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SOME CONSIDERATIONS REGARDING WEATHER AND NATURAL DISASTERS RISK MANAGEMENT IN AGRICULTURE SECTOR

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Abstract

The literature offers multiple examples regarding the failure of traditional insurance schemes to provide affordable and comprehensible crop insurance (Vedenov, Barnett, 2004). For this reason, in that paper, we have analyzed the development of new financial instruments that permit the securitization of weather and catastrophe risk and erase the limitations of traditional insurance products. The weather derivatives and cat-linked securities are new instruments that determine the transfer of weather and natural disasters risk to a country to international capital market. The interest of individual and institutional investors for these securities is high because of the low correlation with other financial instruments. The development of weather risk market is important for farmers and companies from developing countries but also for investors from developed countries that can diversificate their portfolios.
***Key words**: weather, natural disaster, agriculture, risk, management*

Introduction

The participants on the agricultural markets can face multiple risks like price risk, weather risk, natural disasters risk etc. The price risk may be hedged in different ways through specific clauses of the commercial contract or through financial strategies based on futures and options contract traded on stock and commodity exchanges. The offer of exchanges is large and many agricultural products are traded on spot and derivatives markets. In fact, the first commodity traded on exchanges was an agricultural product – the grain at Chicago Boar of Trade in 1865. The characteristics of agricultural products have made its suitable commodities listed on exchanges. So,

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commodities like coffee, cotton, rubber, cocoa, potatoes, palm oil, soybeans, frozen orange juice, meat, maize and wheat are traded on exchanges like Chicago Mercantile Exchange and Euronext. In fact, the agricultural products no do not use directly the derivative contracts in order to hedge the price risk because they do not have the entire expertise to trade, administrate and monitor these hedging strategies. For this reason, in many countries, there are established public or private institutions that offer support services for agricultural commercialization (for example, in Mexico, a cotton price support scheme is available through a public institution).

In addition, in some countries, the public authorities are highly implicated in order to hedge the losses registered by farmers by weather and catastrophe events. For example, according with information provided by the World Bank, in Morocco, a government sponsored-agricultural insurance program was launched in 1995 because this country must cope with the climate change and in India, weather index insurance programs are available.

The weather and natural disaster risk management and international institutions

The dramatic climate change and natural disasters cause important human and economic losses. According with ***Annual Disaster Statistical Review 2008*** published by Centre for Research on the Epidemiology of Disasters (CRED), the figures for the year 2008 are:

- 354 natural disasters were recorded;
- over 235000 people were killed ,
- 214 million of people were affected and
- the economic cost was over $ 190 bln (CRED, 2008).

In the year 2008, the most important events were: the earthquake and severe winter conditions in China, droughts in Asia, Africa and severe weather conditions in USA.

The natural disasters recorded in the last years demonstrated the key role of public authorities in disaster risk reduction and recovery and reconstruction operations. For this reason, the World Bank has launched new risk financing instrument named *Development Policy Loan (DPL) with a Deferred Drawdown Option for Catastrophe risks (Cat DDO)*. This instrument is a „financial bridge" that can be use to manage natural disasters until other financial sources are available for public authorities. Some countries like Costa Rica and Columbia have already obtain loans in order to support their Disaster Risk Management Program.

The weather and natural disasters risk management in agriculture sector is very important because many developing countries depend to a large extend on agriculture products for exports and public revenue (Larson, Varangis, Yabuki 1998). So, in many cases, the revenue of the public authorities are very sensitive to the movements of agricultural products prices - Madagascar, Ethiopia and Uganda (coffee), Burkina Faso, Mali and Sudan (cotton), Cote d'Ivoire and Ghana (cocoa), and Guyana (sugar).

In addition, the government is concerned with food security and natural disasters and dramatic climate change can cause important losses in economy and can affect the national security. The climate change determines new challenges: the predictability of weather will be reduce, the frequency and the intensity of severe weather events like hurricane, cyclones, floods, *droughts will increase. (FAO, 2009)*

„Developing countries, and particularly the poorest people in these countries, are the most vulnerable to the adverse impacts of climate variability and ongoing and projected climate change. Their economies depend heavily on climate-sensitive sectors such as agriculture, forestry, fisheries, a reliable water supply, and other natural resources. They are generally hindered by limited human capacity and limited access to technology and capital to invest in risk reduction… Thus it is imperative that climate change adaptation is not separated from other priorities but is integrated into development planning, programs and projects." (World Bank, 2008).

At international level, there are available programs for weather risk management designed by different institutions like the World Bank. These weather risk management contracts are tailored to the country's needs, taking in account some variables like: the type of weather risk, the probability to occur, the estimated loss determined by the event, the level of protection. These programs are available only for low and middle income countries and the World Bank act as an intermediary that has the expertise in transacting derivatives to hedge the weather risk in different sector like tourism, agriculture or energy production. In fact, these programs have two aims: to hedge the weather risk and to build the national capacity for future transactions between private companies or public authorities and financial institutions from international market.

The weather risk management instruments are financial contracts that paid compensations to an entity that is affected by the volatility of weather in exchange of for a premium paid at the conclusion of the contract. The "undying asset" of these contracts is a weather index based on variables like temperature, rainfall, snowfall, wind etc.

In 2008, the World Bank has signed the first contract of weather risk management with public authorities from Malawi in order to offer financial support for fight against the impact of severe drought. In Malawi, the effects of drought are dramatic not only for farmers and rural population but also for public authorities because the cut of farmers' incomes determine the decrease of taxes paid to government's budget. So, the interest of public authorities for the problem of drought has many determinants: social, financial and political. "*We see the Malawi contract as a natural complement to our work to help countries access market-based tools for managing a range of risks, including interest rate, currency, commodity and weather-related risks*," said Gloria Grandolini, Director of the World Bank Treasury's Banking and Debt Management Department (WB, 2008).

The contract is designed as a *put option on a rainfall index.* Because in Malawi, the main source of food, for an important part of population, is the maize, this rainfall index was created in such way to link rainfall and maize production. If the maize production falls to 10% bellow of the historical average, Malawi will receive a maximum payment of $ 5 mil from the risk taker – the insurance company Swiss Re.

This transactions is very important because was the first weather risk hedging transaction signed by the World Bank and in Malawi, the drought risk has dramatic implications (almost 90% of the population lives in rural areas and the weight of agriculture in GDP is around 40%). This transaction was assisted by other institutions like the UK Department of International Development that provide financial support for Malawi in order to pay the premium for the option contract.

So, the public authorities are responsible for the design and promotion of disasters risk reduction policy, but they are sustained international organizations. Besides the World Bank, we remark the support offer by World Food Program of the United Nation in order to strength the governments' capacity in disaster preparedness and response. (WFP, 2009). The WFP`s risk reduction work is done because the climate change affect the food system from the developing countries and the frequency of these natural disaster is increasing due to the climate change.

The weather derivatives – new products of OTC markets or exchanges

The weather is a key factor that has multiple consequences on national and international economy. For this reason, on the OTC market, since 1996, companies from weather sensitive fields sign contracts in order to hedge the weather risk. The interest of companies from agriculture, constructions, utilities, tourism or retail for weather risk hedging strategies determine the exchanges to launch weather derivatives and in this way we assist to the securitisation of weather risk (OCDE, 2009).

Chicago Mercantile Exchange, the world's largest and most diverse financial exchange, launches the weather exchange traded derivatives in 1999. Now, there are available many derivatives contracts based on weather conditions like temperature, snowfall and frost in more than 47 locations from USA, Europe, Asia, Australia and Canada. All these weather derivatives contracts have as underlying asset an index of temperature or snowfall or rainfall; and the indexes are widely available and objectively measured. The most traded type of contracts is temperature-based contract.

The weather derivatives have been designed and mainly developed in USA for energy companies in order to hedge the climate risk. In present, these derivatives are in competition with traditional insurance policies (the policies that insurance a crop against one or multiple weather risk and the policies that insure the firm` agricultural production against multiple risks – MPCI). The traditional insurance policies have some drawbacks taking in account the following considerations:

- the farmer must demonstrate there is an insurable interest associated with an physical asset or business;
- the multi-peril policies cover a standardized package of risks and a farmer could be interested only in some specific risks;
- the estimation of the loss is not objective because it is done by the insurance company;
- the valuation of the loss generates the increase of the insurance management cost;
- the insurance policies rarely cover the temperature risk (Zara, 2007).

For these reasons, the interest of farmers for weather derivatives has increased. In addition, the payment of weather derivatives depend the evolution of the weather index that is calculated using meteorological data and it is not estimated by the company that must pay the damages.

Catastrophe linked securities

Catastrophe linked securities (CAT linked securities) are financial instruments used to transfer the catastrophe risk to capital market, so, through these instrument, the catastrophe risk is securitized.

The development of this market was sinuous. The first cat-linked securities are considered to be catastrophe futures and options contracts launched by the Chicago Board of Trade in 1992. These contracts had as underlying asset an index provided by the Insurance Service Office. That index" is the dollar loss on $25,000 of catastrophe premiums from a representative national pool of catastrophe policies". The market of these derivatives had no liquidity and the interest of investors and hedgers was low, so these contracts were traded for a small period of time.

Another important instrument use to hedge the catastrophe risk is catastrophe or cat bonds. Insurance companies use these securities as an alternative to traditional catastrophe reinsurance. The firs transaction wit cat bonds take place in the mid 1990s and the marker developed because the investors are very interested to buy these securities` return that has low correlation with other financial instruments. The figures published demonstrated this fact: in 2009, there were 18 issues of cat bonds and the risk capital raised was $3.4bn, and a 25% increased being registered from 2008.

In 2006, the Chicago Mercantile Exchange decided to launch hurricane futures and options based on the Carvill Hurricane Index (CHI). The Carvill Company that is an important independent reinsurance intermediary calculates this index. This index is calculated on the base of some parameter of hurricanes (velocity and size of the official storm) Using publicly available data from the National Hurricane Center of the National Weather Service.

Conclusions

The risk management instruments presented in these papers can be used by companies and authorities from developed and developing countries in order to reduce the economic vulnerability to weather events and natural disaster. The problem of economic vulnerability is much more important for developing countries taking in account the following considerations:

- many developing countries rely on agriculture and agriculture depends heavily on weather conditions and natural factors;
- in some cases, a country can be "identified" by a single agriculture product, so the weather and natural disasters risk affects strongly the micro and macro economic indicators;

- the weather events and natural disasters affect manly the developing countries because these countries are located in high risk regions (Asia, Africa and Latin America); because of that, according with some specialist (Varangis, Skees, Barnett, 2002), the losses determined by natural disaster are 20% greater than in developed countries, as portion of GDP;
- the weather can not be controlled, so weather and natural disasters risk management is very important for developing countries taking in account the relation between weather events/natural disasters and poverty;
- in these counties, there are no government-subsidized agriculture insurance programs.

According with these considerations, we can observe that these developing countries, that are highly dependent on agriculture and highly sensitive to weather and natural disasters risk, are growth markets for weather risk instruments. Through the weather risk markets, the systemic risk could be transferred outside of the local area. In this way, new beneficial partnership is set up between the developing countries and individual and institutional investors from developed countries. The interest of these investors for weather risk instruments is high because these financial products are largely uncorrelated with other securities.

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