have a positive effect on pig enterprise.

2. Literature Review

A futures contract is an agreement between the buyer and the seller to deliver and accept certain assets at a specific price after a specified period. Both parties agree that the price at the expiration date of the contract is the futures price, the assets traded by both parties are the target, and the target of pig futures is the pig. Futures are considered forward purchase and sale contracts, but the difference is that the terms of forward purchase and sale contracts are signed by both the buyer and the seller. However, the terms of futures contracts are carefully formulated by the exchange before listing and will not be easily changed after writing.

The liquidity of futures contracts is very strong, which makes futures play a better role in the agricultural market [1]. The futures market supports the establishment of a fair price for a commodity and supports hedging the price risk related to the commodity. Because many professional buyers and sellers join the futures market, the futures price will also affect the spot price. The resulting futures price will objectively reflect the real supply and demand situation and the price change trend. Because futures will lead the price of the spot market, investment enterprises or individuals will use the information of the futures market to judge the future price trend. And make decisions based on the information obtained.

Although the futures market cannot eliminate the crisis, it can weaken the negative impact of major events on enterprises to a certain extent [2]. For example, African swine fever, China's domestic pig industry is under great pressure under the threat of swine fever, because the cost of water, electricity, etc. for raising pigs needs to be prepaid, but the return of funds needs to wait until at least 6-8 months after the pigs are sold. Not only pig farmers, but also pork processing plants have great pricing pressure. However, if the pig farmers cooperate with the processing industry to finalize the price during the period of piglet birth and pig marketing, it will not only cover the cost of the pig farmers, but also facilitate the processing industry to formulate the product price and obtain the planned profit. In this way, the price fluctuation of live pigs and pork will be reduced, and the market price risk will be reduced to stabilize prices.

"Insurance + futures" means that farmers purchase agricultural product price insurance from insurance companies, and then insurance companies purchase put options from futures companies [3]. Futures companies copy put options in the futures market for hedging, to realize the transfer and hedging of risks in the agricultural product market, and finally form a closed loop of risk dispersion and benefits for all parties. The futures market plays a role in providing an open and transparent price system in this process. As a model hedging link recognized by all participants, it plays an important role in providing a favorable place.

There are mainly two types of hedging [4]. One is selling hedging. Selling hedging is generally applicable to cultivation enterprises. In order to avoid the risk of falling prices, enterprises first sell futures contracts in the futures market. The spot quantity corresponding to the sold futures contract shall be equal to the spot quantity that the enterprise needs to sell in the future, and the delivery date shall be similar. When an enterprise needs to sell the existing goods, it can choose to carry out physical delivery directly, or hedge and close the position of the original sold futures contract while selling the existing goods or assets in the spot market, to preserve the value of the transaction in which it

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sells the existing goods or assets in the spot market and realize the role of locking the price in advance. The other is purchasing hedging. Purchase hedging is generally applicable to the processor. In order to avoid the risk of price rise, processors buy futures contracts in the futures market. The spot quantity corresponding to the purchased futures contract shall be equal to the spot quantity that the enterprise needs to buy in the future, and the delivery date shall be similar. When an enterprise needs to buy spot goods, it can choose to directly carry out physical delivery, or hedge and close out the positions of the originally purchased futures contracts while buying spot goods or assets in the spot market, to preserve the value of the transactions in which it buys spot goods or assets in the spot market and realize the role of cost locking.

3. Methodology

This paper studies and investigates how Chinese pig farms hedge to lock in profits and avoid the depreciation of live pig prices in the future. Therefore, quantitative methods need to be adopted for research. Because it is more important to study how to hedge rather than the relationship between the two variables, this paper does not need to control a variable to collect and statistically analyze many relevant data. The classical and universal latest data is the most needed. As mentioned above, the Chinese government has adopted the option plus insurance method to encourage the live pig futures market, so the data collected is under the option plus insurance mode. Therefore, in addition to the settlement period and futures price to be considered for futures, it is also required to know the insurance price and the amount of government subsidies. It is assumed that there is no impact of plague and other emergencies during the delivery period. The period is within 3 months, because the demand and supply of pork are greatly affected by seasons due to festivals and other reasons. Because it is short-term, it can also be assumed that the macro strategy of pork, the overall economic level of the country and the price of pig food such as corn are unchanged. Transaction costs such as handling fees are ignored. At last, it is calculated and studied by knowing the number of live pig trading tons. The data of live pig price comes from the official data of China Futures Platform. The parity formula of futures is futures price + underlying asset price = present value of execution price. Two situations when the values are different are considered.

Table 1 shows the spot price at first (July 2021) and maturity (September 2021) and future price. Here the cost of insurance is included in the future price. The minimum standard for trading is 16 tons and the required margin is 20% of the total capital trade.

First, it is analyzed how the pig enterprise trades product B for hedging. The pig enterprise is expected to deliver 176 tons of live pigs during the delivery period. The pig enterprise is worried that the decrease in short-term consumption of pork and the increase in pork imports will lead to a decline in the price of live pigs in September, so it decided to sell futures in the futures market to ensure the preservation of the value of live pigs in September. Therefore, he sold 176 tons at the price of 18.4 yuan per kilogram in July. In September, the price of live pigs decreased, and the price of futures also declined. At that time the pig enterprise needs to sell its existing live pigs, and he buys 176 tons of futures in the futures market. It is assumed that the pig enterprise does not take advantage of the futures market, and the impact of price decline on enterprise a is 176000* (15.525-16.5) = - ¥ 171600. However, under the condition that pig enterprises have successfully predicted the downward trend of pig prices, pig enterprises can obtain 176000* (18.4-16.7) = ¥ 299200 through the futures market. The enterprise turned to earn a profit of 127600 yuan.

However, hedging is also risky. If the live pig enterprise misjudges the price change trend of the future live pig market, the sold hedging will also bring certain losses to the enterprise. Now, considering that a live pig enterprise also predicted that the pig price would fall in their region and made the same decision as B live pig enterprise. It can be seen from the table that the price of live pigs increased from 12.2 yuan per kilogram to 13.265 yuan per kilogram, and the futures price also

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increased from 12.4 yuan per kilogram to 14.5 yuan per kilogram. In this case, a live pig enterprise will have certain losses. It is first considered that if the enterprise does not use the hedging, the net profit that the enterprise can earn in this case is 176000* (13.265-12.2) = ¥ 187440. However, due to the wrong judgment of the enterprise, it chose to sell 176000 kg of futures at the beginning and then buy them at 14.5 yuan per kg in September, so the total loss is 176000* (12.4-13.4) = - ¥ 176000.

In fact, it is not really an unsuccessful case. The purpose of hedging is to lock in profits to avoid risks. Since the price trends of futures and spot markets are basically similar, when one market loses money, it will make profits in another market. After the profits and losses are offset, the profits of traders can be maintained at an expected stable level. In this case, the extra profits can completely cover the losses in the futures market. Although this enterprise has lost the profits brought by the rising spot market prices, it has avoided the risk of falling spot market prices. Therefore, the enterprise is equivalent to buying hedging to avoid risks, rather than to make more profits.

On the premise of rising prices of live pigs, as demanders of live pigs, such as pork processors, they adopt the opposite strategy to that of live pig enterprises. For pigs of product a, they will buy futures in July in advance, so that the futures and spot market prices are rising in September. Although it takes more money to buy live pigs, they can sell the rising futures at the same time and offset the rising spot costs with the money earned.

Table 1: Hedging effect of enterprise A and enterprise B.

Product	Spot Price (RMB/kg)	Future Price (RMB/kg)	Spot Price at maturity (RMB/kg)	Future Price at maturity (RMB/kg)	Amount of live pig trade(1000kg)
A	12.2	12.4	13.265	13.4	176
B	16.5	18.4	15.265	16.7	176

4. Results

Table 1 gives examples of changes in spot and futures market prices and the number of options purchased or sold by enterprises in two regions of China. The information and data are accurately extracted from the official data of China Futures platform and recorded on the form, and each piece of information is accurately marked. All the information in the form is mentioned and involved in the calculation, to draw a conclusion. Because the result is completely calculated, there is no subjective explanation or inference in it. The data on how live pig enterprises use arbitrage to hedge against risks are well documented and analyzed. Through analysis and calculation, it objectively shows the strategy that the enterprise successfully locks in profits to avoid risks by forecasting the price trend of the spot market and adopting hedging, and the two situations that may be encountered by adopting this strategy. It shows the idea that enterprises can always use arbitrage to hedge against risks since there are spot markets and future markets and the tendencies of price are similar so enterprises can always use it to hedge the risk no matter how the price changes although the enterprise will earn less profit.

5. Discussion

To sum up, it is known that live pig enterprises can avoid risks as much as possible by locking profits in the futures market. When they predict that the price of their pigs may depreciate during the delivery period, they can sell the contracts in the futures market to preserve the price of the next pigs. In this way, when the delivery period when the price falls, they can sell their pigs and buy the contracts of the quantity sold at that time in the futures market, to avoid the loss caused by the decline in the price of pork on the spot market and make profits. Even if the enterprise misjudges the price of live pigs in the future in the spot market and thinks that it will depreciate, the price is increasing. Although the

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enterprise will lose money selling low-priced futures and buying the same number of high-priced futures, the enterprise will also gain the profits brought by the price increase of live pigs. Therefore, the enterprise generally only gains relatively small profits, but doing so may avoid the losses caused by the devaluation of pigs. This means that if the enterprise learns to use the futures market, it can ensure that it can make a steady profit without losing as far as possible. The reduction of enterprise risk and the improvement of stability can make the price more favorable, to increase the competitiveness of an enterprise. At the same time, the demander can buy the futures if the price of pig is going to increase so they can sell the futures at maturity and use the money earned to buy the live pig with a higher cost. Both lead to the price becoming more stable and both enterprises and customers have fewer risks. This good effect of price stability will also be transmitted to consumers to increase the integrity of the market. However, this paper also has certain limitations. Although the consideration is how live pig enterprises can avoid risks through arbitrage and Hedging under China's option plus insurance policy, the data website does not clearly show the impact and role of insurance because the insurance is included in the futures price. In this research direction, it is supposed that further study the role played by China's policies, such as government subsidies, and how to avoid possible futures losses higher than profits in the case of live pig appreciation, can minimize the risk.

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