Hedging techniques in commodity risk management

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Abstract: The article focuses on selected aspects of risk management in agricultural business with the aim to discuss and compare different hedging methods which are relevant for managing the commodity risks associated with agricultural production. The article provides a broader context for understanding the risks and possible responses to it and analyses four basic hedging strategies – commodity futures, forward contracts, options and option strategies. The substance, advantages and disadvantages of each hedging technique are pointed out and compared to each other with the conclusion that there is always some kind of trade-off between the advantages and disadvantages of the particular strategies. The farmers shall, therefore, consider both all aspects of the relevant strategies and their expectations, before they make the final decision which instruments to use.

Key words: commodity risks, hedging, commodity derivatives

Today's globalized economy offers its participants many advantages – new markets, new clients and thus new potential profits. On the other hand, new risks and threats arise, too – new (and in many situations more advanced and with larger capital endowed) competition and potentially increased volatility. The latter fact concerns mainly goods that can be internationally traded. In a situation of a domestic or a regional market, the price is determined within this individual market and based on the local market forces. But in the case of large globalized markets, the price is the outcome of factors coming from different parts of the world. And this is the problem that many commodities, the agricultural ones not excluding, are suffering from today. The price of wheat, corn, soybeans or oilseed does not depend only on the local conditions, but mainly on the situation within the largest producers. The increased volatility in prices adds new concerns to those with variance in the yield and production (planting and harvesting) costs.

The main objective of this article is to discuss and compare different hedging methods which are relevant for managing the risks associated with agricultural business (mainly with production). For this purpose, we start with the basic definitions of risk and its forms. Then, we shortly describe the possible responses to risk and the way how the wheat prices are established. Finally, we analyze and compare the basic hedging techniques using the example of wheat market and conclude with the main findings of the article.

RISK AND ITS FORMS

Hardaker et al. (2004) define "risk as uncertain consequences, particularly exposure to unfavourable consequences. Risk is therefore not value-free, usually indicating an aversion for some of the possible consequences." This is in line with the traditional definition of risk based on the return on investment (Bernrud et al. 2005): the possibility of achieving at least the given return, the possibility of a loss (a negative return), the possibility of a positive return that is lower than the expected return, the possibility of losing more than the given dollar amount.

The possible forms of risk are wide-ranging and they can be classified to their source (Patrick 1998). Market risk concerns the problems already described – fluctuations in input and output prices which cause income gains/losses. Production risk deals with the yield variance that is the function of many variables – weather, diseases and other causalities. Technological risk arises from technological changes, while institutional and legal risks affect the legal environment or the level of direct payments (subsidies) from the governments. This paper focuses, however, on the output (farmer's production) price fluctuation only.

The price movements do not create an unstable situation only for the primary producers. They suffer when the price goes down, but their clients, mainly the food processors, have to deal often with price increases, which they have to reflect in both the wholesale and retail prices to maintain their mar-

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gins. And this could be hard to justify facing the consumers' claims for low prices. Fluctuations make it difficult for both producers and processors to find the right timing for selling the production, or buying it respectively.

Since the farmers typically harvest and own the production, they are said to be in the long position. On the other hand, processors or traders have the desire to purchase it, so they are said to be in the short position. These terms are close to the definitions that are typically used in financial management.

RESPONSES TO RISK

There are many responses to the different kinds of risk, but we will only attain those that might reduce the market risk. As Patrick (1998) states, the commonly used method involves marketing responses. They could take the form of a detail overview over the market and getting the most accurate information for decision making or participating in government programs, which provide the downside price protection for some commodities. Other way to go is to spread the sales over the year, which allows the farmer that (s)he is not dependent on one price at one time. The last option involves hedging tools, which give the farmer assurance against price increases of inputs and price decreases of outputs. Typical hedging tools available in agricultural business are commodity forwards, commodity futures and commodity options. The hedging principle itself is based on taking the opposite position in the futures (forward or option) market to the position in the cash market. For farmers, this implies taking the short position in one of those markets compared to their long position in the cash market. Within the text, we assume that the hedge ratio (the proportion of the cash position to futures/forward/option position) is 100%. Haigh and Holt (2000) describe this situation as a full-hedge strategy.

For the purpose of this paper, the price of agricultural output (wheat) was chosen to illustrate the benefits and costs of hedging.

ESTABLISHMENT OF WHEAT PRICES

When dealing with the price establishment process, two different markets have to be taken into account. These markets function separately, but they are closely related. The first one is called the futures market, and wheat contracts are traded there for the future delivery. Futures contracts are standardized contracts, in which the buyer of a contract (long position) agrees to buy the underlying asset (wheat in this case) from the seller of the contract (short position). The underlying asset is specified in terms of quantity and quality, as well as the price is predetermined for the future delivery date (Madura 2006). The system of trading is institutionalized through commodity exchanges, which specify the individual futures contracts for wheat (see below). The second market is called the cash market (spot market) and this is a market where the asset (wheat) is traded and handled physically. Farmers or producers sell the grain typically to the middlemen companies, such as country elevators, or to processors.

With the existence of two markets, one question arises. Which one is relevant for the farmer? Actually, both are equally important, since the futures price determines the price in the local cash market. As the next formula states, there is a positive correlation between the local cash price and the futures price:

Local cash price = Futures price – Local basis

The term basis typically refers to the difference in prices between the local cash price and the futures price and it can be of both positive and negative value (depending on the local cash and futures prices).

Local basis = Local cash price – Futures price

If the local cash price is said to be "under", then it is nominally lower than the futures price and the local basis must be negative. A basis becoming less positive or more negative is said to widen or weaken. If the local cash price is said to be "over", then it is nominally higher than the futures price and the local basis is positive. A basis becoming more positive or less negative is said to narrow or strengthen.

The basis reflects the local market conditions, thus its value depends on several local factors (CBOT 2004):
– transportation costs,
– local supply and demand conditions, such as grain quality, availability, need or local weather,
– interest/storage costs
– handling costs and profit margins.

The basis value informs the producer about how to sell the production – using the spot market, the futures market or utilizing futures or option strategies to hedge (Table 1). Strengthening basis typically works for the sellers (local cash price is increasing

Table 1. Marketing strategies for grain producers based on the size of the basis and price

	High wheat price	Low wheat price
Strengthening basis	Selling in the spot market (at the cash price)	Selling in the spot market (at the cash price) Speculation on higher wheat price: – buying futures contracts – buying commodity forward – buying a call option
Weakening basis	Hedging: – selling futures contracts – selling commodity forward – buying a put option	Store the harvest

Source: Parcell and Pierce (1997)

relative to futures price); weakening then for the buyer (the local cash price is decreasing relative to the futures price).

HEDGING THE WHEAT PRICE WITH FUTURES CONTRACTS

Hedging agricultural commodities is to a certain degree specific to hedging prices of other assets. Most of the farmers (mainly smaller ones) have limited opportunities to whom to sell their harvest. They have established their contracts with customers and their intention is not to sell to other parties, but to hedge, to lock in the selling price. Derivative contracts (forward, futures, and options) then only serve as a hedging tool, not as a mean of selling the wheat itself. However, their use has become increasingly popular over the recent time (Irwin and Sanders 2012).

Wheat futures are mostly traded within the two largest commodity exchanges, the CBOT (Chicago Board of Trade within the CME Group) for the US trading and the NYSE Euronext for European trading. As stated above, futures contracts are standardized. The most important features of the two wheat futures contracts are summarized in the Table 2.

Wheat producers can hedge against an unfavourable change in the price (decrease) by selling wheat futures to lock in the selling price. By doing this, they postpone the physical delivery of wheat on the spot market that will be eventually used. Thus selling futures contracts can be viewed as a temporary substitute of selling in the local cash market. The position the farmer is taking in the futures market is opposite to the position in the local cash (spot) market. Producers are in the long position regarding their production (they harvested it and possess it), so they have to open the short position in the futures market (they have to sell futures contracts). If a farmer has harvested 5000 tons of wheat (is 5000 tons long), to be hedged using futures contracts, (s)he must sell wheat futures in the same size (and thus become 5000 tons short).

Here we get back to the establishment of price. The major component of it is the futures price, which means that when hedging with futures contracts, the main part of the price is stabilized and only the local basis remains of the unknown value. The futures price decline, what would cause the local cash price decline that would be offset with gain in the futures market, because the farmer's position (sold contract) could be closed out with purchasing the same futures

Table 2. Wheat futures contract specification

	CBOT	Euronext
Name of the product	Wheat futures	Milling wheat futures
Size of one contract	5000 bushels (~ 136 metric tons)	50 tons
Pricing unit	USD cents per bushel	Euro and euro cents per ton
Delivery months	March, May, July, September, December	November, January, March, May*
Last trade date	The business day prior to the 15th calendar day of the delivery month	18:30 on the tenth calendar day of the delivery month (if not a business day, then the following business day)

*September, December, March and May starting September 2015

Source: CME Group, NYSE Euronext

contracts, but at lower price. The originally placed hedge would then be lifted (offset). When the farmer finally sells the production, also the long position in the local cash market would be closed out with the short transaction (selling the production to the processor).

Short futures hedges illustration

Short hedge, as mentioned above, is used to lock in the selling price in the future. It requires the short position in the futures market (selling one or more standardized futures contracts to cover the long position in the local cash market). The farmer can hedge the already harvested production or the production that will be harvested in the future.

When the farmer has harvested 1000 tons of wheat and does not want to sell them immediately in the spot market (because of existing contracts, low price or weakening basis), but (s)he is worried about the price fluctuation in the future time, the option available is to open the short position in the futures market to the long local cash market position. 1000 tons of wheat equal to 20 Euronext contracts that the farmer sells. The delivery date of the futures contracts should match or fall behind the planned local sale (and thus cover the hedging period). In this case, the November delivery date would probably be appropriate. The current price after the harvest is 185 EUR/ton, but till November, it may decline. The current price of wheat futures (November delivery) is the same, 185 EUR/ton. In order to lock in the selling price at this value[1], the farmer has to sell 20 contracts.

Hedging results if current local price at time of delivery declines to 170 EUR/ton

Without the futures hedge, the farmer would have to sell at the current price without any additional gain offsetting the price decrease. With the futures hedge, the farmer does really sell in the local cash market at the local cash price and receives 170 × 1000 = EUR 170 000. However, since 20 wheat futures contracts were initially sold at 185 EUR/ton and now could the same contracts be purchased back at 170 EUR per ton, the farmer closes out the futures position and receives (185 – 170) × 1000 = EUR 15 000. This additional gain covers the loss resulting from the local cash price decrease. Effectively, the farmer is selling wheat at the price 185 EUR/ton. We do not take into consideration the costs connected with opening the futures position (especially an initial margin at the exchange and a brokerage fee) and the basis variation.

Hedging results if current local price at time of delivery increases to 195 EUR/ton

Without the futures hedge, the farmer would be able to sell at the current spot price, which would be profitable. With the futures hedge, the farmer does really sell in the local cash market at local cash price and receives 195 × 1000 = EUR 195 000. But since 20 wheat futures contracts were initially sold at 185 EUR per ton and now could the same contracts be purchased back at 195 EUR/ton, the farmer can close out the futures position only with a loss (185 – 195) × 1000 = – EUR 10 000[2]. This loss resulting from futures position offsets the higher revenues resulting from the local cash price increase. Effectively, the farmer is selling wheat again at the price 185 EUR per ton. We do not take into consideration the costs connected with opening the futures position (especially an initial margin at the exchange and a brokerage fee) and basis variation.

In both situations, the farmer sold in the end at the locked price, which is the purpose of hedging. Nevertheless, we must mention that the effective price is hedged both ways, so an increase in the local cash price does not bring the farmer any additional revenue. This might be considered as the cost of hedging the price.

HEDGING WITH FORWARD CONTRACTS

One of the main differences between futures and forward contracts is related to their standardization. To be able to trade futures contracts, they have to be standardized in many aspects (the size of one contract, its length, delivery date, etc.). On the other hand, forward contracts can be tailored to the client's individual needs in most of the aspects that are fixed in the case of futures contracts. This constitutes the main advantage of a forward contract.

[1]Under the circumstance that local basis does not change.

[2]Alternatively, the farmer might wait with the reverse transaction in the futures market, if the last trade day follows after the local physical delivery. Potentially, the price of the contracts could decrease which would reduce the loss resulting from the futures contracts.

Commodity forward contracts are usually non-deliverable. By this, we mean that (as in the case of cash settled futures contracts), the commodity itself is not delivered and only the price differences are settled after the expiration date of the contract. The client (farmer) agrees with the bank the forward price of a commodity (wheat), which is compared with the closing price of this commodity on the date agreed when the transaction is negotiated (reference day). The closing price refers mostly to the local cash price. When there is a difference in prices, it must be paid by the party in the disadvantageous position for the given amount of commodity, usually 2–5 business days after the difference was calculated.

For the given reference period, the level of settlement equals to:

$$LS = CA \times abs\,(LCP - FP)$$

LS = level of settlement
CA = agreed amount of commodity
LCP = closing price (local cash price)
FP = agreed fixed price

In case that the local cash price on the reference day is nominally below the fixed price, then the farmer receives the difference between prices, corresponding to the agreed amount of commodity. (S)he sells in the local cash market at the local cash price, but receives the additional price difference. This protects the farmer against the local cash price decline. In the other situation, when the local cash price exceeds the fixed price, the farmer has to pay the difference and (s) he would be better off without the forward contract. (S)he sells again in the local cash market (in accordance with the existing sale contracts), but has to pay the price difference. This additional outlay might be understood as the cost of hedging. Effectively, the farmer is selling the production at the fixed price and is protected against the price decline. On the other hand, the participation in increasing the local cash prices is not possible.

Forwards are typically firm contracts with a limited opportunity to close out the open position with a reverse transaction (as it is possible with futures contracts). Though, this option exists as an early termination of the contract, but it is offered at costs.

For farmers outside the main markets and where the main currencies are not used, a quanto commodity forward could be the option. It offers the settlement in other currency to that used for the underlying commodity quotation.

HEDGING WITH "PLAIN VANILLA" OPTIONS

Farmers may also close their long positions on commodity markets by buying put options, which give them a right to sell given amount of commodity or commodity futures contracts at predetermined strike price. Since the put options give only the right and not the obligation to sell the commodity or commodity futures contracts at predetermined strike price the farmers have to pay the option premium to the option sellers.

Generally, options are both standardized contracts traded on organized exchanges and individual contracts between the clients and banks. In particular case of commodity options, farmers may use either options on commodity futures contracts traded on organized exchanges or options offered by the banks as individual contracts. In this article we deal only with options as individualized contracts between the clients and banks, which could be more accessible for the Czech farmers.[3] Furthermore, we illustrate the process of hedging only with so called "European Style Options", which means that they can be exercised only at expiration.

Similarly to commodity forwards, commodity options are also non-deliverable. Thus, there is only financial settlement of the contract and no physical delivery of the commodity. In case of options the financial settlement can only be positive from the option holder's perspective.

The farmer agrees with a bank on the amount of a commodity (wheat), maturity of the option and strike price. On maturity day (reference day) the strike price of a commodity is compared to the closing price of this commodity. The closing price refers mostly to the local cash price. In case of put options the financial settlement is then computed as follows:

$$FS = CA \times max\,(0, X - LCP)$$

[3]Hedging with options on commodity futures contracts is in substance very similar. But still, there are some important differences which relate to standardization of the contracts, local basis and its variation etc. Furthermore, these contracts are also "American Style Options" that can be exercised whenever till the maturity. For more details concerning the specific aspects of hedging the commodity risks with options on commodity futures contracts see for example CME (2006).

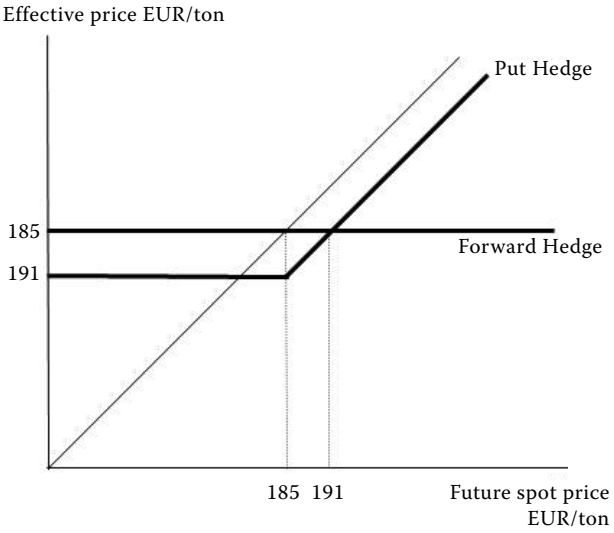

Figure 1. Comparing the "Plain Vanilla" option and the forward hedge

Source: Authors

FS = financial settlement
CA = agreed amount of commodity
LCP = closing price (local cash price)
X = strike price

Let's move back to our example and assume that the strike price of a put option on 1000 tons of wheat equals 185 EUR/ton and the option premium required by the bank amounts to EUR 6000. Then, if the spot price on the expiration day lies above 185 EUR/ton, the farmer will let the option expire and will sell 1000 tons of wheat at the prevailing spot price. However, since the farmer has already paid the option premium, he will effectively sell the wheat by 6 EUR/ton cheaper in comparison with the spot market conditions.[4] Nonetheless, the maximum amount to be received for 1000 tons of wheat is theoretically unlimited (if the spot price rises).

On the other hand, if the spot price on the expiration day is less than 185 EUR/ton, the farmer will exercise his option and will therefore receive the financial compensation from the bank. He sells in the local cash market at local cash price (currently lower), but receives the additional price difference. Then, we shall deduct the paid option premium that is EUR 6000. Thus, the farmer will sell 1000 tons of wheat at the effective price of 179 EUR/ton. It is also the minimum effective price for the farmer.

Let's assume, for example, that the spot price on the expiration day is 170 EUR/ton. Farmer sells at this price, but simultaneously he receives the compensation from the bank which is computed as follows:

$$(185 - 170) \times 1\,000 = \text{EUR } 15\,000$$

Thus, he receives EUR 185 000 in total. If we then deduct the premium of EUR 6000 which has been already paid, we come to final effective cash inflows of EUR 179 000.

Figure 1 compares the effective prices at which the farmer will sell 1000 tons of wheat when using the put option or alternatively the forward contract.

If the future spot price lies above 191 EUR/ton, put option hedge will be more favorable, because the farmer will effectively sell 1000 tons of wheat for more than EUR 185 000. However, if the future spot price is less than 191 EUR/ton, the forward contract will be more profitable.

Thus, the forward contract allows the hedging at better price since the farmer does not have to pay anything at the beginning. But on the other hand, forward hedge does not provide the possibility of participating on positive price fluctuations (in this case increase in price).

HEDGING WITH OPTION STRATEGIES

Option strategies generally represent a mixture of different option positions. So-called "zero costs strategies" that represent mix of two or more option positions with the same amount of paid and received premiums are very popular ones. In this text, we will use so called "Collar" strategy and "Ratio Spread" strategy as examples.

Hedging with the "Collar" strategy

The strategy consists of two basic option positions. If the aim is to hedge the long position the farmer buys one put option, which gives the right to sell a specific amount of commodity at a predetermined strike price within a specific period of time, and simultaneously he sells a call option, which grants a right to the bank to buy the same amount of commodity within the same period of time. Both options have different strikes but the same option premiums. The farmer sets a strike price of the put option and the bank calculates the strike price of the call option both option premiums being equal.

[4]We assume off the time value of the premium paid.

The formula for computing the financial settlement of a put option is described above. Financial settlement of a call option can then be defined as follows:

$$FS = CA \times \max(0, LCP - X)$$

FS = financial settlement
CA = agreed amount of commodity
LCP = closing price (local cash price)
X = strike price

It should be noted that farmer sells a call option in this case and hence the financial settlement of the option can only be negative for him. In other words, he is the one which is obliged to pay if the option is exercised.

Let's move back to our example and assume that the farmer sets the strike price of put option that is for example 175 EUR/ton. It is the worst acceptable price for him. The bank calculates the strike of call option that is for example 192 EUR/ton. The option premiums are the same. Thus, the farmer does not have to pay anything at the beginning.

Well, if the spot price on the expiration day is above 192 EUR/ton, the bank will exercise its call option and the farmer will let the put option expire. The farmer will have to pay the financial compensation to the bank. But on the other hand he is now able to sell 1000 tons of wheat for higher price on spot market. In total, the farmer will effectively sell 1000 tons of wheat for EUR 192 000.

Let's assume, for example, that the spot price on the expiration day is 210 EUR/ton. Farmer sells at this price, but simultaneously he must pay the compensation to the bank which is computed as follows:

$$(210 - 192) \times 1\,000 = \text{EUR } 18\,000$$

Thus, he effectively sells the wheat for EUR 192 000 (210 000 minus 18 000).

If the spot price on the expiration day lies between 175 EUR/ton and 192 EUR/ton, both the bank and the farmer will let the options expire and the farmer will sell 1000 tons of wheat at the prevailing spot price.

Finally, if the future spot price on the expiration day is less than 175 EUR/ton, the bank will let the call option expire and the farmer will exercise the put option, which means that the farmer will receive the financial compensation from the bank. This will offset the lower price at which he sells the wheat in the local cash market. Thus, he will effectively sell 1000 tons of wheat for EUR 175 000.

Summing up, the farmer will effectively sell 1000 tons of wheat for EUR 175 000 at the worst-case scenario and for EUR 192 000 at the best-case scenario. Figure 2 illustrates the effective price at which the farmer will sell 1000 tons of wheat.

When using the "Collar" option strategy the minimum amount to be received for 1000 tons of wheat is EUR 175 000 in this case. The maximum sum is, however, also limited, which is a big difference to "plain vanilla option" hedge.

The farmer does not have to pay anything at the beginning when hedging with this strategy. But on the other hand, this strategy does not provide the possibility of participating on positive price fluctuations to the same extent as the "plain vanilla" put option hedge does.

Last but not least, the farmer should compare the strategy with simple forward contract. Assume the forward price is 185 EUR/ton. Then, if the future spot price is less than 185 EUR/ton, the forward contract will be more favorable, whereas if the future spot price lies above 185 EUR/ton, the "Collar" strategy will provide better financial results.

It is quite natural trade off. The "Collar" strategy consists of two options, whereas the farmer sets a strike price of the put option and the bank calculates the strike price of the call option both option premiums being equal. The bank calculates the higher strike price of the call option the lower strike price of the put option is set by the farmer (other things being equal). Thus, if the farmer accepts relatively lower minimum amount to be received for 1000 tons of wheat, he simultaneously creates the opportunity to receive significantly more if the market conditions are positive.

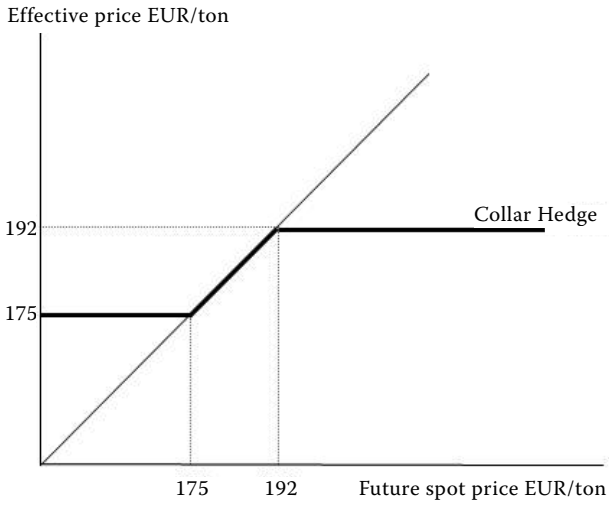

Figure 2. Effective price for wheat hedged by the "Risk Reversal" strategy

Source: Authors

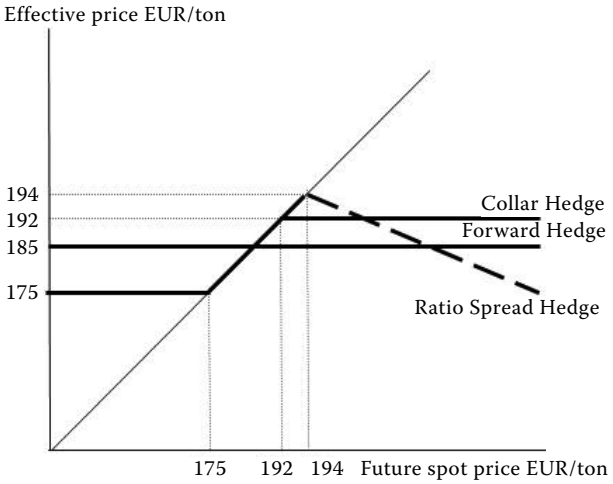

Figure 3. Ratio spread hedge

Source: Authors

Hedging with the "Ratio Spread" strategy

"Ratio Spread" option strategy represents a combination of two basic option positions with the same premiums and different strikes like the "Collar" strategy does. But in this case the amounts of underlying commodities are different for each position. Assume the farmer wants to hedge his long position on wheat market once again. In this case farmer buys a put option and simultaneously sells a call option. Both options expire at the same predetermined period of time. The strike prices and the amounts of underlying wheat are, however, different.

Let's assume the farmer is long 1000 tons of wheat. Then, he buys a put option that gives him right to sell 1000 tons of wheat in the future and sets the strike price that is for example 175 EUR/ton. At the same time he sells a call option, which grants the right to the bank to buy 1500 tons of wheat in the future. The bank calculates the strike price of the call option so that the option premiums were the same. Since the amount of underlying commodity in call option is bigger than the amount of underlying commodity in put option, the strike price of call option should be higher in comparison with the simple "Collar" strategy.[5]

Let's say the strike price of call option is 194 EUR per ton. Then, if the future spot price on the expiration day is more than 194 EUR/ton, the bank will exercise its call option and the farmer will let his put option expire. It means that the farmer will have to pay the financial compensation to the bank corresponding to the 1500 tons of wheat. Since he is, indeed, selling only 1000 tons he is now exposed to inverse risk. The higher the price is, the less money he has in total.

Let's assume, for example, that the spot price on the expiration day is 210 EUR/ton once again. Farmer sells at this price, but simultaneously he must pay the compensation to the bank which is now computed as follows:

$$(210 - 194) \times 1\,500 = \text{EUR } 24\,000$$

Thus, he effectively sells the wheat for EUR 186 000 (210 000 minus 24 000).

Furthermore, if the spot price on the expiration day lies between 175 and 194 EUR/ton, the bank and the farmer will let the options expire. In this case, the farmer will sell 1000 tons of wheat at the prevailing spot price.

Finally, if the future spot price on the expiration day is less than 175 EUR/ton, the bank will let its call option expire and the farmer will exercise his put option. Thus, the farmer will effectively sell 1000 tons of wheat for EUR 175 000. Figure 3 illustrates the effective price at which the farmer will sell 1000 tons of wheat when using the "Ratio Spread" option strategy.

Summing up, if the future spot price is less than 175 EUR/ton, the farmer will effectively sell 1000 tons of wheat for EUR 175 000. Within the prices of 175 and 194 EUR/ton the farmer will sell 1000 tons of wheat at the prevailing spot price. Above the future spot price of 194 EUR/ton effective price equals 194 EUR/ton minus half of the difference between future spot price and strike price of sold call option (because of the ratio 1.5 to 1).

The strategy provides hedging against the fall in wheat prices at the level of 175 EUR/ton and simultaneously enables to participate on the slight increase in wheat prices. If this increase is, however, too strong, the effective price, at which the farmer sells his production, starts to fall.

The strategy is to some extent similar to the "Collar" strategy. The long position in wheat is hedged against the fall in wheat prices. However, since the underlying amount of wheat in call option is greater within the "Ratio Spread" strategy, the strike price of call option is higher. The farmer can participate on the price increase to a larger extent. On the other hand, if the price increase is too much, the total inflows start to decrease and the "Ratio Spread" strategy becomes less convenient.

[5]For more details on option pricing see for example Hull (2012).

CONCLUSIONS

In todays globalized world the companies have to face many challenges. On one hand there are new opportunities, but on the other hand lots of new risks are arising as well. It is true also for agricultural business. In order to strengthen their competitiveness and to avoid huge cash-flow fluctuations the entrepreneurs in agriculture should be able to effectively manage different risks associated with their businesses.

This article aimed to analyse and to compare different hedging techniques which are relevant for agricultural business using the example of wheat producers. Four basic hedging strategies have been presented, analysed and compared.

Futures and forward contracts are popular instruments to hedge the price risks. Farmers do not have to pay any option premiums and the effective price is locked at the beginning no matter what the future spot price is. Futures are standardized and can be, therefore, easily traded on organized exchanges on daily basis. On contrary, forward contracts are individualized. They can be better fitted to individual needs (in terms of volumes and maturities). However, due to lower liquidity forward contracts could be more expensive and difficult to be closed out before the maturity.

"Plain vanilla" option hedge enables to participate on positive future price fluctuations being hedged against the negative future price fluctuations. Of course, the single option strategy provides the hedging at worse price in comparison to forward contracts because the farmers have to pay the option premiums.

"Zero cost" option strategies represent a combination of two or more option positions with the same amount of paid and received option premiums. Thus, Farmers do not have to pay anything at the beginning. We have discussed the "Collar" and "Ratio Spread" option strategies as examples. There is nothing to be paid for the strategies, but on the other hand, they don't provide the possibility of participating on positive price fluctuations to the same extent as the "plain vanilla" put option does. When using "Ratio Spread" strategy the farmers may participate on price increase to a larger extent in comparison to "Collar" strategy. On the other hand, if the price increase is relatively too big, effective price starts to fall and the user of the strategy is exposed to inverse risk. Thus, "Ratio Spread" strategy cannot be considered as "real" hedge.

Well, there is always some kind of trade-off between the advantages and disadvantages of the particular strategies. The farmers shall, therefore, consider both all aspects of relevant strategies and their expectations, before they make final decision which instruments to use.

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