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Agricultural Market, Economic behavior and uncertainty in a financial globalization context

TEBACHE Djamal [1]
Senior lecturer at Ferhat abbas university Setif 1/ djamal.tebache@univ-ecosetif.com

CHETBANI Saida
Recommended Inspector of the Budget Setif/ Doctorate degree from Abderrahmane Mira Bejaia University/ chetbanisaida@yahoo.fr

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Abstract :

The purpose of this paper is to explain how financial globalization can carry agricultural market to inefficiency. It shows the dark side of financial globalization. Corona virus health crisis and recent War in Ukraine has resurrected the episode of cereal market volatility. In this study, we started from the microeconomics-funded analysis until macroeconomic evidences. We focused on Bernoulli's deductions and VNM[2] analysis, to explain how the financial globalization can affect cereal's market efficiency through professionals' behavior.

Results indicate that, the long run relationship should be confirmed. That is how the professional's activity will be subject to non-professionals activity in financial globalization context. Hence the information asymmetry between market participants.
Keywords: Financial globalization, Agricultural market, VNM expected utility, herd behavior, uncertainty.
Jel Classification Codes: C55, D9, G41, Q02.

Introduction :

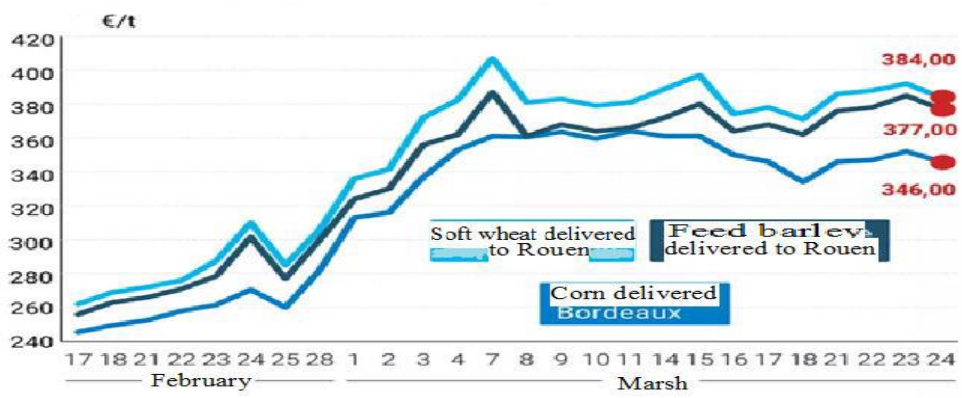
Its well known that the agriculture is characterized by the government interventionism and protectionism, which contradict the main policy of universal trade liberalization rule. Hence, the following dilemma; is trade liberalization and financial globalization really the adequacy system for agricultural markets? *risk* and *uncertainty*, is it taken into account? How the uncertainty can affect market participant's decision, and what about market efficiency?
Corona virus health crisis and recent War in Ukraine has resurrected the episode of

[1] Corresponding Author.

[2] VNM : Von-Newman & Morgenstern

commodity price's volatility. The following graph clearly shows the effect of speculation on prices following Russo-Ukrainian crisis information, as it can be seen that well before the aforementioned crisis, the prices of the main grains rose sharply, while they were relatively stable in March compared to February (TEBACHE. D, 2022).

Figure 1. Prices of the main French cereals before and during the Russo-Ukrainian crisis



Source: FAO stat

In fact, free trade and liberalization, long advocated in the works of Ricardo, Samuelson and Smith, are assumed to be the best system for ensuring market efficiency. Yet the beginnings of the failure of this system, in certain situations, have been proven over the last two decades (Mommagri 2009, 2011, 2012).

Indeed, this system has been indicative of a high degree of uncertainty accompanied by permanent instability in commodity markets since the early 2000s (UNCTAD, 2011). The world economy has been marked in recent years by the interdependence of futures markets, so that contagion from these markets has become very fluid through the uncertainty that accompanies the various economic and financial policies (Gozgor et *al* 2017). Hence, the question of the new rules imposed in recent times, which may profoundly affect the general trend in commodity markets.

It is widespread throughout the world, and has been since antiquity, that agriculture is the sector most marked by public interventionism and protectionism, which contradicts the current universal policy of liberalization. As a result, the question of the relevance of this global economic model is limited, as the agricultural market is unstable and closely linked to variables other than fundamentals (Aulerich. N.M, et al, 2012).

In this study, we will demonstrate that recurring issue has become more prominent with increased uncertainty resulting from this process of financial globalization. This issue appears more clearly during the buying and selling decision process of professionals in the sector. We will take the logic further by focusing not only on

the decision-making process in the face of uncertainty, but also by looking at the consequences of this situation on the efficiency of the wheat market. Thus, we will explain how the behavior of different market participants can affect the general trend of the cereal market under the new rules imposed by financial globalization. Since the works of D. Bernoulli in 1728, the process of decision-making under uncertainty has been the subject of several discussions and economic analyses. Thus, Knight (1921), V.Newmann and O.Morgenstern (1944), Friedman and Savage (1948), and recently Machina (1987) have been interested in the rules of decision under uncertainty. In the theoretical part of this study, we will rebound from Bernoulli's findings and the VNM analysis to explain how a causal link can be established between the current trend of financial globalization and the efficiency of the world cereal market through the decision-making process of the various market participants. In the practical component, empirical verification of this impact can be carried out using weekly/daily Cbot market data and VAR modelling.

1. Decision-making process under uncertainty: By admitting that the future is unknown, economic agents facing this situation make decisions on a permanent basis. This is the nature of humans and it is quite normal in the world of economics. Taking risks has even become, in certain circumstances, the general rule of success (P.Cocioc, 2017). However, the role of information and informational symmetry is crucial, particularly for market efficiency (UNCTAD, 2011). When different economic agents operate in a market, any decision can affect the behavior of other participants. As a result, supply and demand may be affected on their part, profoundly destabilizing the general trend of prices, which will deviate from fundamentals for a long time to come. Hence the importance of this study in economic theory. It has been shown that the decision-making process is subject to different and specific rules. Notably, in a situation of uncertainty this subject has aroused the interest of several authors since the works of D.Bernoulli(1728), Knight(1921), V.Newmann and Morgenstern(1944), Friedman and Savage (1948), and recently Machina(1987).

1 . 1 . The risk aversion of economic agents: the notion of risk aversion and decision-making under uncertainty was highlighted with the paradox of the St Petersburg game. Since then, this notion has been recognized and later introduced into economic analysis. The credit goes to D. Bernoulli(1728) in his new risk theory. Bernoulli demonstrated that the mathematical expectation, introduced by Pascal(1670), constituting the measure and the rule by virtue of which one can opt for a given decision in a situation of uncertainty, is called into question in certain situations. Several paradoxes have already proved this in practice (Eckhoudt et al, 2005). Thus, Bernoulli has introduced two criteria whose importance is paramount in the analysis in a situation of uncertainty :

- The behavior and character of the individual
- The evaluation of results is not based on a material value, but on

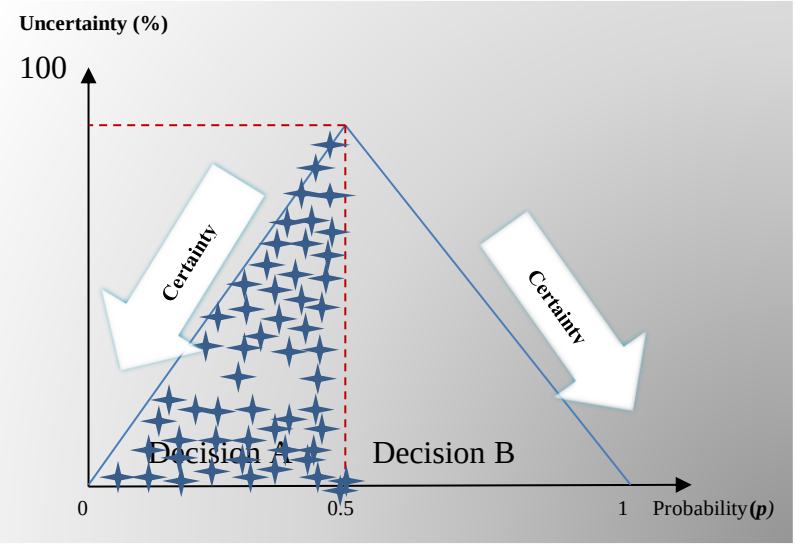
a subjective (immaterial) value, which is utility.

The behavior of economic agents partly explains which decision should be taken. This decision is the result of the degree of risk aversion that differs from one agent to another. The problem that arises in the decision-making process consists essentially in choosing the alternative that is considered optimal. If there is certainty about the consequences of an alternative, the choice of decision is not a problem (Malita and Zidaoiu, 1980). However, it becomes an arduous task to make a decision when the consequences are indicative of intense uncertainty. In this situation, some agents may make a positive decision, while others may prefer to abstain. So what will be the criterion in the choice of decision?

Decision under uncertainty can be described as follows:

An economic agent faced with a range of choices can make decision A, just as it can make decision B, as the decision chosen is perceived to be an optimal choice. The latter can be determined relative to the probability of possible events as described in the following graphic:

Figure 2. Individual decision under uncertainty



Source: Realized by the authors

An economic agent chooses decision A, for example, as long as the probability (*p) is* less than
0.5. He chooses decision B in proportion to the value *p>0*.5. The degree of uncertainty increases as long as the probability of the occurrence of an event leading to decision A approaches the probability of B. Moreover, the uncertainty peaks when the two probabilities equalize, in which case an individual cannot make any decision (indifferent).
In the meantime ($0 < P < 0.5$) and ($0.5 < P < 1$) the optimum becomes less clear; some agents will opt for decision A, while others will choose B under the same

conditions. So it also depends on their subjectivities (V.Newmann & Morgenstern, 1947). When *p=0.5*, they become indifferent, and this corresponds to the greatest level of uncertainty. We can therefore conclude that in a situation of uncertainty, a rational decision depends on two main rules:

- Probability of occurrence of an event (objective criterion)
- Characteristics of the individual (subjective criterion)

It therefore appears that the first criterion can be easily measured once the probability of each event is known. On the other hand, it is more complicated to set a measure for the subjectivity of individuals. Referring to the VNM analysis, and the contributions of Arrow(1965) and Pratt(1964), the utility function and risk premium can explain *ex ante* the behavior and subjectivity of individuals, it can be determined as follows :

$$\Pi(w_0, \tilde{x}) = \underbrace{-\frac{u''(w_0 + E(\tilde{x}))}{u'(w_0 + E(\tilde{x}))}}_{\text{Objectivity measure}} \underbrace{\frac{\sigma_{\tilde{x}}^2}{2}}_{\text{Subjectivity measure}}$$

/

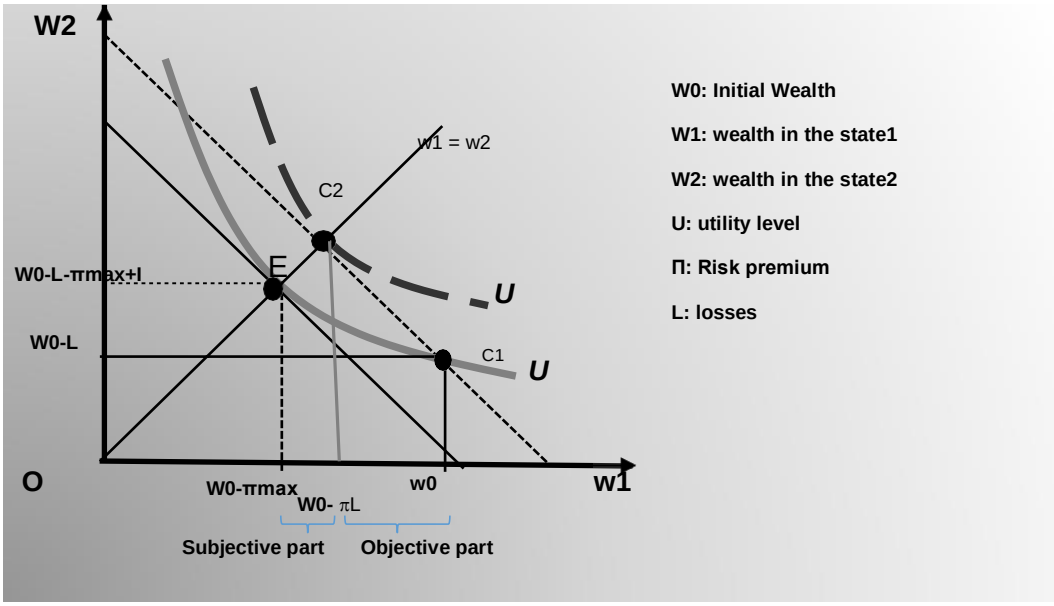
w_0 : Initial wealth

$\tilde{x}$: Possible outcomes

σ : Standard deviation

The greater the subjective part, the higher the risk premium will be (next figure). Thus, this part measures the degree of risk aversion of economic agents and differs from one agent to another.

Figure 3.parts and limits of Risk premium



Source: Realized by the authors.

We can thus conclude that, in a situation of uncertainty, economic agents make decisions differently depending on the degree of risk aversion that can be measured as described above. This measure depends on its share of the relative change in the utility expected by each economic agent.

1.2. Overview of the concept of expected utility VNM :

With reference to the work of VNM, if the economic agent evaluates the results by theirutility and not by their material value, the choice of individuals in a situation of uncertainty can be described as follows (J.V.Neumann, O.Morgenstern, 2007) :

Let *E* be a finite set of possible events, and *P* be the set of probability distributions on this set.

$e_1, e_2 \quad e_n$ are possible events, and $r_1, r_2 \ldots\ldots\ldots r_n$ are results associated with each event, $p_1, p_2 \ldots\ldots\ldots p_n / \sum p_i = 1$, are probabilities for an event *e to* occur and obtain a result *r*.

All combinations: $[(r_1, p_1), (r_2, p_2,) \ldots (\ldots\ldots\ldots r_n,) p_n]$ represents an uncertain world where several events are possible.

Referring to Bernoulli's analysis, we must introduce the characteristics of the individual by adding another criterion which is *utility*, and the situation of uncertainty will be described as follows:

$$[(u(r_1) p_1,), (u(r_2), p_2) \ldots \quad (u(r_n), p_n)]$$

Now consider the possible outcomes as the wealth of the individual, the following formula will be obtained:

$$[(u(r_1), p_1), (u(r_2), p_2) \ldots\ldots\ldots (u(r_n), p_n)]$$

According to VNM, the individual makes his choice (decision) in a situation of uncertainty by referring to the expected utility that flows from this situation as follows :

$$U[(w_1, p_1), (w_2, p_2), \ldots\ldots\ldots (w_n, p_n)] \neq \sum_{i=1}^{i=n} p_i w_i = \sum_{i=1}^{i=n} p_i u(w_i) = EU(w)$$

This equation is the formula for the expected utility of an economic agent in a situation of uncertainty. So that, any individual faced with the choice of decision in an uncertain world makes a trade-off between the level of utility arising from each situation, in other words, it will be a matter of choosing between $U[(w_1, p_1), (w_2, p_2), \ldots\ldots\ldots (w_n, p_n)]$ and $EU(w)$

In fact, economic agents make decisions by choosing between the mathematical expectation of the utility of the possible outcomes (the average), and the utility of each possible outcome: *UE(W)~EU(W)*. Consequently, we distinguish three types of behavior of economic agents under uncertainty :

- An agent who prefers *E(wf)* to $(\tilde{w}_f)$ / $(\tilde{w}_f)$ As a final wealth,

$$\Rightarrow UE(\tilde{w}_f) \rangle EU(w_f)$$

This behavior is considered risk-averse, risk-phobia, so its utility function will be represented by a logarithmic function ($U(w) = \ln(w)$), for example.

- An agent who prefers $(\tilde{w}_f)$ to *E(wf)*

$$\Rightarrow UE(\tilde{w}_f) \langle EU(w_f)$$

It's the behavior of an agent attracted to adventure and risk, risk-philia. Its utility function can take the form of a positive exponential function ($U(w) = e^w$).

- The other type of behavior is the indifference, or risk neutrality:

$$\Rightarrow UE(\tilde{w}_f) = EU(w_f)$$

The utility function of a neutral agent is linear ($U(w) = aw + b$).

Indeed, D. Bernoulli (1928) in his new theory of risk described only one type of behavior, which is the case of a risquo-phobia, which is represented by a logarithmic function.

In order to consolidate our ideas and hypotheses, we will push the logic a little further; In fact, in our analysis, this is equivalent to describe the behavior of a player who is a producer (of grain, or a trader who has to make the decision to buy and sell, and who is considered risky-phobic* in the face of uncertainty. The latter being due both to changes in market fundamentals and to false signals sent by the market as a result of the interdependence of the markets. As described above, and as we have deduced that the utility function of a risk- averse agent is generally a logarithmic function, the variable we need to introduce into our model will take the following formula "*f(t) = U(w) = ln(x)*". It is assumed to be the element (the endogenous variable) that allows us to describe the behavior of professionals (producers and traders) that varies according to the variation in the data cited above (fundamentals and positions of financial speculators).

2- Application for the cereal market(Cbot):

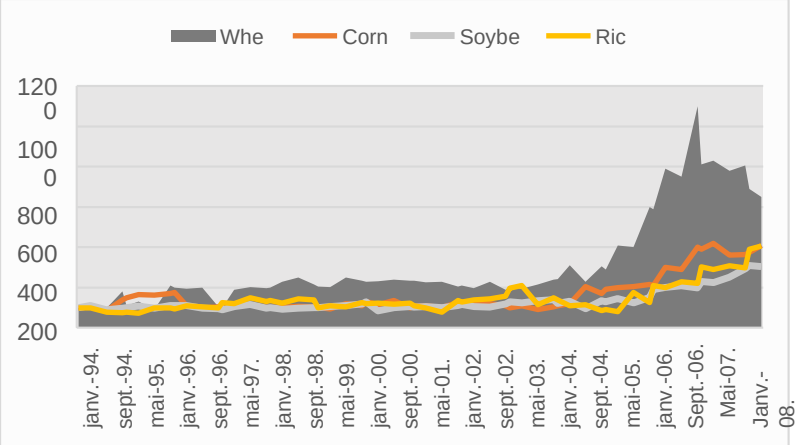
Cocioc (2017) considers that risk-taking is the general rule of success. What about the case of professional participants in the cereal market?. This observation needs to be put into perspective; in line with the theory of market efficiency, all available information must be incorporated into price formation. However, in recent years, the commodity market dominated by the activity of non-professionals has been characterized by great uncertainty (Masters (2008), J.B.Elise et al (2009), Gozgor et al (2017)). Market participants generally make a decision based on factors other than fundamentals. As a result, it becomes difficult for new entrants (professionals) to know whether their decision choice is the result of fluctuations in fundamentals or not. When making decisions based on market trends (due to lack of information)

it is easy to make a mistake and opt for the wrong decision. Over the last two decades, business decisions have been made in a very unstable and uncertain environment (UNCTAD, 2011).

2.1. Increased financialization and herd behavior of market participants:

Currently, as a result of the new rules imposed by financial liberalization and globalization, commodity markets are being devastated by a process of increased financialization in response to a growing need for risk averse professional coverage **(**Balcombe, K, 2010). This has plunged these markets into intense uncertainty **(**Cooke, B., Robles, M, 2009). Several factors need to be taken into account in order to anticipate futures prices, the statistics speak for themselves, and the following graph shows clearly that the number of buying and selling positions taken on the main cereals at the level of the Cbot market has increased significantly since the late 1990s and early 2000s.

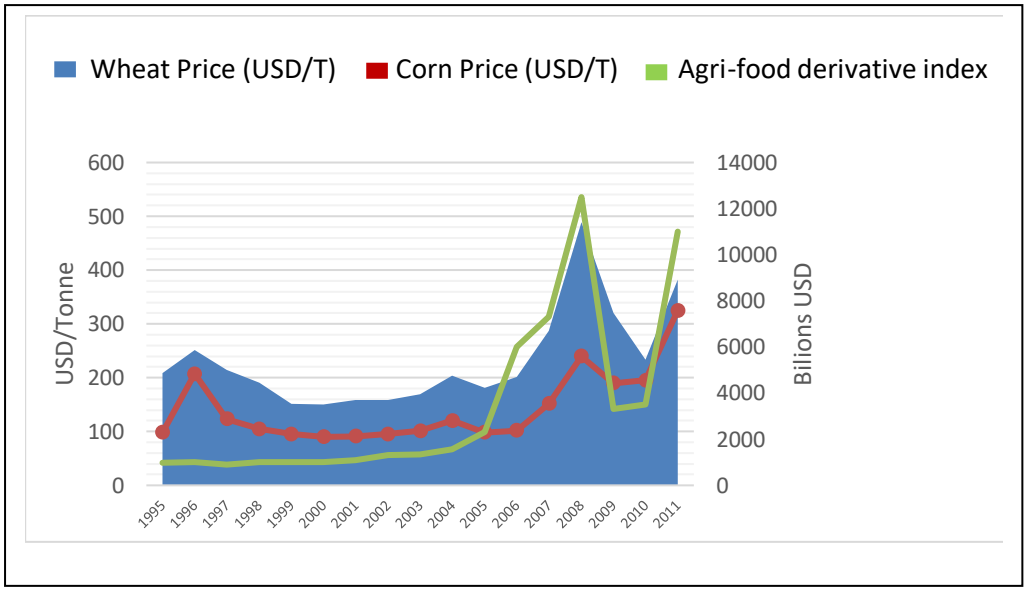
Figure 4.speculative contracts on the main cereals (1990-2008)



Source: Based on CFTC reports

As a result of this strong financialization process, the selling prices of the main cereals have become very volatile. This volatility has been accompanied by increased financialization (see the following graphic).

Figure 5. Evolution of the amount of derivative contracts (indexed to the prices of wheat and corn) in parallel with the evolution of wheat and corn prices (1995-2011)



Source: Based on FAO and USDA data.

A report published by (World watch, 2012) revealed alarming figures, less than 5% of the contracts traded on the world grain market are settled by physical delivery of the commodity, suggesting that more than 95% of contracts are concluded for financial speculation purposes. In such a situation, risk-averse professional players will use hedging techniques provided by future markets and non-professionals to protect themselves from the various risks **(**Hernandez.M, Torero.M, 2010). According to the analysis of VNM and Bernoulli, the greater the degree of risk aversion, the higher the risk premium will be. The latter is justified in Keynes' (1928) theory of normal backwardation* by the remuneration of financial speculators (non-professionals). Thus, when the market is characterized by high uncertainty, the risk aversion of professionals increases. Moreover, in an efficient market, the futures prices formed will be biased downwards, according to Fama (1971). Thus, this situation seems more profitable for non- professional participants, who see their remuneration increase to the detriment of the certain equivalent (the target price). These participants can push prices to deviate from the fundamentals for as long as possible. In other words, when a commodity market is dominated by the activity of financial speculators, it becomes less efficient if we consider that some participants are less informed than others (Cordier and Gohin, 2000, 2006, 2012). With this logic, it can be said that the risk-averse behavior of professional participants and the risk premium explain more, in this situation, the futures prices formed than the fluctuations in fundamentals.

Market participants update their information in order to be able to anticipate future price developments on the basis of private (personal) or public information **(**Bouet.A, 2011). As a speculator by a positive risk premium is the adjustment instrument that explains the difference between spot and futures prices.

As a result, prices fluctuate according to information flows, and this means that the market moves in the same direction as fluctuations in fundamentals. Thus, the behavior of different market participants will be deemed rational. However, when market participants ignore their private information and changes in fundamentals to follow the market trend and the decisions of other market participants, market efficiency will be questioned, and price movements cannot be explained only by fundamentals (D.Tebache, SC.Chakour, 2018).

Overall, when the market is characterized by a high degree of uncertainty, herding and other such practices are not to be ruled out (Bikhchandani and Sharma, 2001). This analysis shows that market participants may react for a number of reasons. Whether their behavior is rational or not, such behavior can push prices to deviate from fundamentals for a longer period than expected, leading to absolute uncertainty. As a result, the decision-making process becomes more complicated for industry professionals. This situation has had a major impact (in recent years) on the world cereals market (UNCTAD, 2011).

It has become more difficult to predict the behavior of market participants; spoofing* and layering* are the main practices **(**Lallemand.B, 2013). Empirical work carried out in this direction has not provided sufficient answers to this recurring question. Some conclude to the presence, others to the absence of a mimetic behavior within the world cereal market, and with regard to its effect on the general price trend (Momagri, 2009). However, if we focus on the impact of the movement of financial speculators, as explained above, and with reference to the theory of normal backwardation, the difference between the future prices formed and the expectation of the future price of the good is justified by the remuneration of financial speculators (non- professional participants), also known as the risk premium. The latter varies in proportion to the degree of risk aversion **(**Irwin.S.H, Sanders.D.R, Merrin.R.P, 2009).

Thus, it will be obvious that in a situation of uncertainty (resulting from the interdependence of markets and increased financialization), an indirect and significant impact of the movement of financial speculators on prices can be expected, through the risk aversion of professionals.

2.2. Modeling the behavior of professional market participants

The body responsible in the United States for regulating, monitoring and collecting data from the futures markets for raw materials, in particular the OTC* market, and for disseminating information to the public is the CFTC* . This body is a commission that periodically publishes reports of the *commitments of traders.* These reports disclose the net long and short positions taken by the various market

participants (speculators and traders), and each week it provides the total open positions of the various participants in the futures contract in question. Two types of data can be distinguished: the first table provides us with pure positions in futures contracts, while the second table shows the sum of pure positions in futures contracts and equivalent positions in options on the underlying futures contract. The total positions of the players, pure futures contracts and equivalent options, were used in the causality analysis.

As explained above, it is clear that a distinction must be made in these relationships between commercials and non-commercials (or between professionals and non-professionals), with the *long position* meaning the buy position, and the *short* position meaning the sell position.

Open interest is the total number of open contracts (purchases and sales) by all categories of
traders.

The statistics could be collected from the Chicago CBOT American market.

For *traders*' positions all data are available in the weekly reports of the CFTC, for different cereals prices, the database are also available in the UNCTAD and FAO web site, prices are expressed in US dollars/ton.

We can estimate our model using Eviews software.

2.3. Model Specification:

Modelling involves regressing the value of historical prices on the value of current prices (to characterize the effect of changes in fundamentals), and the values of other variables that can have a significant effect on forward price determination. In our case, we rely on the effect of variation in speculators' positions (short position, long position) and the spread. Thus, this relationship can be built between:

- Endogenous variable ($f(t)$): The function of the utility of the trader at time *t* such that, $f(t) = U(x)$, *x* represents the trader's wealth which is the unit price average of a ton of cereal at time *t*. This variable is supposed to characterize the behavior of traders.
- Exogenous variables:

(lal_t): The change in the position of long speculators (swap dealers, money managers, other reportables), for period *t*.

$(sal)_t$: Change in the position of short speculators (swap dealers, money managers, other reportables), for period *t*.

$(hps)_t$ The spread (swap dealers, money managers, other reportables), for the period*t*

Let's consider a risk-averse commercial* (this was our hypothesis), its utility function can take the following form : $u(x) = \ln(x)$

As: $f(t) = \ln(x) \Rightarrow \Delta f(t) = \frac{d\ln(x)}{dx} = \frac{1}{x}$

x: represents the wealth of a professional, in other words, the unit price of a ton of grain in US dollars.

2.4. Results and discussion:

The past values of the price per ton of cereal should be integrated with a positive sign. This is explained by the fact that traders are very sensitive to the evolution of prices, and it is quite normal, their buying or selling decisions depend on forecasts of future price evolution by referring to past price values. This variation represents the sensitivity of the professionals' decisions following the variation in the general trend of prices according to the variation in the fundamentals.

Speculative buying positions should be integrated with a positive sign, indicating that the speculators' buying position has a significant impact on the utility function of the traders. Thus, the effect is positive on the behavior of risk-averse traders. Consequently, any variation in the speculators' buying position can create a wave of speculative buying, which, in turn, will motivate the appearance of a speculative buying wave leading to a vertiginous increase in prices, because in this case, the market will send a positive buying signal.

Speculative sales positions should be included with a negative sign with a smaller impact, hence the negative impact on sales staff behavior. This can be explained by the fact that speculators get rid of their buying positions, the risk-phobia of sales staff increases, which will negatively affect their utility function, leading to a reluctance to make buying decisions that cause a sharp fall in prices.
The findings of this study provide an understanding of the context in which the world cereal market and any other commodity market is currently operating. Overall, in a period of rising prices and uncertainty, market players are betting on further price increases and often opt to take herd positions on the market. They therefore become more aggressive, buying and selling more quickly, with the possibility of rebuilding stocks (taking into account the storable nature of cereals). Sellers sell less quickly, which explains the possible lagged effect of the variables chosen in our model. In addition, their behavior, which is described as both cautious and greedy, contributes to a more pronounced increase in prices. The same observation can be made in a period of falling prices. To this end, the more unstable the market is, the greater the uncertainty, and the situation becomes more profitable for financial speculators, insofar as the risk aversion of professionals increases, which in turn increases the risk premium, to the detriment of the certainty equivalent*, which is incorporated in forward prices. This does not exclude the indirect effect of the interdependence of future markets on cereal prices.

Conclusion:

According to a report published by Food watch in 2011, until 1999, the proportion of contracts concluded for purely speculative purposes was between about 20 and 30 % of the total contract volume. At least, two-thirds of the contracts were held by traditional traders for hedging purposes, the so-called hedgers, whose intention was to guarantee future purchase or sale prices. Between 1999 and 2006, however, this

proportion was reversed. Up to 80% of all positions are now held by financial speculators, whereas traditional contracts intended to guarantee prices (hedging) now account for no more than one third of the total volume of contracts. The three markets - physical, futures and OTC - have thus become under the control of this category of market participants and hostages to financial speculation.

The phenomenon of cereals market instability, due to financial speculation effect, has recently resurfaced with the Russo-Ukrainian crisis. As a result, the activity of professionals becomes subject to decisions taken by non-professionals. The latter, who are becoming increasingly better informed than the former, due to their extensive intervention on the three markets, can adopt strategies that can affect the prices of traded contracts up or down, thereby calling into question the efficiency of the world agricultural market. This situation is only the culmination of a global strategy of financial liberalization and globalization.

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