

Ewelina Sokółowska

Nicolaus Copernicus University, Toruń

PRICE FORECASTING AND HEDGING METHODS IN AN ENTERPRISE

Abstract: The hedging is an effective method in enterprises of the great scale of action, operating in conditions of the keen competition, narrow margins as well as the high exposition on risk. The main aim of his article is introduction of hedging as the effective method of assessing prices in the enterprise. The future contracts are derivative instruments which enable to secure the future prices of goods and services. The article is illustrated by examples from the agriculture market.

Key words: price forecasting, hedging, derivatives.

1. Introduction

In the terminology of finance the notion of hedging is being applied in two basic contexts: in activity of the enterprise and in investing. In running a company the applied hedging is above all for securing prices of raw materials, manufacturing products, fuels, courses of exchange, or also changes of interest rates. Applying methods of hedging enables enterprises to earlier establish the prices and in the consequence ensures the safety of their functioning. Unpredictable changes of prices not only influence company's performance, but can also influence even its survival. The hedging is an effective method in enterprises of the great scale of action, operating in conditions of the keen competition, narrow margins as well as the high exposition on risk. The main aim of this article is introduction of hedging as the effective method of assessing prices in an enterprise. Futures contracts as the tool which enable legal entities to protect against the violent changes of prices will be presented.

2. The notion and the nature of the hedging

In the terminology of finance, the hedging is a strategy which consists in protecting enterprises and different legal entities against losses that can be a result of surprise changes in prices. The information about total production costs enables the calculation of the individual price of goods, which makes the production process profitable. It is possible to use methods of hedging to the purpose of protection the mini-

mal level of the future price of the goods and services the producer is going to receive. It is important then for the producer to calculate the minimal level of the profit margin, which assures profitability of the manufacturing process. More important from the desire to achieve high profits is to protect the determined, rational level of profit, which enables simultaneously to minimize the risk of severe losses. It is possible by using derivatives. Derivatives are instruments which bind obligation between two parties (future contracts) or give one party the right (options contracts) to deliver specific quantity and quality of a commodity at a predetermined time and place in the future. The basic derivative instruments are: future contracts, forward contracts, options, warrants, and swaps. Derivative securities enable the realization of three essential investment strategies: the speculation, arbitration and actual hedging. In hedging, prices for the cash market and the futures market tend to offset one another. This means that a loss in one market will be offset by a profit in another market. This way buyers and sellers are protected in cases of price hikes or price drops. Participants of hedging operations make assumptions that probable losses carried on the spot market resulting from a business transaction will be offset by the profit achieved from the opposing position on the futures market. In the situation when the loss on the cash market is entirely balanced by the profit on the futures market, the transaction is called the perfect hedge. However, this kind of hedging is difficult for putting into practice, because of the risk of the base. There are three situations where hedging may occur – storage hedging, production hedging and hedging expected purchases. In storage hedging, producers will short on futures contracts to protect themselves from declining prices, while a commodity is being harvested. Then, they will buy the contracts at the point when their commodity is sold in the cash market. This way, gains in the futures market will offset losses in the cash market.

Over the last decade, the awareness of applying hedging methods in enterprises grew considerably. Risk Management has become an important function at multinational corporations around the world. Extremely valuable information about using derivative securities by enterprises provides survey carried out by ISDA (International Swaps and Derivatives Association, Inc.) in March 2009 amongst 500 largest enterprises in the world. The survey was carried out amongst enterprises localized altogether in 32 countries. As many as 94% of explored enterprises admitted they used derivative securities in their activity for purposes of hedging. In such states as Canada, France, Great Britain, Japan, and Netherlands, all examined enterprises declared application of derivatives securities in their activity. The lowest share of replies confirming using derivative securities for purposes of hedging was get in such states as South Korea (87%) and China (62%). The most commonly used derivatives in the activity of enterprises were exchange-rate derivatives (88%), interest rate derivatives (83%) and commodity derivative securities (83%). The results of the survey confirm that applying derivative securities to purposes of hedging constitutes the integral element of the effective risk management in contemporary enterprises.

3. Classification of hedging methods

It is possible to divide methods of hedging according a lot of different criteria of identity. The most basic division of the hedging includes:

- sale hedging (short hedge),
- purchase hedging (long hedge).

The sale hedging enables to protect against the risk of the decline in prices, whereas the purchase hedging protects the investor against their possible growth. Applying the strategy of hedging makes it possible to protect against the disadvantageous changes of prices of goods and services, interest rate or currency exchange-rates.

Considering the criterion of the scope of protecting the exhibition of risk of legal entities we can distinguish:

- total hedging,
- partial hedging.

The total hedging is applied in enterprises that are exposed to a high degree of risk or are marked by aversion to face the risk. Such enterprises are willing to apply the total hedging, so they will be making an attempt at securing all possible areas of the enterprise exposed to risk. The partial hedging is applied in legal entities which try to secure only areas of activity exposed to risk in the greatest degree.

Hedging methods can also be classified as:

- fixed hedging,
- dynamic hedging.

Hedging appears when investor takes the position opposite to the position on the cash market and holds this position without any alterations of protecting, all the way to the moment of the finalizing transaction. Applying the dynamic hedging is tied with constant monitoring of the results of the applied strategy and making possible corrections of the position, together with changing market conditions.

Considering the criterion of eliminating of risk, the methods of hedging can be divided into:

- perfect hedging,
- imperfect hedging.

Perfect hedge is a rare kind of protection, difficult in realization on the futures market because of the appearing constraints and the uncertainty in the process of hedging. In the case of securing commodity prices, it is hard to select the futures contracts, constructed on the underlying commodities characterized by the same quality and amount. Another problem is the same expiration date of the transactions on the spot and the future market. Perfect hedge enables the total elimination of risk. The transactions on the futures market enable total compensation of potential losses on the cash market. The basic conditions of the perfect hedge are as follows:

- the same value of the long and short position in the moment of creating the position,

- the price of filling the long position must be equal of the price at which a short position was filled.

The perfect hedge is the technique of selection of two opposing positions, which guarantees protecting against losses, but at the same limits the potential of additional profits.

Imperfect hedging (imperfect hedge) means that only a partial elimination of the risk of the transaction is possible. This kind of hedging belongs to the most often met kind of securing the transaction on the financial market. The lack of the possibility of the total elimination of risk results for example from different values of the protecting and protected positions, as well as from differences in prices resulting from the positions on the cash and futures market taken in different moments of time. This problem is called the risk of the basis. The basis is important because it is the single major factor that will affect the outcome of a hedge. In essence, the hedger is speculating on a basis change rather than a price change. However, even though prices vary greatly from year to year, the basis typically does not change dramatically and generally can be predicted on the ground of historical patterns. Basis risk can improve or worsen the hedger's position. Such a situation also reduces the probability of applying the perfect hedging. It is extremely hard to find the derivative security characterized by the same changeability of the price assets as the object of hedging. Hedging assets using derivative securities, based on assets different from protected instruments is called cross protection or indirect hedging.

It is also possible to divide methods of hedging by considering the criterion of the scope of used instruments. If only one kind of derivative securities is used for the purpose of organizations of the hedge strategy, such a hedging is called straight hedging. Applying in transactions different kinds of derivative securities will mean applying the folded hedging.

4. Hedging on commodities markets

Commodities are volatile and complicated, but their diversifying properties have long been noted by investors. Producers of agricultural commodities are faced with price and production risk over time and within a marketing year. Furthermore, increased global free trade and changes in domestic agricultural policy have increased the price and production risks of agricultural producers. As price and production volatility increase revenue variability, producers are realizing the importance of risk management as a component of their management strategies [Parcell, Pierce 2006]. The concept of hedging is one of the core reasons why commodity futures exist in the first place. As the price of their harvest was dependent on supply, demand and season, farmers wanted to secure prices for their crops way before they delivered them. Thus, they purchased futures contracts with the commodities exchange. At the point of contract maturity, these traders will then deliver their products at a price stated in the contracts. With this, farmers are able to anticipate prices for their crops

especially in a fluctuating market. The risk in agriculture is a very special kind of risk. It results from the greater unpredictability of phenomena than in industrial production.

A commodity hedging strategy does not remove all price risks. In fact, there are costs associated with trading in commodity futures markets that must be factored into any hedging strategy. Those costs include the commissions paid on the futures trades and the costs associated with placing money in the futures account to cover initial margin requirements (good faith deposits) and maintenance margin calls (additional deposits to cover adverse price variations).

The increased changeability of prices on markets of goods and raw materials causes the necessity of active management of this group of risk. The most important kinds of the risk appearing in the farming are:

- price risk,
- events risk,
- profit risk.

The risk of the price for agricultural goods can appear for many reasons, like unexpected changes of weather conditions (drought, too high humidity), changes of the demand, changes in the international production. On appearing of the risk of prices the big influence have also long production cycles. One of the solutions to reduce this kind of risk is using forward and future contracts.

Futures markets are performing two basic functions on the market for agricultural goods:

- discovery of prices,
- risk management of prices.

Applying methods of the hedging on the commodity market:

- enables to protect company's performance against the unpredictable changeability of the commodities market,
- enables better strategic planning of activities in conditions of competitive market,
- enables to build more probable projection of the future result of the enterprise's performance.

One of the agricultural products characterized by a high changeability of prices is wheat. The risk management of commodities prices requires its identification, i.e. of fluctuations of prices of goods that have the highest influence on the performance of the enterprise. The market of wheat is marked by considerable seasonal character and is liable to essential fluctuations. Figure 1 shows changes of wheat prices in the period from 1994 to 2007 and the forecast of prices for the period 2008-2010. At the continuation of the linear trend it is possible to expect prices of wheat to develop as follows: 2008 – 54.56; 2009 – 55.67; 2010 – 56.72.

The effectiveness of hedging on the commodity market requires considering the following principles:

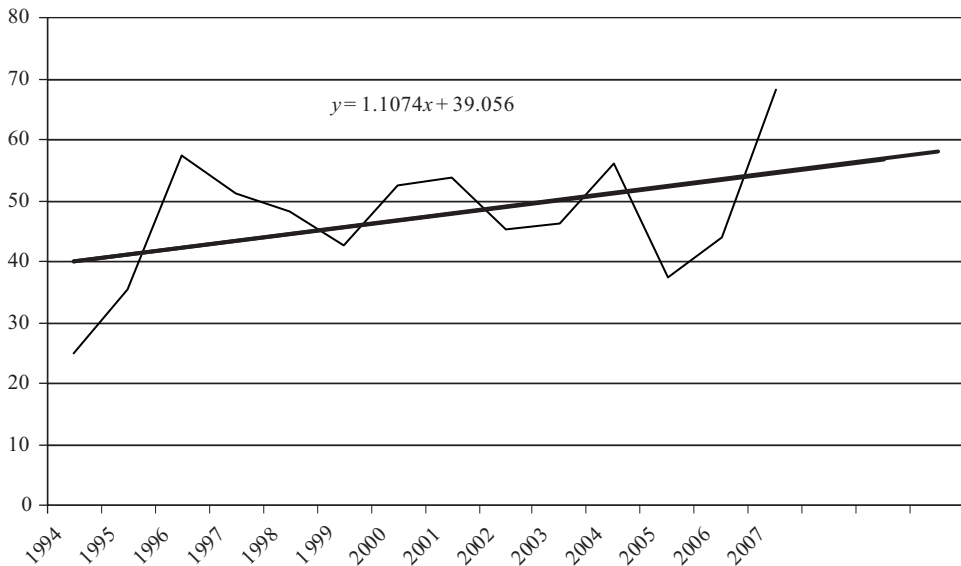


Figure 1. Prices of wheat on the cash market in 1994-2007 and the forecast of prices for 2008-2010

Source: own elaboration on the basis of GUS data.

Table 1. The examples of commodity exchanges

Name of the stock exchange	Creation date of the stock exchange	Underlying commodities	Location
Chicago Board of Trade (CBOT)	1848	cereal crop, oat, rice, soya, soya oil, wheat	USA
Coffee, Sugar and Cocoa Exchange	1882	coffee, sugar, cocoa, cotton, orange juice	USA
Chicago Mercantile Exchange (CME)	1874	butter, milk	USA
Budapest Commodity Exchange (BCE)	1989	cereal crop, wheat	Hungary
Kansas City Board of Trade (KCBOT)	1856	wheat	USA
Bolsa de Mercadorias & Futuros (BM&F)	1985	sugar, ethanol, coffee, soya, cereal crop, cotton	Brasil

Source: own elaboration on the basis of world exchanges data.

- adoption of appropriate instruments of the strategy in the process of the hedging,
- appropriate assessment of possibilities to secure the price of goods,
- proper organization of hedging taking into consideration the entire process of the risk management.

Derivatives based on agricultural commodities are available on two kinds of market: exchange-traded and over-the-counter (OTC). On the stock exchange market standardized instruments are available, however, on the over-the-counter market the instruments are tailored individually for needs of the safeguarding transaction. Futures, unlike forwards, are standardized and traded on exchanges. For example, every soybean contract traded on the Chicago Board of Trade (CBOT) is for 5000 bushels, every gold contract traded on the New York Mercantile is for 100 troy ounces and for a specific grade. The examples of stock exchanges and the underlyings are described in Table 1.

5. Using future contracts as the instrument enabling to protect against the decrease of prices in the future

Futures contracts enable the purchase or sale of a commodity at a fixed price in a particular month in the future. Traditional hedging uses the futures contract that comes to delivery in the month a grower intends to sell.

Table 2. Cash flows of the wheat producer

	Cash market	Futures market
10 th February	wheat price on the cash market 515 PLN/t	producer sells 100 March contracts on wheat for 525 PLN/PLN
15 th August	producer sells 5000 t of wheat for 490 PLN/t	Producer buys 100 March contracts on wheat (closes position) for 495 PLN/t
Price on the cash market		490 PLN/t
Profit on the futures market		+ 30 PLN/t
Net price from wheat sale		520 PLN/t

Source: own elaboration.

Let us assume that on the beginning of a year the producer decides to sow the wheat. He is planning to collect in August about 5000 ton of wheat. At the same time the producer is calculating costs necessary for producing this amount of grain. The producer is ranking among basic costs: the sowing material, crop protection chemicals, fertilizers, fuel and labour costs. They were estimated on the level of 450 PLN/ton. So that the production of the wheat is profitable, the producer reckoned that the price received for the ton should amount to at least 520 PLN. At the same time, however, the producer is aware that prices of the wheat are characterized by a high instability. To the purpose of hedging against the decline in prices of wheat the producer sells on the 10th February 100 March futures contracts on wheat at the price of 525 PLN for the ton, with the expiration date of 15th August. On the 15th August prices of wheat on the exchange-traded market amounted to: 490 PLN on the cash market and 495 PLN on the futures market (price of the August contract). And so the

producer sells the wheat on the cash market and he is turning his position away on the futures market in order to compensate for the loss on the cash market. The profit on the futures market amounts to: $(525 - 495) \cdot 100 = 3000$ PLN.

6. Using future contracts for the protection against increase of prices in the future

Wheat is a product used to the huge extent in the food industry for the production of the flour, pastas, bread. Different uses include applying the production of fodder or also the production of alcohol and biofuels. Because of its various applications in many sectors, it is extremely important to protect the appropriate level of the future price. A drastic increase in prices of wheat results in the lack of the profitability of determined productions of products or causes an increase in prices of final products. Let us establish that a producer of flour, after checking supplies of wheat in February, states that held reserves will be enough as late as in August. At the same time, however, the eventuality of immediate purchasing of goods would be connected with additional costs of storing and insuring wheat. The producer predicts that in the season, in the period of the high supply of wheat, the price of wheat will be relatively low. At the same time, however, in order to keep the level of the profitability of the production, the producer can pay 510 PLN at most for the ton of wheat. After analyzing accessible futures contracts on wheat, he notices that there is a possibility of purchasing the future contracts on wheat with the expiration date in August with the exercise price amounting to 505 PLN. This price satisfies the producer, therefore he decides to purchase 60 futures contracts, protecting the purchase of 3000 ton of wheat in the process. In August it turned out that the price of the wheat on the cash market amounted to 490 PLN. Table 3 presents final cash flows of the food processing industry entrepreneur.

Table 3. Cash flows of the wheat industry worker

	Cash market	Futures market
10 th February	Wheat price on the cash market 510 PLN/t	Producer buys 60 March contracts on wheat for 505 PLN/t
15 th August	Producer buys 3000 t of wheat for 490 PLN/t	Producer sells 60 march contracts on wheat (closes position) for 490 PLN/t
Price on the cash market		490 PLN/t
Profit on the futures market		-15 PLN/t
Net price of wheat		505 PLN/t

Source: own elaboration.

Thanks to carrying out a transaction on the futures market, the food processing industry worker secured the price of the wheat amounting to 505 PLN. The loss on

the futures market was balanced by the alternative of the more beneficial purchase of the wheat on the cash market. It is worthwhile, however, emphasizing that the industry worker should also take into consideration transaction costs in the planned selling price. The costs of hedging are straightforward; however, these expenses can become substantial over time. Commissions are paid to a broker for administrative costs and for operation and regulation of the futures exchange. Margin money is paid only on futures positions and not options positions. Margin refers to earnest Money placed in a brokerage account to cover potential losses. The initial margin is needed to start trading. Typically, a futures position will require the initial cost of 3 to 10% of the actual cost of the contract being traded.

7. Summary

Using derivative securities enables enterprises to establish the proper level of prices. The future markets make it possible to transfer the risk of the prices between entities operating on the market. However, the limitation of the risk is always tied with resignation from above average profits. Appropriate understanding and applying derivative securities in enterprises would streamline processes of the risk management and would influence the safety of their functioning. It is also worth remembering that effective risk management in an enterprise can be a source of competitive advantage – it can lower the average procurement cost, reduce the impact of price volatility on earnings, and consequently increase shareholder value.

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PROGNOZOWANIE CEN I ZASTOSOWANIE HEDGINGU W PRZEDSIĘBIORSTWIE

Streszczenie: głównym celem artykułu jest przedstawienie hedgingu jako jednej ze skutecznych metod umożliwiających zabezpieczenie przez niekorzystnymi zmianami cen artykułów i usług w przyszłości. Instrumentami, które mogą służyć do ustalania przyszłych cen, są instrumenty pochodne, w tym również kontrakty *futures*. W referacie przedstawiono również przykłady zastosowania kontraktów *futures* na rynku artykułów rolno-spożywczych.