APPLICATION OF RISK MANAGEMENT IN MODELING INTERNATIONAL CEREAL TRADE

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Abstract: Over the last two decades, risk management in the economic activity as well as its implications on the economic entities brought about an explosive development of technical and methodological approaches of the concept. This aspect occurred over a period of increase of interdependence degree of the economic systems and acceleration of the information flow. As a result of this process, the diversity of technical and methodological approaches was explained strictly on a disciplinary basis, being founded on a number of criteria varying from the commercial, financial or investment ones up to the psycho-sociological or philosophical ones. This particular approach of risk may induce to the economic receiver the perception of non-systematization of the accomplished analytic constructions and of dynamics of chaos in this new universe of economic knowledge. Any activity or economic effort is based on a number of unknown and uncertain factors or opportunities simply because its subject is located in the future. There are sometimes situations where the uncertainty is too high, making it virtually impossible because a decision or goal in itself or the way that it can achieve are not sufficiently defined, or that risks could be totally destructive.

Key words: risk, uncertainty, variable, risk cost, futures contracts, forward contracts

1. Introduction

As part of foreign trade companies, managers prefer to take an active part in approaching the issue of risk and uncertainty and to take them on. Zur Shapira, the American economist, showed in his study concerning the managerial perceptions on risk that 75% of interviewed managers consider that in general risks are manageable and therefore they prefer to take them on. To achieve this objective, a risk management model can be employed, which is a conceptual model, that is not intended to be exhaustive by the approached themes, and which could include the following stages (Figure 1):

a) identifying risk factors;
b) determining the possible methods of hedging;
c) choosing the best solution of hedging;
d) implementation of the adopted solution;

2. Identifying risk factors

In this context is intended to estimate the vulnerability of the company that is engaged in foreign trade, in relation to possible adverse developments in the external environment, the emphasis being put on the possibility of generating unwanted events and the potential losses. Therefore certain characteristics of the operations at risk are taken into account.

The analysis of the foreign trade development that involves agricultural products allows us to identify certain essential characteristics and specific trends of the trade with such products and to identify and eliminate the risk factors that have a great impact upon it.

Designed by the last century systemic changes, the agricultural and global food market is characterized by instability, price fluctuations, supply and demand imbalance between different geographical areas of the world, rapid changes in consumer preferences, concerns of international bodies to increase product quality and ensure food security.

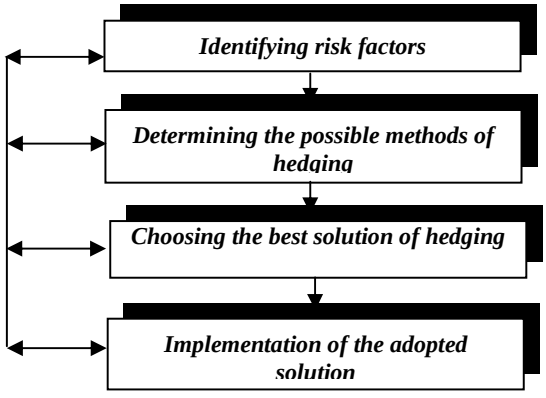

Figure 1 Risk management model employed in the foreign trade

The main risk factors that had essentially changed the development of agricultural products trade, in the first part of the twentieth century, were the two World Wars and the financial crisis between 1929 and 1932, which led to major reductions in world agricultural products and foodstuffs trade. The world market continues to be characterized by strong supply and demand imbalances between 1950 and 1972. Numerous food crises and famine periods were registered between 1972 and 1975 in many countries of the world, particularly in the less developed ones.

Countries such as Zimbabwe, Sudan, Ethiopia, Botswana, Bangladesh, were marked by power imbalances due to their inability to ensure the necessary minimum of food from domestic production or imports. The main cause was the prolonged drought in sub-Saharan Africa or flooding in Bangladesh, which triggered the cut down in domestic agricultural production and the loss of most jobs in rural areas. The developed countries exerted strong pressure on cereal prices and the U.S. blocked its soybeans exports.

World production and food product international trade were experiencing a strong increase between 1975 and 1994, as a result of the modernization of processing industries and rural infrastructure. The EU agricultural policy reform, known as the McShary program (1992), the extension of support programs for American farmers provided by the U.S. government and the acceleration of the integration processes may all be considered risk factors that distorted the world food trade. Beginning with 1994 up to now the world food market has been marked by the financial crises in Asia, Latin America and the Russian Federation, Argentina, which in their turn caused the export reduction to these areas and hence lower prices on certain products.

Trade with agricultural products may also be influenced by a number of other specific factors such as climatic factors, biological factors (perishability and seasonality), global stocks, packaging and refrigeration technology, relatively high costs of storage and transport. These factors may be considered risk factors in certain circumstances.

a) Climatic factors, such as hurricanes, typhoons, heavy rainfalls and prolonged droughts, new phenomena like "El Nino", greenhouse effect has led to increased amplitude temperatures in many parts of the world over the last 15 years, have had an immediate impact on crops and recorded yields, resulting in a significant reduction in agricultural production and consequently on world food product trade. Thus, the presence of Mitch Hurricane in Central America caused a reduction of 19% of coffee production in Guatemala and 54% of banana production in the same state and 75% in Honduras. Drought brought about the reduction of wheat production in the Middle East and North Africa (2000), reduction of coffee production in Côte d'Ivoire (1998-1999), decreased tea production in India, Indonesia, Kenya and Bangladesh (1999). Heavy rainfalls in Europe affected the wheat production, decreased the production of coffee in Colombia with 6% (2000). The high amplitude of the temperatures affected mainly tropical and citrus fruit production, as it happened in California, where citrus production fell by up to 23% (2000).

Weather is known to directly affect the agricultural production but at the same time the climatic factors have a great influence on the world trade developments that involves agricultural products by redrawing the trade flows, taking into account the degree of impact they have on crops.

b) Perishability is a main risk factor having immediate implications on world food product trade. The food product consumption varies in terms of quality, quantity and structure from one individual to another, but it also varies within a year. The main factors determining these variations are mostly related to climate particularities (temperature, humidity) but also to the agricultural production seasonality. Thus in cold periods high-energy food (rich in protein and fat) or preserved meat is mainly consumed, while in warm periods high biological value food (rich in vitamins and minerals) and refreshment beverages are consumed. Moreover, the technical progress has developed new technologies for processing food products, new packaging technologies that provide mechanical, physical and chemical protection of the products and which have an important part of prevention against harmful agents from the external environment (e.g. Tetra Pack type aseptic system).

The scientific and technical progress has allowed the validity period increase of food products under quality conditions favorable to food consumption, minimizing losses due to perishability of goods. In general, cereals have a greater resistance to the processes of harvesting, transport, storage and marketing, resulting in relatively low losses compared to vegetables and fruits that can be kept fresh for a relatively small period of time and also in specific conditions of temperature and humidity, thus generating additional costs. Usually, the share of degraded perishable products can be recovered due to the selling price of the others (increased accordingly) unless the conditions in which the competitive advantage does not require not to exceed a certain threshold price, thus recording losses.

c) Seasonality is another risk factor that affects certain food product trade of vegetable nature, both

directly (in the volume of trade) and indirectly through significant price variations. Seasonality is the result of storage and warehousing opportunities for fresh products and implies relatively low costs. For vegetables and fruits, when new crops are launched on the market it has a double impact on market prices: the price of products in stock from last year's crop has a tendency to decrease more or less pronounced, and the new crop price marks a moment of maximum after which a downward trend can be noticed on the extent of increasing the amount harvested. Furthermore the price witnesses a trend of price stabilization showing a slightly oscillating fluctuations around the average value, which is relatively low, being a direct consequence of the quantity variation of produced and distributed products.

As compared to fruits and vegetables, cereals record fewer seasonal fluctuations. Normally, the harvesting period and the following months, the lowest prices for these products are recorded due to the huge quantities that are offered for trading. Later on these prices tend to increase as a result of the accumulation of operating costs, drying, storage and perishability, tendency which is maintained until the months preceding the next harvest.

d) The price of food products may be influenced by all these factors: seasonality, weather conditions, wars, political instability, intense and increasingly aggressive competition that causes significant price variations, ascending or descending, in a relatively short period of time.

In the agricultural and food area, whether it is about the grain, animals breeding, processing, processing or marketing, we can not afford not to take the price risk, specific to the performed activity into account. Price risk emerges due to the time factor that occurs during the course of a transaction. Together with the increasing of the complexity degree of agricultural product international transactions, especially over the last 30 years, the time interval between the harvesting time and the marketing time of a commodity may vary from several weeks to 1 year, and more.

The price of commodities has always been unstable and therefore there have always been reasons for studying these risks. The food market has changed, in many ways; therefore these reasons have become even more powerful. The state has frequently reduced the effects of food product price instability by employing these programs which have been specially designed to stabilize the prices, yields or results. Some states even guaranteed the cereal stocks to maintain prices. Removing public price support programs and freezing programs, bring about a greater volatility in the food product markets, aspect which forces us to perform better the risk management in order to ensure the development of this sector.

The changes that occurred in Canada and the United States were spectacular. Thus, in Canada, the national price support programs and related income to food products began to decrease. The U.S.A. also cancelled several programs, especially wheat and grain supply management ones. Many experts believe that the inevitable result that was expected as a consequence of these changes was a fluctuation increase of sown areas and, consequently, a worsening of price volatility. Under these circumstances producers and traders had to rely on a greater extent on themselves regarding the risk management if they intended to remain competitive.

The graphs below illustrate the price evolution of the forward contracts between 1971 and 1999 for the corn quoted on Chicago Board of Trade (CBOT) (figure 2).

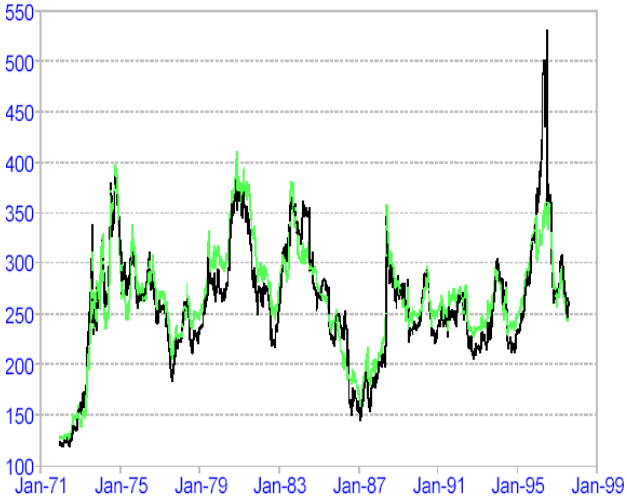

Figure 2 Price evolution of the futures contracts having different degrees of maturity between 1971 and 1999for corn - cents/bushels

The vertical lines of these graphs symbolize the daily maximum and minimum prices of the forward contracts (for two contracts with different maturity), while the horizontal lines refer to the liquidation. The variability of these prices is significant. Even on a short term, foodstuffs prices show significant variations. For wheat contracts they rose by $ 1.39, from August 1995 to July 1996, for the contract in September 1996. During the five months that followed, prices fell to $ 2.60, which is a lower figure compared to earlier levels. During a period of 18 months, prices had varied either increasing or decreasing by over 50%.

Such price fluctuations were not limited to a specific food product; they were reflected on the other cereals as well, on the oil markets and on the market of animal-origin foodstuffs. The

exploitation of the parks used for beef fattening that lacked certain operation plans that would insure against price risk showed a substantial cost increase. Similarly, lower grain and oilseed producers who did not insure the prices before the time of harvesting, insurance that should had been made by hedging operations, registered a reduction in expected earnings.

In addition to price changes that can be analyzed for long periods of time, the food products also witnessed a change in prices due to the seasonality of these products. This development can be assessed on the basis of Figure 3, the horizontal line in origin representing the annual average of the illustrated grain quotes.

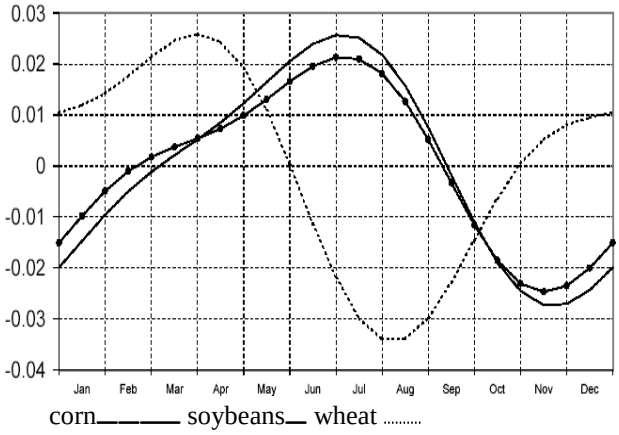

Figure 3 Futures contracts price evolution in 2009 for corn, soybeans and wheat

An illustration of risk analysis for maize and soybeans price: a decrease of $ 1.00 of corn price leads to a loss of $ 30,000 for marketed products that would result from an area of 500 acres. For the same area, a decrease of $ 2.00 soybeans price represents a loss of $ 5000. It is true that the decrease in price percentage is considerable. This can also be shown by the recorded data regarding price changes on grain between 2008 and 2009.

The price risk for each instance occurs only when the product in question is bought or sold. The expected risk of the producer who sells the product is reflected in the possibility of a price decrease at the same time the producer being faced with the risk of input prices increasing.

The price risk is really dangerous due to its effect on operating margin. If practice shows that potential fluctuations in prices are low compared to their overall level, in many cases they turn out to be enormous compared to operating margins. The gross margin means the difference between the sale price per unit of final product and the actual or direct cost of production per unit.

Taking into consideration the examples above the incidence on gross margin can be predicted. We can notice the approached reports by referring to the following three examples. For corn, the actual price turns out to be lower than the forecasted price of $ 1.00. The forecasted gross margin is only of $ 0.50, meaning 200% less than the one forecasted in spring. For soybeans, the lack of profit in relation to the anticipated price is only 25%, which is in reality 115% less than compared with the forecasted gross margin (Table 1).

Table 1 Gross margin risk

Product	Forecasted result Gross margin	Real gross margin	Decrease of forecasted result through margin (%)
Barley	1,40 $	0,40 $	71%
Corn	0,50 $	0,50 $	200%
Oatmeal	4,75 $	2,75 $	42%
Soybeans	1,75 $	0,25 $	114%

3. Setting up possible methods of hedging

The trade universe has changed in a spectacular way over the last three decades, up to taking a central place on the global economy stage. The continuous increase of the international transaction volume involves the analysis of a significant number of disturbing factors that may affect the conduct of a transaction. Under these circumstances the employment of information technology has become absolutely imperative in order to process this information and to determine possible methods of hedging these risks.

The accomplishment of a thorough research on risk factors, their interdependence and possible methods of hedging is absolutely necessary for the screened information to be considered an important element in consolidating the investment decision.

The multi-criteria and multidisciplinary approaches provides to any trader the possibility of accepting or not a particular risk, to assume only certain parts of this risk and depending on them to apply the methods he/she considers to be the best in order to hedge it.

The employment of various models and mathematical methods for modeling economic phenomena and processes gives the trader the opportunity to identify and quantify risk.

One of the characteristics of international markets is its cyclicity. The highest efficiency employment of the mathematical models is possible in the period when the business sector stabilizes. By applying the same mathematical models when the market shows inflections can result in massive losses for traders.

Thus, in periods of market stability the economic entity faces little danger, also encountering opportunities of little profit. In times of expansion

or decline of a business sector or economic subsystem, the economic entity is confronted with unpredictable situations that involve significant risks. Nevertheless if the economic entity correctly anticipates the trend development the profit may be substantial.

To better understand the element of markets cyclicity we employ a method of qualitative analysis of primary information that is called **the Heisenberg principle**, or the **principle of rational phenomena anticipation.**

Thus, we define as two points A and B, located at a distance D apart, where point A is the economic entity and point B is the analyzed transaction. To better substantiate the decision, the operator aims at covering half the distance (left to conduct of the transaction) based on available input information. At each new step, the investor will cover half of the remaining distance. From a certain step X_u it can be noticed that on the one side the investor will not be able to permanently reduce the distance between itself and the transaction (this highlighting that he/she has to take on a certain degree of risk in any activity he/she performs), and, on the other hand starting from the same X_u point, the economic entity will be close enough to the time of the transaction, thus being able to anticipate its evolution.

The main purpose of Heisenberg's principle is to use the forecasting function in substantiation decisions. The reduction of the distance between points A and B represents the acceleration of the knowledge process by changing the trader's status from macro-system object to the macro-system subject , i.e. the investor will modify his/her decisions, will change the macro-system based on input information.

Therefore, a comprehensive analysis of a phenomenon is not sufficient to base a decision and thus the four phases of analysis should be carefully analyzed: the phenomenon, process, event, specific situation.

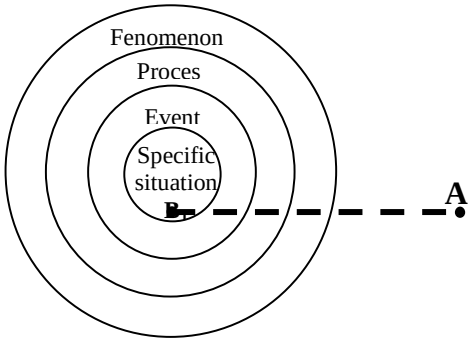

Figure 4 Principle of rational phenomenon anticipation

Examples in point are the following:

- financial crisis in South America in 1997 (phenomenon);
- financial crisis in South America in 1997, more accelerated in Brazil (process);
- financial crisis in South America in 1997 that brought about the Brazilian currency devaluation by 40% (event);
- financial crisis in South America in 1997, which had as a consequence the Brazilian currency devaluation by 40%, and offered the chance of increasing Brazilian exports for a series agricultural products for which foreign demand was fluctuating (particular case) .

Using the principle of rational phenomena anticipation is very important for predicting changes in structure of the global economy or of the systemic alliances transformation that generate directly or indirectly, significant influence on the international market. The most resounding failure of the use of mathematical models was the investment fund LTCM - Long Term Capital Management, which recorded losses of 40 billion USD in 1998, as a result of the financial crisis from 1997 to 1998, recorded in different parts of the world although the VAR (Value at Risk) model was employed by making investments of about 1000 billion USD in international financial markets with capital reserves of only 4.8 billion TSD. The use of the principle of rational phenomena anticipation would have allowed the observation of the fact that the systemic exposure is significant and would have determined the measures taking to reduce risk.

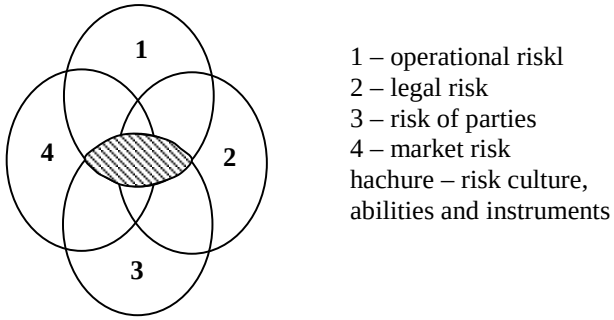

Figure 5 Risk culture

Therefore, the following question arises: which risk assessment methods are more efficient, the quantitative or qualitative ones?

The increase of the complexity degree between the economic systems, determines the economic analyst to take into consideration both the quantitative methods and qualitative commensuration the risk that is manifested in international transactions. The ability to anticipate the phenomena depends on an intrinsic way on quality of input information, on its opportunity as well as on the analyst's experience and intuition. It

can be noticed that the human factor has again priority compared to the technological factors.

4. The stage of choosing the best solutions for hedging

That can be considered a decision in which the set of variants is made up of all possible methods of hedging together with the risk-taking solution. Among the elements that may influence the adoption of the best variant are the following:

- risk indicators: the maximum loss, the possibility of recording adverse results etc.;
- characteristics of hedging methods: costs, degree of loss reduction, the degree of diminishing the possibility of producing damage, the time required for its implementation, etc.; attitude towards risk managers (Figure 5).

Risk-concerning solutions can be divided into three categories depending on the degree of vulnerability diminishing:

- Total hedging;
- Partial hedging;
- Risk assuming.

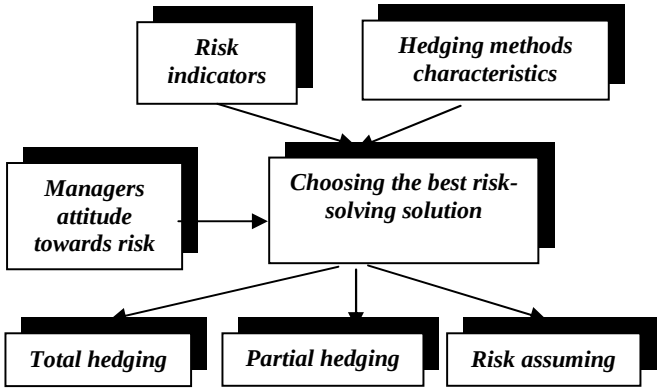

Figure 6 Choosing the best risk-solving solution

5. Implementation of the adopted solution

It includes all steps taken to apply the best solution. If the risk has not been totally hedged, the entire decision-making process can be repeated through reverse connection, so that a new solution can be adopted and implemented in due time when major changes occur regarding the risk issue. For this dynamic approach of uncertainty is however necessary the risk identification and characterization to be achieved fast enough to allow a response in due time. Under these conditions the efficiency may become more important than its accuracy for managers.

The use the mathematical models of risk management (Black-Scholes model, VAR model, Delta model, etc.) can provide a high efficiency in vulnerability assessing, under certain conditions. However most of these models approach risk in a single way, only for certain economic transactions, not for the entire business activity of a company. This limit, imposed by the difficulties of an overall assessment of the vulnerability does not allow taking into consideration the interdependencies that may exist between different activities. Over the last few years an increased interest has been noticed in risk management regarding the comprehensive approach of the economic entity vulnerability.

In this respect, the article entitled *"Meet the risk mongers"* published in *The Economist* on 18-24 July 1998 reads: *"So far, nobody has been able to hedge all risks of large companies in a single model but it is clear that risk management is heading towards that direction."* The intense pace of development witnessed by the techniques based on artificial intelligence in recent years seems to open new ways of solving this problem. In the same article the case of RMS company (Risk Management Solution) is presented, which has designed several software applications that allow the simultaneous approach of several risk types.

Another risk management drawback comes from the fact that in general, they were built to be applied in conditions of normality being less effective in cases of major instability. This shortcoming became obvious during the crisis in financial markets in 1998, when some transferable securities companies recorded losses of billions of dollars. For example, the mutual fund L.T.C.M. from U.S.A., which was applying the sophisticated VAR (value at risk) model lost in October 1998 more than two billion dollars due to fluctuations in the bond markets. Such situations revealed that regardless its complexity, a mathematical model of risk management can not be considered infallible.

Risk hedging manifested in the agricultural products foreign trade is traditionally performed by involving bank instruments or insurance contracts. Insurance can not cover all types of risk. The entrepreneurs' ability to isolate and analyze these risks determines ultimately the success or failure in business. Although some risks are unavoidable, many of them can be controlled.

6. Risk hedging

In the following chapters we present some of the techniques used to cover the price risk that occurs in agricultural products foreign trade.

6.1. Futures Contracts

In all developed countries a rapid development of the risk control projects has been recorded over the last years. Alternative financial tools (exchange contracts through futures transactions or with options) have emerged as a necessity of risk management which may occur, particularly in foreign trade with agricultural products. For some products and/or services these tools are the only available to cover the risks.

The Futures contracts have emerged as a necessity, these playing the role of hedging the price risk related to trade with some seasonal goods. The main objective of futures transactions is to transfer risk from the producers of a particular product to speculators (or investors in futures contracts).

The standardized futures contract on food commodities is the technical tool that allows the accomplishment of a strict risk management in connection with the interests of the trader.

The first organized market for trading futures contracts is the commodity exchange from Chicago which began its activity in an organized way beginning with 1928 and it is known as The Chicago Board of Trade - CBOT. It is the largest commodity exchange in the world. In competition with the CBOT, there is the Chicago Mercantile Exchange - CME, in these two exchanges being traded the most important contracts in the futures industry. With the unprecedented economic and technological development recorded in the U.S., nine other futures-type stock exchanges have been set up as a result of risk management:

- New York Coffee, Sugar and Cocoa Exchange Inc.;
- Commodity Exchange Inc.;
- New York Cotton Exchange;
- New York Futures Exchange;
- New York Mercantile Exchange;
- Kansas City Board of Trade;
- Philadelphia Board of Trade;
- Mid – America Commodity Exchange.

In U.S.A., the country with the greatest experience having the most refined system of trading the futures commercial markets can be classified depending on the origin of goods that are traded into: markets for agricultural goods (on which futures grain are traded: corn, wheat , oats, rice, oilseeds, three types of soya: beans, flour and oil, animal products: frozen pig carcasses, live cattle) markets for alimentary and fiber goods (on which sugar, coffee, cocoa, orange essence are sold) and markets for goods from the metals class and energy products. Besides USA, 23 other futures markets are located in the main developed countries (Tokyo, Zurich, Toronto, Sydney).

If in the 20's the only contracts quoted on the Stock Exchange were the futures contracts on wheat, corn, barley, together with the sustained economic development we also witness the diversification of the financial instruments (today currency futures contracts and interest rate are listed, and also futures contracts or option on indices).

The main function of the future markets (futures) is hedging (risk coverage). Price risk can be identified in any field, with its positive and negative effects. The question is whether a trader is willing to give up the possible positive effects of price trends for a safe counteracting of the negative ones.

Hedging deals with buying and selling futures contracts to compensate the risk of price changes on the spot market (spot). In their effort to minimize risk exposure, hedgers are willing to lose the opportunities regarding the evolution of the spot market price trends for the protection of these prices, while speculators are willing to take on the risk of others, hoping to make a profit.

There are many examples that can illustrate that hedging is a defensive strategy which protects against adverse price changes. In practice two types of hedging can be encountered: buying hedging and selling hedging.

Buying hedging is in itself an exchange transaction that purchases forward or option contracts. Selling hedging is employed in those cases where an insurance against price increase for a particular foodstuff is necessary, that the futures market operator intends to purchase in the future. If the price increases, the buying trader will have to pay more for the product, but at the same time, the product can be bought cheaper on the spot market. For instance: let's suppose that the on June 1st, an investor purchases on the Mercantile Stock Exchange, a livestock contract (live cattle contract), the transaction unit is 4,000 pounds (1 pounds = 453.6 grams), and the quotation for September is 77.15 cents / p.

The buyer assumes that in September the price of futures is about 7 cents higher than the price in cash, so if you buy a contract in September amounting at 77.15 cents / p, it will set a spot price at about 7 cents less than the cash price operating in September. If during the period from June to September the market increased, the operator would have been recorded a loss in natural commodity without hedging the future market contract. Under the given circumstances, the profit made on the exchange (having a long position and the price increased) will compensate for the loss resulting from the purchase contract on the spot market.

Selling hedging involves a foodstuff price freeze on its possession all the time. If prices fall during the possession of the goods, the trader will lose on the spot market, but will make a profit on the futures market where this decrease will bring in some earnings. For example: let's suppose that an investor believes that in May that his wheat harvest will be in July of 10,000 bushels. According to his calculations, to cover costs and to turn a reasonable profit, he has to sell after harvesting at a price of 3.80 $ / bu (cost) and $ 0.20 / bu (margins), therefore at a price of 4.00 $ / bu. The July wheat being quoted in May to 4.00 $ / bu, the producer will sell July futures, the two CBOT wheat

contracts (2x 5000 BU). If in the period May-July the wheat price on the cash market falls reaching $ 3.80 / bu, it will be compensated for the loss of earnings from natural goods as a result of selling futures. If the cash price would have increased to 4.20 $ / bu, the producer could have sold by $ 0.20 / bu over its normal price, but the loss on the future market of 0.20 $ / bu ($ 420 - 400 $) canceled this supplementary profit. By hedging the manufacturer has provided a normal return, but without being able to take advantage of the spot market favorable circumstances.

The use of hedging has as a main objective the protection against all possible losses due to price volatility, but it also allows the accomplishment of some significant earnings from the price favorable amplitude.

In the two cases presented above, the compensation between the two markets is accomplished differently, because it was assumed that the cash and futures prices are evolving identically, which means that the operator does not make a profit yet does not lose anything from his normal commercial profit. It is the ideal case of pure hedging. In reality form hedging limited profits or losses can be registered however, due to the differentiated although similar evolution of the cash and futures prices. The difference between futures prices and spot prices is called the base or basis.

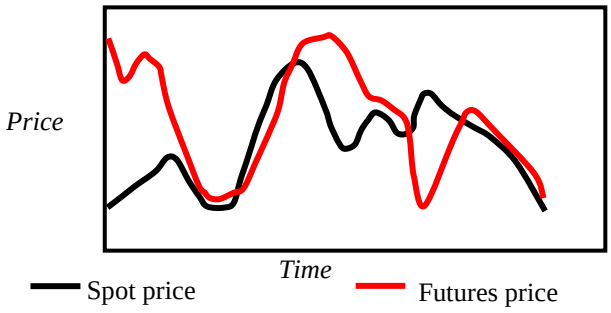

Figure 7 Spot price and forward evolution for agro-alimentary products

Hedgers are most interested in the difference between the cash price and the futures price. Depending on the basis, the decisions are made whether or not to conduct the transactions. For instance: let's assume that in February the FOB on CBOT cash price for yellow soybeans no. 2 is 6.20 $ / bu and the May futures contract is quoted $ 6.50 / bu, then the basis for this is -0.30 $ (6.20 $ - 6.50 $), or as we may say 30 below (engl.30 under). If the futures contract would quote at 6.00 $ / bu, the basis would be + 0.20 $ / bu ($ 6.20 - $ 6.00), or 20 above (engl.20 over).

The basis predictability showed by E. Duhnea, allowed owners / buyers of natural goods to take the trading strategy by involving the basis, they being interested when determining the exchange setting of a certain basis, more in their basis than in the evolution of the goods quotations. At the basis transactions, the parties basically agree to buy or sell a cash commodity at a set price, with a margin above or below a certain futures contract price.

Example: the following tables show the contracted quantities for two types of agro-alimentary products (corn and wheat) and the way their basis is evolving on maturity dates.

Table 2 Corn contracts basis having the maturity date in July

Date	Cash price	Forward price	Basis
01.06.	2 USD/bushel	2,25 USD/bushel	- 0,25 USD
15.06.	2,5 USD/bushel	2,6 USD/bushel	- 0,10 USD
01.07.	2,3 USD/bushel	2,25 USD/bushel	+ 0,05 USD

Table 3 Wheat contracts basis having the maturity date in July

Date	Cash price	Forward price	Basis
01.06.	3,1 USD/bushel	3 USD/bushel	+ 0,1 USD
15.06.	3,2 USD/bushel	3,4 USD/bushel	- 0,2 USD
01.07.	3,5 USD/bushel	3,8 USD/bushel	- 0,3 USD

If in case of corn contracts (Table 2), a consolidation of the basis takes place as a result of the different evolution of prices, regarding the wheat contracts (Table 3), a narrowing of the basis occurs as a result of the quotations recorded for this product. In this situation we speak about the hedger's profit or loss.

To better understand the way the spot and futures prices can evolve, we shall try a graphical analysis (Figure 8) of the way they vary for corn, soybeans and wheat. Corn and wheat contracts have maturities in March, May, July, September and December. The contracts expire on t=1 time and the figure below shows the values evolution of contracts when the basis is positive or negative, at a certain point before the contracts liquidation.

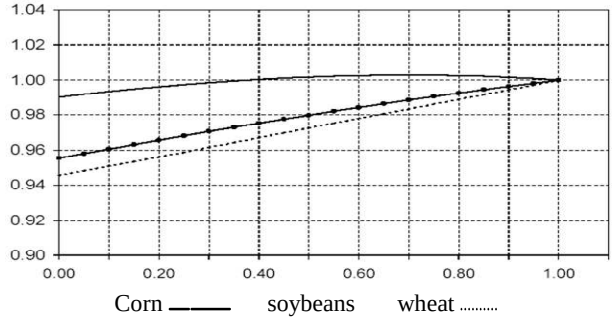

Figure 8 –Spot and futures price evolution (2000) for corn, soybeans and wheat (cents/bushels)

If the spot price increases more than the futures price this will have as a consequence the decrease of the basis, conversely, will lead to the basis increase. The basis's normal tendency is to decrease due to the diminishing of the costs of storage, handling etc. As we approach the month of delivery, the basis becomes lower so the at the time and place of delivery the spot and futures prices are usually identical. Therefore on the maturity date the basis is zero.

A futures market operator which has a long position (he/she purchased a futures contract) and a position of selling goods, will make a profit if the basis increases and will lose if the basis decreases. For example: let's suppose a wheat trader buys on July 1st from the market for a subsequent resale 15,000 bushels of red winter wheat # 2, at a price of 3.5 $ / bu. At that time the wheat futures contract CBOT December quoted at $ 3.75 / bu, which means that he bought at a base of -0.25 $ / bu. As during the storage period of goods the wheat price can decrease, the trader opens a short position for December at 3.75 $ / bu, to protect against price risk. On October 1st the market decreased and he found a buyer for his goods, but the cash price of 3.35 $ / bu, meaning at a basis of -0.17 $ / bu (at the time the December futures contract being quoted at 3.52 $ / bu). By conducting this transaction the trader managed to protect the value of his goods, despite the market decrease between July and October, because the basis was reduced. Indeed, he sells at a real price 3.58 $ / bu and not at 3.35 $ / bu as it was the cash price in October. In other words, he earned a selling price for October of $ 3.58 / bu (3.50 $ / bu 0.08 $ / bu). In addition to risk hedging, the operator makes a profit as a result of the transaction conducted which he saves or which can be used to cover the costs of goods storage during the three-month period.

Conversely, the operator who has a selling position on the futures market (sold a contract) and a position of purchasing goods will make a profit if the basis is diminishing and will lose if it increases. Therefore a hedger turns the price risk into a risk regarding the basis.

Nevertheless there are situations (especially concerning the agro-alimentary goods that have a seasonal character) in which the basis is usually negative. The May futures quotation for wheat having the maturity date in July should be lower than the spot quotation. The futures market becomes excessively speculative, which is why the futures quotation is not entirely the result of supply and demand.

Taking into account the time component, it can be said that a contango market (with a positive basis), is characteristic to the situation in which futures prices increase gradually together with the time increase until the futures contract expiration date and a backwardation market (with a negative basis), represents the situation in which futures prices are progressively decreasing at the same time with the time increasing left until the futures contract expiration.

To conclude we may say that hedging is different from speculation, the latter being that particular activity according to which a person assumes the risk in the hope of achieving profit. Hedging is a strategy designed to protect the operator from the risk of prices evolution in an unfavorable direction. All those who want protection against unwanted changes of the spot-market price, can use the futures markets to cover risk by hedging (farmers, exporters, importers, banks, insurance companies, portfolio managers, capital market investors).

Another advantage of hedging is that it allows the products due to the futures contract to cover a quantity of goods that may not be identical to the quantity to be protected. If a trader wants to sell 20,000 bushels of wheat, he can cover by hedging only 15,000 bushels, the difference being a speculative investment. The producer thus accomplishes a partition of the price risk, and although this technique does not provide full coverage, if his strategy was well conceived, he can maximize the earnings. In this case the hedging is actually the translation of *the price fluctuations in base of changes*.

The table below shows the contracted quantities of some agro-alimentary goods and their quotations. There are two categories of main actors of the stock exchanges, namely the producers/traders and speculators.

Table 4 Contracts traded on CBOT (converted in values)

Product	**Stock Exchange**	**Quantity**	**Price**	**Value of contract**
Corn	CBT	5.000 bushels	2,25 USD/ bushel	11.250 USD
Soybeans	CBT	5.000 bushels	5,6 USD/ bushel	28.000 USD
Wheat	CBT	5.000 bushels	3,6 USD/ bushel	18.000 USD
Live pigs	CME	40.000 pounds	44,1 USD/ CWT	17.640 USD
Live cattle	CME	40.000 pounds	71 USD/ CWT	28.400 USD

1- 1 bushel = 27,9 Kg
2- CWT – Kg.- live weight

The economic entities that aim at buying (or selling) a commodity on the cash market at a certain point in the future, wishing to minimize risk, employ the forward market to lock the price. Speculators are those who take on risks from the producer who sells. They have no intention to virtually sell or buy goods. If a producer sells on the futures market, speculators buy from the same market. The producer uses the market to ensure a market price and the speculator takes on the price risk by adopting an opposite position.

6.2. Agro-alimentary commodities spread contracts

Is consisting of a simultaneous purchase and sale of an agreement, this strategy is called spread. Due to the factors acting on the bases that were listed above there are three types of spreads:

• spread within the market (intra-market spread) – certain positions were employed for the same agro-alimentary product, but they have different maturity dates;

• inter-goods spread (inter-commodity spread) - two different agro-alimentary products are employed but they have the same maturity date;

• inter-market spread (inter-market spread) - contracts are employed for the same agro-alimentary product, but on two different exchanges.

6.3. The use of options on futures contracts

An option contract is an agreement which provides the possibility to one of the parties, to sell or buy a contract on agro-alimentary goods for delivery within certain predetermined conditions. Since the contracting parties are entitled, but not obliged to sell or buy, these contracts are called options. An option works as an insurance policy. It gives the buyer the possibility of selling or buying, depending on price fluctuations that can generate profit or loss. Depending on the nature of those obligations there are purchase options (call) and selling options (put).

Trading options offers a powerful leverage effect as the buyer of an option has to invest a small amount of money to control a large amount of goods. Put and call options are completely separate. Some people do not understand this concept because on the futures market if you have a purchase position on the market, this should be compensated by a sale position, and therefore goods must be delivered or accepted to meet the contractual obligations. In the case of the options market, sales and purchases are completely separate.

The strike price of an option increases by a certain step. For livestock this step is 2 USD / CWT (kg of live weight), for cereals it is 10 cents per bushel, and for soybeans 25 cents per bushel. For example: an investor buys in options the right to sell (put) for wheat at a price of 3USD/bushel, and after a period of two weeks, he chooses to exercise the option when the price quotation of wheat reached 2.5 USD / bushel. In this case the option buyer, becoming short at 3USD can offset the position by buying on the current market buying price of 2.5 USD, thus turning a profit of 0.5 USD / bushel, except for the cost option and the specific charges. The option seller recorded a loss as a result of this transaction. He bought wheat from the option exercise at 3USD and sold at the market price of 2.5 dollars, the loss being estimated below the level of 0.5 USD.

In this example, the risk the option buyer takes on can be seen as is rather limited (it includes the cost of action meaning the premium and the specific charges), while the option seller faces a significantly higher risk. Practice has shown that investors turn to a series of alternative sales and purchase to minimize losses and increase profits, according to the chosen strategy.

The intrinsic value of an option can never be negative. The intrinsic value of call options depends on the possibility of making the best upon a favorable position on the futures market. The holder of a call option can earn money by making the best of this option through a buyer position at the strike price and compensating this position of a seller when the forward price exceeds the execution price. If the holder has a call option with an execution price, the option could be seized in a seller position being immediately compensated by buyer position.

If an option has no intrinsic value it does not mean that the premium for this option is zero. The premium can be even significant because there are two more factors that influence it. In general, the time value is the highest at the beginning of the option contract due to the higher risk options at this point in time for the forward price to vary and hence the option to have intrinsic value (Table 5).

Table 5 The intrinsic value of the option depending on several maturity dates (USD)

Option's strike point	84	84	84	84
Forward price	80	83,5	84	85
Intrinsic Value	4	0,5	0	0

The value of an option is 84 dollars, while its intrinsic value is 4USD, given that the forward price is 80 USD. **(Intrinsic value = strike price of the option – forward price)**

This value can influence the time value of an option. If wheat is traded at $ 2.5, a put option for $ 3 has an intrinsic value of 0.5 USD. If wheat is traded at 3.5 USD the put option has no intrinsic value. Three cases can be encountered in practice:

• the option is "outside money" (out of the money) if the execution price is less than the forward price (for a put option) and if the execution price is higher than the forward price (for a call option);
• option is "at the money" - if the execution price is the same as the forward price for both the put option and call option;
• option is "in cash" (in the money) if the execution price is higher than the forward price (put option), and the execution price is less than the forward price.

The advantage of holding a put option is given by the ability to be protected against the price decreasing, but also allows not be trapped at a specific price when it increases. For this reason, when there is a commodity for sale, we can buy a put option to block a minimum selling price. Moreover we can have an advantage in case of price increase. For the holder of a put action, three investment options can be distinguished:
• if prices decrease, the option may be used on the futures market;
• compensation (offset): to sell the option and to cash the premium;
• the holder may wait for the option's time limit and lose the premium.

7. Conclusion

As a rule, risk and uncertainty are analyzed compared with certainty. Better safety may be associated with certainty and forecast with risk or uncertainty. The risk derives from uncertainty. From a *formal point of view*, the state of certainty is considered to designate the cases where expectations regarding the future flows are unique or do not vary significantly. The risk term is used to refer to future situations in which expectations are not unique, but it helps to assess the possible solutions for each variant.

If the risk can be associated with danger, uncertainty may display a negative component, either a positive component generated by unpredictable favorable states. In this case, the negative component is associated with risk.

Any activity or economic effort is based on a number of unknown and uncertain factors or possibilities, simply because its subject is located in the future. Once we have accepted the size of real time, we may try to turn any future event into a possible one, but we can not control with certainty.

An area of uncertainty will always persist because of the fundamental impossibility of predicting all the elements that make up the environment when in real-time the evolution and dynamics are accepted as real life.

The imperfect market systems and therefore uncertain and risky, represent an important pillar for a properly functioning economy.

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