

IMPORTANCE OF COMMODITY DERIVATIVES FOR SERBIAN AGRICULTURAL ENTERPRISES RISK MANAGEMENT*

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Abstract

The transition to market economy in the agricultural sector of Serbia reinforces the need for the development of market mechanisms that would allow agricultural producers production planning, marketing, and hedging. The object of this paper is to study and analyze the relevance of commodity derivatives for the development of agricultural enterprises in Serbia. Establishment and development of commodity derivatives (futures and options) in Serbia will enable agricultural companies to secure the price of agricultural products prior to harvest / picking. This research is based on two most important methods: historical method in commodity exchange development analyzes and the comparative method which is applied in the analysis of experiences of countries in transition and developed commodity exchange systems. Commodity derivatives market leads to an increase in the overall production and trade volume, but also lower interest rate on loans to the agricultural sector.

Key words: *Commodity exchange, futures, options, commodity derivatives.*

Introduction

One of the main characteristics of modern business is dynamic and increased level of uncertainty. Cash flow of agricultural enterprises continuously is exposed to changes in prices of agricultural products and

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inputs, tax and interest rates, labor costs, exchange rates, adverse effects of natural factors and so on. Result of these phenomena increased need for the development of financial instruments whose implementation could be used as a risk management instruments. For this reason, in the last thirty years there has been a fast development of commodity derivative markets, which allows agricultural enterprises in developed market economies to use various hedging strategies. In this way, farmer's risk of change in prices of agricultural products can be transferred on risk-taking speculators who expect to make a profit.

Based on the experience of other transition countries as well as countries with long tradition in commodity exchange business, it can be concluded that the establishment of commodity exchange activity is an important factor for the successful management of agricultural enterprises. Planned economy, which characterized business in the agricultural sector after the second world war, in the 1990s has changed to the market economy system. In planned economy farmers were protected by guaranteed prices and guaranteed purchases of produced agricultural products. On the other hand, in market economy farmers were left to the market conditions. Farmers are facing with questions: what to *produce*, how to *sale* agricultural products and how to *hedge* price and sales of agricultural products?

Agricultural producers on the futures markets can use hedging strategies to ensure price of agricultural products before the harvest / picking. This way they can protect themselves from adverse price movement and provide stability and certainty in the business of agricultural enterprises. Also, the development of commodity derivatives has other positive effects, including most importantly raising the volume of loans in the agricultural sector.

In the current situation, banks often grant loans that are 50%-70% of the value of agricultural products which are land against warehouse receipts, for the reasons of uncertainty of product prices in the future. Commercial banks are able to secure price of agricultural products in future by using commodity derivative market and as a consequence able to approve agricultural loans in higher amount.

Derivative commodity-market among others has a positive effect on macroeconomic stability because it allows the formation of prices on the free-market basis. Like in other developed systems, development of

Serbian commodity-derivative markets requires two institutional prerequisites:

- Establishment of an effective commodity-exchange activity in Serbia.
- Development of the secured storage of agricultural products, which enables the creation of commodity securities to ensure safe delivery of goods to the spot and futures market.

The development of commodity and stock exchange in Serbia

According to the Law on public stock exchanges from November 3rd 1886 which was signed by King Milan, the first stock exchange founded in Novi Sad was established on March 5th 1921, in order to promote, facilitate and regulate commerce. Its official name was the Novi Sad Commodity and Securities Exchange, and the subject of trade on the stock exchange was a variety of goods, especially agricultural. The first president of the Stock Exchange was one of the most prominent landowners of the time, Gideon Dundjerski. Stock functioned until 1941.

Novi Sad Commodity Exchange was established in December 1958 by the decree of the Government of the Republic of Serbia and had a foothold in the Regulation on Commodity Exchange from 1953. Stock market in Novi Sad was founded in the premises of Matica Srpska. Since its establishment, through the Commodity Exchange in Novi Sad was traded over sixteen million tons of cargo. In the SFRJ the average annual turnover of the stock market was about 350,000 tons of goods, while during the 1990s turnover dropped to just over 100,000 tones³.

Securities trade (mostly corporate shares and state issued bonds) in Serbia is carried out through the *Belgrade Stock Exchange (BSE)*, which was founded in the late 19th century. After the Second World War and the change of the political system, the stock market was closed for almost five decades. In 1989 was founded the Yugoslav capital markets. In 1992 it changed its name and becomes the BSE. Annual turnover on the BSE during the 1990s was modest. During the beginning of 21st century there has been a significant increase in trade as a result of political changes and the sale of privatized company's shares. In the following years, some economist expected significant decrease in stock trading after the privatization of the most successful companies. However, the volume of

³ Data source: www.proberza.co.rs.

trading showed a surprisingly positive trend until the political instability related to the elections and the global economic crisis in 2008. In the next four years, trading volume is significantly lower due to the economic crisis.⁴

Serbia has no established commodity-exchange business, largely due to lack of a proper legal framework. First of all, Serbia lacks the safeguards that guarantee that the seller will be paid, and that the buyer will get the goods. In our practice, participants are left to regular court procedure.

Law on Capital Market (Sl. glasnik RS, no. 31/2011) regulates issues related to the establishment of standardized commodity derivatives, while spot trading and trading with non-standardized derivatives is left to the Law on commodity exchanges that is only in draft phase. The adoption of the Law on commodity exchanges will create the opportunity for a safe trading and establishment of futures market on agricultural products. Currently there are no conditions to allow commodity-exchange business in Serbia, which is primarily reflected in the absence of a body that controls and grant licenses to commodity exchanges and brokers.

Serbian agricultural market has a small size. The draft law relies on existing institutions, which are the carriers of these activities in other developed commodity-exchange systems. This simplifies the commodity-stock system, and it is a more economical (there is no need for establishment of new institutions).

Creation of commodity securities that provide secure delivery of goods

Law on Public Warehouses (Sl. glasnik RS, No. 41/09) created the legal framework for the establishment of a system of public warehouses. Sixteen public warehouses were licensed until 29.08.2012., while the 15 warehouses are in the licensing procedure.

For goods received for safekeeping public warehouse is obligated to issue *warehouse receipts*. There are several main characteristics of public warehouse system in Serbia:

⁴ See more: Zaki V. et al (2011) *Tržište hartija od vrednosti kao faktor razvoja korporativnih preduze a u Srbiji*, Društvo ekonomista Beograda, Ekonomski vidici, vol. 16, br. 4, str. 735-746

- The public warehouses must fulfill the requirements in order to complete licensing procedure, which consists of two parts: (1) must meet the requirements in terms of equipment and facilities for storage of goods, (2) must meet the requirements related to financial performance indicators and to keep certain amount of capital that is not mortgaged.
- A special inspection services within the Ministry of Agriculture, Water and Forestry is responsible for regular and special control of public warehouses which provides additional security to the system.
- Following the example of other successful public storage systems, Indemnity Fund of the Republic of Serbia is established. In the event that a public warehouse can not deliver the stored goods, owner of warehouse receipt will be compensated from Indemnity Fund within quick out-of-court procedure. In this way Indemnity Fund encourages lending and trading because the participants in the system know that warehouse receipt will be compensated out of court in case of loss of goods. In other words, agricultural producers can use warehouse receipts as collateral to obtain short-term loans or for trading.

The importance of commodity derivatives to manage risk in the agri-business sector

Derivative Securities (both financial and commodity derivatives) are financial innovation, which appeared in the financial market during the last thirty years.⁵ They were established primarily due to the increase in overall levels of risk in the financial markets. Derivative securities trade volume exceeds the turnover of many classical financial instruments. The introduction and development of these securities in the financial markets has enabled further development of instruments for hedging. Today, the derivative securities are considered to be the most successful financial innovations and the estimates are that the volume of trade will increase in the future.

The concept of financial derivative means a group of derivatives designed for:⁶ foreign currencies, interest rates, other securities and market indices.

⁵ See more: Vlado Kovačević, „Značaj tržišta robnih finansijskih derivata za poljoprivredna preduzeća“, Magistarski rad, Ekonomski fakultet Beograd, 2002, str. 39-64;

⁶ Erić D., *Finansijska tržišta i instrumenti*, Naučna knjiga, Beograd, 1997, str. 209-210;

Commodity derivatives have background in metals, agricultural products, industrial raw materials, crude oil and natural gas, minerals, rubber etc.

In the basis of these securities is some type of assets or indices: commodities, foreign currencies, interest rates, other securities or indices. Basic change in the price of underlying assets will affect the price movements of derivatives. Futures have a number of features that distinguish them from the spot (prompt) trading. Unlike spot transactions, where the transaction ends immediately or not later than 2-5 days, futures transactions suppose a certain period of execution. Also, there is a difference in the physical delivery of the goods - prompt trade transactions must end with delivery of goods, while futures contracts do not necessarily follow the delivery of assets..

The essence of futures trade is to predict future price movements. Sellers are expecting a drop in prices, while buyers rely on reliable forecasts of rising prices. The dynamism and increasing the level of business risk in the world in the past thirty years have caused the need for the development of instruments for hedging. There are several types of instruments that are used to control the business risk, but the most important for commodity derivative markets are:

- Futures contracts.
- Options contracts.

Hedging strategies with futures contracts

Futures are liquid contracts that have a lot of similarities with the forwards so that some authors consider a variant of *forward* contracts⁷. Futures contract means the agreement of forward exchange a certain amount of agricultural products, at a predetermined price, quality and delivery place. The main agricultural products of the highest volume of trade with futures are: wheat, corn, soybeans, rice, coffee, cocoa, cotton, and sugar. There are many fundamental *differences* between these two types of contracts, such as:⁸

⁷ *Futures & Options What You Should Know Before You Trade*, Commodity Futures Trading Commission, januar 1997., <http://www.cftc.gov/opa/brochures/futures.htm>;

⁸ See more: Eri D., *Finansijska tržišta i instrumenti*, Nau na knjiga, Beograd, 1997, str. 206-214;

- Futures contracts can be traded on secondary markets (they are liquid) as opposed to a forward contract;
- In futures contracts, terms are flexible so that the delivery of agricultural products can be made during the month. In a forward contract, the delivery of agricultural products is linked to a particular day or a maximum of a few days.
- The forward contract is not managed by clearing house and does not require margin, so that a forward trade carries a greater risk of default with respect to futures.
- The conclusion of forward contracts ends with the actual delivery of agricultural products to which the contract is concluded, while in futures goods delivery are rare (only few percent of futures contracts implement the actual delivery of goods), and the closing of the contract implies paying the difference in price.
- There is a difference in paying terms. Forward contract payment is made at the maturity date of the contract. In the futures, both parties are obliged to deposit a certain sum immediately upon conclusion of the contract.
- Futures contracts are characterized by high standardization in terms of asset types, quantity, quality and delivery. At the conclusion of futures, meeting of the buyer and the seller is not required because the clearing house appears as the buyer's and seller middleman. Also, the analysis in terms of creditworthiness of the seller by the buyer and vice versa is not required.

Organized trade with futures requires that the following conditions are met⁹:

- Sufficient assets that must be standardized on the basis of quantity, quality, place of delivery and time of delivery. When a client submits an order to buy or sell a contract on any agricultural product, he doesn't need to emphasize the amount of goods that he wants to trade. Futures contracts are standardized in terms of quantity, so if wheat is traded on the CBOT (Chicago Board of Trade) this implies that a contract is concluded in 5000 bushels. Resolving the issue of the size of the contract is a sensitive matter for any commodity derivative, because it hinders trade agreements for small investors and producers. On the other hand, too small contracts increase costs, which are allocated in the name of commissions to brokers. It can be concluded that standardization of certain amounts of assets per futures contract

⁹ See more: Eri D., op. cit, str.212-213;

should be determined on the basis of the situation on specific market (experience of other markets should not to be accepted without careful analysis).

- Standardization of quality implies that agricultural products have certain physical and chemical properties. For some products, there could be determined more level of quality, as is the case where the CBOT corn contract at the standard quality is referred as "No. 2 yellow", but there are allowed other quality replacement within established relationships.¹⁰
- In terms of delivery place standardization there is an alternative: (1) set the delivery at one place (usually a warehouse of commodity exchange), (2) adjustments due to the selected location (in that case futures contract prices may vary). It should be noted that the majority of modern commodity exchanges in the world has its own storage space, while neither Belgrade nor Novi Sad Stock Exchange have own warehouses. This deficiency could be solved simply by renting storage space from public warehouses.
- Standardization of delivery time means that the maturity of the futures contract is predetermined and related to events in a particular month. So, for example, CBOT corn may be traded on March, May, July's, September and December contracts.
- Established norms enable achievements of scale economies effect in transactions and thus reduce transaction costs and makes trade easier and more attractive.
- The existence of competition in the supply and demand is a necessary condition for the efficient trading of futures on agricultural products. There must be a sufficient number of subjects in the futures markets for agricultural products that want to protect themselves from risk, but also enough subjects that are taking that risk in order to make a profit.

By reviewing profit chart (Chart 1 and 2), it can be stated that when the buyer realizes gain, the seller records the loss of the same amount, and vice versa - seller profit is equal to the loss of a buyer.

Futures contracts buyer (taking a *long position*) expects the price of agricultural products in the spot market to *grow*.

¹⁰ "Futures & Options What You Should Know Before You Trade", Commodity Futures Trading Commission, januar 1997., <http://www.cftc.gov/opa/brochures/futures.htm>;

Futures contract seller (takes a *short position*) on agricultural product expects the opposite, i.e. that the price of agricultural products in the spot market will *fall*.

Chart 1. Profit graph for buyers of futures on agricultural products

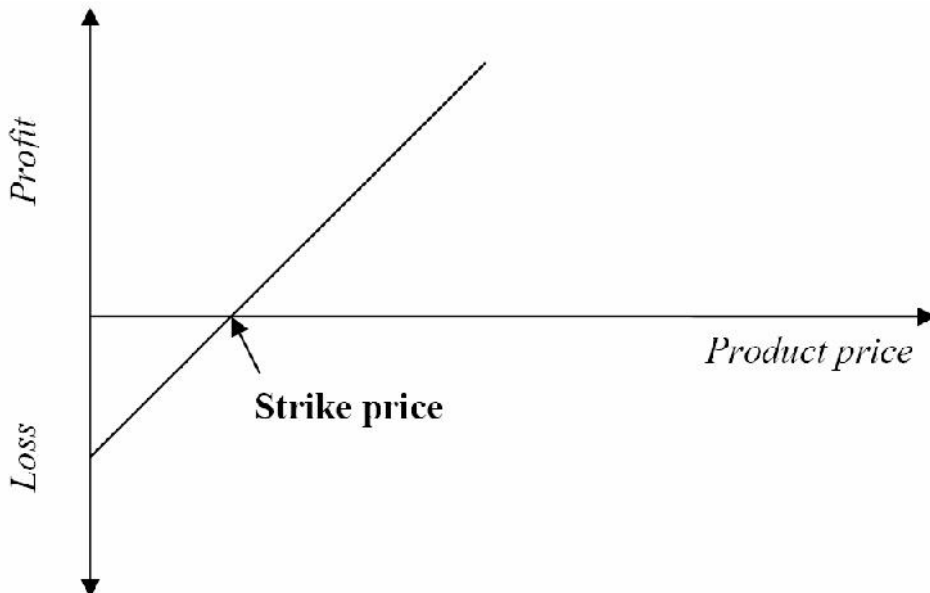
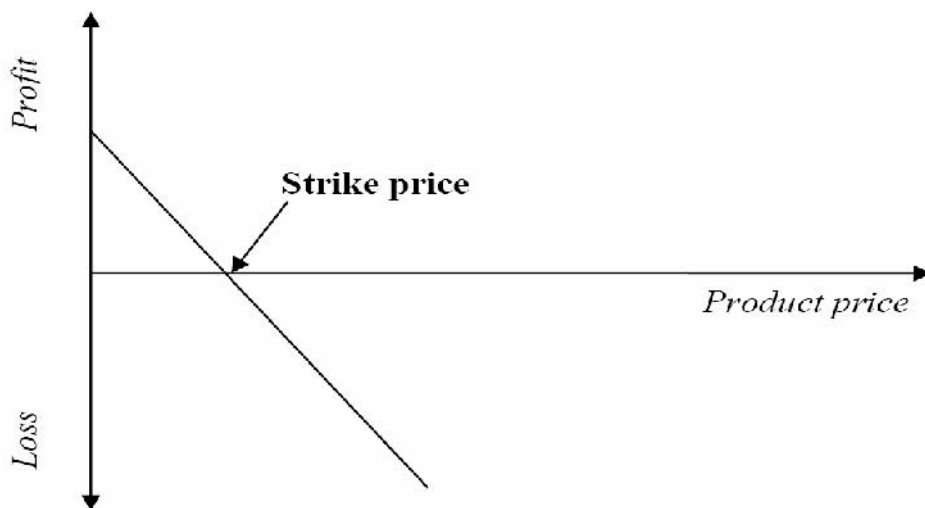


Chart 2. Profit graph for seller of futures on agricultural products



It could be concluded that the sum of all the gains in the futures market for agricultural products is equal to the sum of all the losses, so that this is a game with a total score of zero. All of these characteristics are achieved through specific futures trade mechanism, based on a system of *margins* and daily adjustments (market to market). The existence of these mechanisms means that the parties must deposit a certain amount (margin) in order to *secure the payment*. There are two types of margin: initial margin and daily maintenance.

Initial margins are created by opening an account with a broker - dealers and they are initial condition for futures trading. Initial margin amounts to 5-15% of the contract value and must be paid at the time of signing the contract

Margins for maintenance are usually 5-10% of the contract value, and if the amount falls below this limit, the clearing house sends warning to subject to pay an additional fee.

Futures prices are determined at the end of each day and on that basis funds are transferred between the accounts of the parties. Clearing house calculates the position of the parties and makes adjustment depending on the direction of price changes. For example, if the strike price of wheat for delivery in December is 172.51 \$, and the next day the price rises to 172.82 \$, the clearing house will transfer 0.31 \$ from the seller's to the buyer's margin. Otherwise, if the strike price of wheat for delivery in December is 172.51 \$, and the next day the price falls to 172.20 \$, the clearing house will transfer 0.31 \$ from the buyer's to seller's margin. In the same way, the clearing house will perform the transfer between the accounts of the parties. On the maturity date of the contract the buyer and seller close their positions by paying the difference (supply of goods is rare).

The existence of price limits is another characteristic of commodity futures. Maximum and minimum limits for future prices are determined in advance. This establishes the price stability of agricultural products. This could be useful for Serbian market, which during the last years have recorded great price instability.

Hedging strategies with option contracts

Options can be traded at commodity exchanges or OTC (Over the Counter) market. Trading at derivative exchanges implies the high standardization of option contracts, which primarily includes the standardization of quality of agricultural products specified in options (options that have the same underlying assets are called class; options that have the same strike price, the same unit of trade and the same maturity are called series), a given quantity of agricultural products at one contract and options expiration date. As in the case of futures, high standardization of options allows secondary trading of these derivatives.

The technique of trading with option contracts on derivative markets is different from futures contract trading. The buyer of the option pays the full premium amount to the seller at the time of purchase and the margin system is not applied for the buyer. Option seller has to pay the deposit amount to account of the clearing house (OCC - Option Clearing Corporation) on behalf of margins. Clearing house, as in futures trade, performs daily price adjustments and in the case of negative pricing trends call seller to pay additional funds on behalf of margin.

Closing of options is done in a similar way as in the case of futures. At options trading there are also trading limits. The main objective of the limit is to ensure the protection on the price impact, which the owner of a large number of options certainly could have (he could cause disturbance in option price by selling or purchasing large number of options).

Beside the trade at commodity exchange, trading is possible at OTC market. The most important characteristics of OTC options trading are:

- The ability to create non-standardized contracts (whether in terms of type, quantity or quality of the assets underlying the options, options expiration date etc.);
- It is possible to trade with large number of contracts (there are no limits as to commodity exchanges trade);
- OTC trading carries a higher credit risk so the existence of credit information for other party is necessary.

The reasons why volume of commodity options trade is increasing each year widely are:

- Effect of "Leverage" - investment in options has high leverage which gives opportunities to realize large profits by relatively small stake. For example, the premium for the November option on wheat was paid in March 1 \$ at strike price of 4 \$; in May; the market price of wheat went up to 5 \$ (the breakpoint at which neither buyer nor seller have no loss or gain). From this point, each increase in the price of wheat for November delivery will be direct profit for buyer of call option.
- Another important reason that makes commodity option attractive for investment is that the investor may lose only the amount of premium paid.

Charts No.3, No.4, No.5 and No.6 shows possible scenarios in which the buyer and seller have profit or loss.

Chart 3. Profit graph for buyer of call option on agricultural products

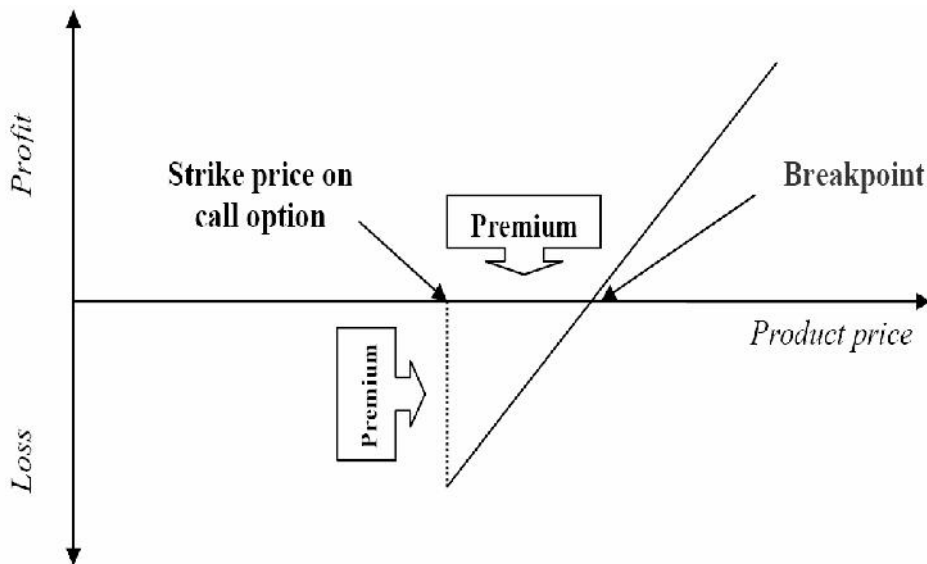


Chart 4. Profit graph for seller of call option on agricultural products

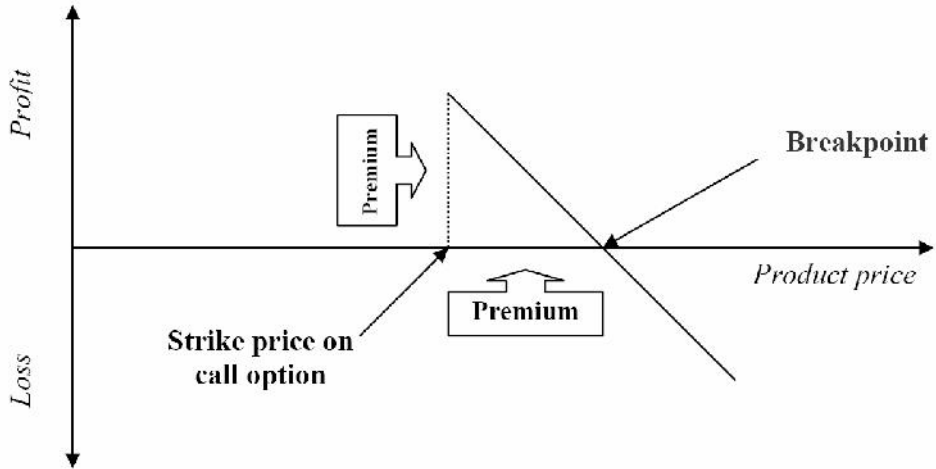


Chart 5. Profit graph for buyer of put option on agricultural products

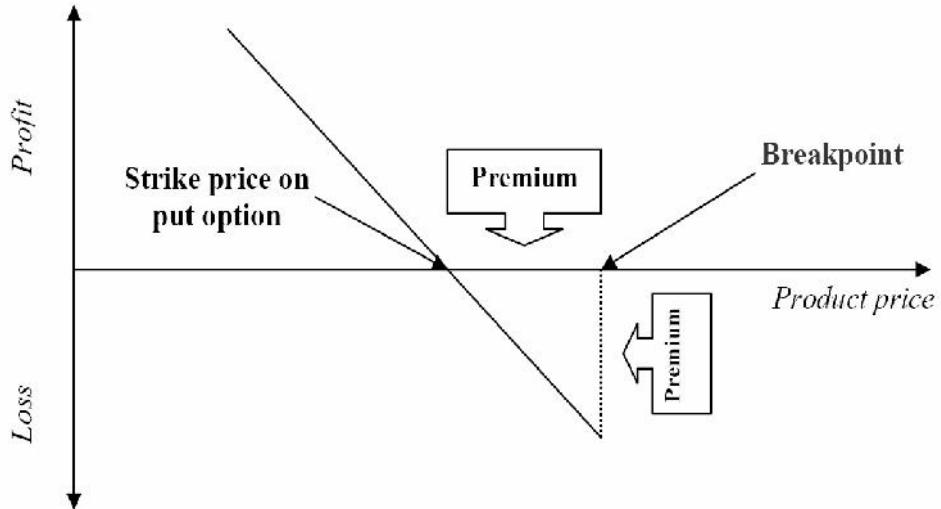
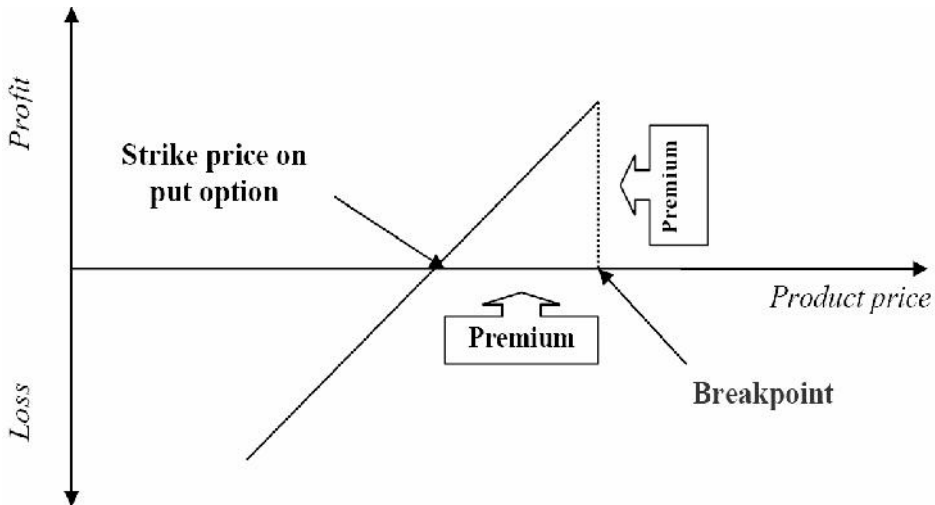


Chart 6. Profit graph for seller of put option on agricultural products



Determining the options value and price

In addition to pre-defined elements, option has other elements that determine its value during the period covered by the contract¹¹. The time value of an option is the amount that buyers are willing to pay for that option over its present value, expecting that its value will increase until the option maturity period. Unlike the real value time value of an options has speculative character and depends solely on the assessment of market trends.

Factors that influence the creation of the time value of the options are:

- The time length of its validity - the principle is that the longer term means premium is higher (due to higher time value). If option is closer to maturity time it decreases the value, because it is less likely that there will be significant price movements of assets underlying the option.
- Assessment of market opportunities – it expresses on the option price in terms that if the market situation is unstable, the premium will

¹¹ See more: German C., *Selecting and Using Agricultural Options*, Delaware Cooperative Extension, 1997., <http://bluehen.ags.udel.edu/deces/mrkt/mrkt-15.htm>;

be higher (in that case price movement in the market is hardly predictable). On the supply side, sellers of options in these situations will require more premiums, while on the other side buyers will be willing to offer a higher premium because they expect significant price changes. In periods of price volatility, even options with short expiration date can have a high premium in the derivative market.

- The ratio of market price and the contract price - this ratio has a significant impact on the amount of the premium, so that if strike price is closer to the market price, premium will be higher. Example: When the price of wheat on futures market is 0.32 \$ per kilogram, a call option with a strike price at 0.32 \$ will have a higher premium than the same options with a strike price at 0.33 \$ per kilogram.
- The actual value could represent the difference between the contract price and the current market asset price. The actual value of the option changes during the duration of options, depending on changes in asset prices, which is its foundation. Therefore, the call option has actual value if the strike price is lower than the current market price for a given agricultural product. For example, call option for a lot of wheat could be contracted at strike price of 3.27 \$ per kilogram. If the current price is 4.07 \$, option has actual value of 0.80 dinars per kilogram.

Theoretical models relating to the pricing of options and futures have a very practical application in commodity derivatives trading and one of the most commonly used is the Fisher Black and Myron Schultz model.¹² After several months of unsuccessful attempts, they published in 1975 their famous model. The work deals with the determination of pricing options. Today this model is known as the Black-Schultz option pricing model and its parameters are integral parts of most application software intended to run on the options. Black- Schultz model is based on certain assumptions under which the value of the option prices depend solely on the basis that it was created and the time T options, along with other constant variables. Ideal conditions are: the European option; known interest rate over the life of the option; option basis price follows the Monte Carlo method with variance proportional to the square root of the price of the stock exchange; there are no transaction costs etc.

¹² See more: German C., *Selecting and Using Agricultural Options*, Delaware Cooperative Extension, 1997., <http://bluehen.ags.udel.edu/deces/mrkt/mrkt-15.htm>;

Call option price is given by the formula¹³:

$$C(S,T) = SN(d_1) - Ke^{-rT}N(d_2) \quad (5)$$

where:

$$d_1 = (\ln(S/K) + (r + \sigma^2/2)T) / \sigma T^{1/2} \quad (6)$$

$$d_2 = d_1 - \sigma T^{1/2} \quad (7)$$

- C - Indicates that is call option
- S - Price of underlying assets
- N(d) - The cumulative density function that has a normal distribution
- K - Strike price
- T - Maturity date
- r - Interest rate can be achieved with no-risk
- σ - Annual variance of the underlying assets

The main reason for the attractiveness of the Black-Schultz formula is the fact that the option price is a function of "visible" variables and that the model can be used to determine the price of any kind of options. Option price is depending on the expected yield of the underlying assets. Expected return on underlying assets can be determined due to the fact that it correlates with the price of underlying assets at the commodity exchanges.

Conclusion

Based on the developed countries experiences, it can be concluded that the hedging is one of the most common ways to manage the risk of agricultural enterprises. In transition countries, farmers are still not able to use hedging strategies (the exception is Hungary). Positive experiences in developing countries result from the direct use of hedging strategies as well as indirect effects which the developed markets of commodity derivatives have on macroeconomic stability, especially by influencing: balance between supply and demand, lower inflationary pressure, less price volatility, more favorable market situation and so on.

¹³ See more: Arditti F. D., *Derivatives (A Comprehensive Resource for Options, Futures, Interest Rate Swaps, and Mortgage Securities)*, Harvard business school, Boston, 1996., str. 56-59;

For the establishment of commodity derivatives market it is necessary to establish a legal framework, i.e. adoption of the Law on commodity exchanges. In accordance with previous observations, we can distinguish the following recommendations:

1. The licensing and oversight of commodity exchanges should be delegated to the Commission for Securities and Financial Markets (Komisija za HoV) and futures registry should be within Central Registry for Securities (Centralni registar HoV). Given the size of the agricultural products market, relying on a system of existing institutions (which are the carriers of these activities in other developed commodity-stock systems) simplifies the commodity-stock system that is also more economical (there is no need establishment of new institutions).
2. To amend the Law on capital market which prescribes minimum capital of EUR 1,000,000 for commodity futures exchange, which is certainly an obstacle to the establishment of commodity-futures trading.
3. Within the Marketing Information System (STIPS), running for the Ministry of Agriculture, Forestry and Water Management, should be created pricing and other reports, which are essential to allow equal information to all participants of commodity derivative market.
4. To create a long-term transparent mechanism for interventions by Republican and Provincial Directorate for Commodity Reserves. Intervention must be known in advance to all stakeholders. One possible model is the European model of "minimum price", which defines minimum price for main strategic products.

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