A Market for Weather Risk?
Worlds in conflict and compromising

Abstract
In this paper, we examine the process of risk commodification involved in the creation of a market for weather derivatives in Europe. We approach this issue through an in-depth qualitative study in which we focus on the interactions of different actors involved in weather risk. Building on Boltanski and Thevenot's framework (1991, 2006), we describe risk commodification as a justification process by which promoters try to draw weather risk into the market world.
By offering a concrete description of a derivatives market as a meeting place between different value systems, our results highlight the relevance of value-based issues within the process of risk commodification. We show that there are limits to the thesis of financial theory, according to which all kinds of risks can be transformed into financial risk, and exchanged on financial markets. Our paper contributes to the lively debate about the performativity (in Callon's sense) of financial theory within the social study of finance.

Key words: commodification, justification, derivatives markets, social study of finance, risk, performativity

Introduction

The current financial crisis has triggered sharp criticism of what are now being termed the excesses of so-called financial capitalism. Raised voices call for the de-financialization of the economy and a new focus on running businesses according to the longer-term rules of industrial strategy. Besides technical arguments, the dispute between forms of capitalism appears, in the light of the present turmoil, intensely values-based. Yet, the amount of research devoted to the issue of conflicting values associated with capitalism does not seem to match its theoretical and practical significance.

Derivatives markets provide highly relevant empirical material for those who aim, at least in part, to fill this quantitative gap. Not only are they seen as the main instrument of financial capitalism, but they have developed recently to encompass exotic new risks, such as terrorist attacks, hurricanes, or atypical credit risks that were not previously linked in any way to the financial markets[1]. In December 2007, notional amounts of US$677 trillion (that is, 12 times world GDP) were involved in over-the-counter[2] (OTC) or exchange-traded derivatives contracts, and the gross market values of the derivatives contracts themselves amounted to approximately US$16 trillion (30% of world GDP)[3]. Some authors (e.g., Bryan and Rafferty,

[1] Derivatives markets are markets on which financial instruments (options, futures) are traded, with the primary aim of providing protection against market risk, i.e the risk of variation in the price of some underlying asset.
[2] OTC (over-the-counter) markets are financial markets where trading occurs directly between two parties, as opposed to exchange trading, which occurs on organized exchanges.
[3] Statistics provided by the Bank for International Settlements. The exact value of OTC contracts is difficult to assess. Notional amounts are used as reference for the computation of actual financial flows, which are probably

2006) criticize them for causing what they see as a radical transformation of capitalism. Others express concern about the expansion of the abstract RiskMetrics they allow when they extend "the boundaries for risk transfer and for the securitization of new assets, such as weather bonds" (Porter, 2003; Power, 2007: 75).

Our view is that the extension of the financial sphere that derivatives attempt to create requires market promoters to impose a certain value system—characterized by perfect competition, product homogeneity, liquidity and transparency—on other spheres of economic action that do not share it from the start. In this paper, we interpret the process of financial innovation as a process of risk commodification and apply an empirical study to the difficulties of such a process.

Our approach to this phenomenon is largely in line with the debate developed by MacKenzie (2006). Emphasizing numerous critiques by geographers, sociologists and anthropologists who have recently turned their attention to derivatives, MacKenzie underlines the rather abstract terms they use. He points out that the notion of "virtuality," often argued against derivatives, requires a detailed analysis of the process through which it occurs. While efforts in this direction have resulted in the rapid development of a literature devoted to the social study of finance (see e.g., Beunza, Hardie and MacKenzie, 2006: Callon and Muniesa, 2005; Huault and Rainelli, 2009; Knorr Cetina and Preda, 2005; Lepinay, 2007; MacKenzie and Millo, 2003; MacKenzie *et al.,* 2007; Smith, 1989; 2007), in this paper we adopt a value-oriented perspective, hoping to make a new contribution to current sociological research on financial innovations and the derivatives market. We maintain that the risk commodification process required by the creation of a new derivatives market is complicated by the remoteness of the risk from the world of finance; it involves different groups, with different value systems, using multiple interpretations and competing ways of describing risks.

We examine how the creation of a new derivatives market implies the interaction of different spheres around the notion of risk. Each sphere is organized around a "distinctive evaluative principle" (Beunza and Stark, 2004: 373; Stark, 2000) and a specific value system, each of which has its own metrics and standards of evidence for proving the value of any object or idea (Callon and Muniesa, 2005; Kaplan and Murray, forthcoming). We characterize the different spheres at stake, and their interactions. We study how market promoters try to construct a compromise across the contested values and multiple logics of action associated with a financial product. We use Boltanski and Thevenot's analysis (1991, 2006) (exemplified in Beunza and Stark, 2004; Callon and Muniesa, 2005; Kaplan and Murray, forthcoming; Stark, 2000), which provides a very useful lens through which to view these dynamics. Building on their framework, we suggest that market promoters try to impose their logic through a justification process, by which derivatives promoters attempt to extract risk from the non-financial sphere and bring it into the financial one. This requires them to appeal to various higher common principles or "worth" to achieve a compromise in a context where justifications conflict.

Our research is driven by three main research questions. What kinds of financial and non-financial value systems interact in the creation of a new derivatives market? How can these interactions be characterized, and how much effort is needed to drag a given risk into the financial sphere? What kinds of result(s) do these interactions and efforts have for the market structure?

We approach these questions through a study of a new derivatives market: the European market for weather risk. Weather derivatives contracts combine meteorology and finance, and are exchanged in over-the-counter markets in Europe. They are little standardized. They involve various categories of actor, each with a different value system,

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best reflected in the gross market value of the contracts, although the reliability of the figures in these markets remains problematic.

from the worlds of meteorology, industry, agriculture, financial markets, insurance and banking companies. Despite extensive efforts by promoters over the last ten years, this market remains remarkably thin and has not taken off.

We conducted an in-depth qualitative study of the development of this market from 1999 to 2008. Our study examines the beliefs of the different actors, their perception of weather risk, and their arguments. We analyze the market promoters' efforts at justification, and their attempts to bring weather risk into the financial sphere.

Our findings contribute to the study of the process of risk commodification in several ways. While other authors have already focused on markets as cultures (Sjögren and Helgesson, 2007, MacKenzie and Millo, 2003; Zelizer, 2005), we offer a concrete description of a derivatives market as a meeting place between different worlds, with different logics of action and distinct value systems. This is a relatively new way of looking at the social structure of derivatives markets. Using the sociology of Boltanski and Thevenot (1991, 2006), we examine the values of both investors and risk protection seekers, from their own point of view.

Moreover, we show that the commodification process we study runs into severe obstacles, resulting in a market structure that does not match the perfect competition rule, which serves as the highest common principle of the market world. Instead, the market for weather derivatives is characterized by hybrid forms of transaction. We provide evidence that economic transactions take place without any real extension of the market world. This result has two main implications. First, our research yields practical predictions about the future of the market we analyze. The odds that the market for weather derivatives will eventually become a liquid financial market are low, while it seems likely that its development will lead to a thin insurance market. Second, we produce evidence that performativity[4] of the theory (in Callon's sense) might in some instances be difficult to obtain, because of the social interactions that interfere in the process of commodification. Our case study provides an example where the stickiness of different, indeed competing, value systems challenges validation of the theory, according to which any risk can be commodified and exchanged as a financial product.

The remainder of this paper is in four parts. Using results from the social study of finance, we first focus on the role of derivatives products in the recent transformation of capitalism, and present the structure of a derivatives market as the result of interactions between different worlds, in Boltanski and Thevenot's sense. The second part of our paper describes our research method, a longitudinal qualitative study over the period 1999–2008, based on interviews with the principal actors in the market, and on the analysis of secondary data. Next, we study the process of commodifying weather risk as a justification process, by which market promoters try to rally other actors around their vision of risk. In the fourth and final part of this paper, we discuss the main conclusions of our research.

1- Derivatives at the core of a new capitalism?

As might be expected, the rapid development of derivatives markets has triggered various reactions both outside and inside the academic community, and some questioning has recently emerged regarding the role these markets play in current capitalism. The study of the materiality of these markets remains however in its infancy, and we require a better

[4] Although the definition of performativity is currently strongly debated (MacKenzie, 2006; MacKenzie *et al.,* 2007), the idea of performativity refers to the fact that finance theory creates a world in its own image (Callon, 1998 ; MacKenzie, 2004).

understanding of what it takes to develop such markets, of the strategies implemented by market promoters, and of the difficulties that they encounter.

1.1 Derivatives and the transformations of finance

The increasing importance of derivatives has been welcomed with enthusiasm by many economists, who emphasize their role as efficient instruments of risk transfer, management and allocation[5]. Various critiques, however, have expressed concerns (see e.g. Arnoldi, 2004; Bryan and Rafferty, 2006; LiPuma and Lee, 2004, 2005; Maurer, 2002; Pryke, 2007; Pryke and Allen, 2000; Tickell, 1998). Particularly upsetting to some is the role potentially played by derivatives in transforming capitalism by enhancing economic competition almost without limits. Bryan and Rafferty (2006), for example, emphasize the ability of derivatives to "bind" and to "blend" future and present, local and remote prices of the same asset or of different sorts of assets, or even of non-assets. Derivatives, they argue, make instantaneous comparison of all kind of assets across time and space possible, throwing them into a relentless process of competition. This provides the channel by which capitalism can become more globalized than it ever was and organize the competition of all against all, with consequences on firms, countries and individuals.

Although the technical potentialities of derivatives are convincingly described by Bryan and Rafferty (2006), their analysis falls short of explaining how these potentialities came to be enacted to the extent that we currently observe. We can account for this side of the phenomenon only by taking into account the transformation of finance over the last fifty years. As MacKenzie (2006) demonstrated, the deep changes in the size and nature of financial markets in recent decades have been accompanied, and to a certain extent accomplished, by a revolution in theoretical thinking about finance. The exploitation of the theoretical intermingling faculties of derivatives products on real financial markets was indeed greatly facilitated by the shift in representations that resulted from Markowitz's conceptualization (1952), which transformed investors into risk buyers[6]. This shift in representations provided the driving force for financial innovation: the never-ending creation of new derivatives appears all the more desirable to investors, as it constantly enlarges the set of investment opportunities provided to them, offering them renewed ways of mitigating their risk and maximizing their profit. In addition to commodities, stocks and bonds, their portfolios may include "standard" derivatives on these assets, and all kind of exotic derivatives, some of them written on risks that hitherto were not the object of any financial market. Derivatives on terrorist attacks or hurricanes belong among the latter, as do the derivatives on the value of house property, or on international low wage competition, as imagined by Schiller in his (*The) New Financial Order* (2007).

Overall, supporters of derivatives in recent decades can be seen as having found in financial theory strong incentives and nice tools to extend the product range apparently without conceptual limits, thus meeting the needs stemming from the rise in liquidity-seeking investment opportunities they were faced with. Most unnoticed among the representations that support the process of financial innovation however, is an implicit view that acts as a sort of

[5] Merton and Scholes were presented with the Nobel Prize for economics in 1997, for the so-called Black and Scholes model, which the Nobel foundation described in the following terms: ""Your methodology has generated new financial instruments and facilitated more effective risk management in society" (cited in Bryan and Rafferty (2006: 3)).

[6] Before Markowitz, investors in financial markets saw themselves as buying bits of capital (namely shares and bonds), in the hope of gaining some returns from dividends or interest, and from capital gains when they sold the assets. Markowitz's approach changed this view, by depicting investing activity as buying some risk in exchange for some expected return. This framework was to transform what Preda (2005) calls the "figure of the investor".

black box (MacKenzie, 2005). According to this never explicitly expressed, needless to say little debated, view, derivatives market are places where the interests of the investors as risk buyers exactly match the needs of the risk protection seekers. The opening of this black box provides the starting point of the present paper.

To see that the implicit view supporting financial innovation can be deconstructed, it is of interest to take the view of risk protection seekers and reckon that the derivatives mechanism is not the only solution they can resort to. In many situations, risk protection is sought through the more traditional mechanism of insurance. Now, contrasting financial derivatives with insurance schemes shows that investors in search of new investment opportunities and protection seekers do not necessarily have exactly matching interests. Insurance is based on the principle of mutual mitigation of risks. The risk taker (insurance company) and the risk protection seeker (underwriter) have an interest in an interpersonal relationship, in which the risk and moral hazard profile of the latter will play a role in the definition of the premium paid to the former. Derivatives, on the other hand, seek to "translate" risk-hedging issues into investment opportunities. This requires the goods exchanged between risk takers and risk sellers to be objectively defined, so that the risk taker will be able to resell them on a secondary market whenever she wishes. This possibility is essential to provide "liquidity", a notion encompassing a mechanism by which myriads of freely competing risk buyers are able to meet myriads of freely competing risk sellers, thus producing an accurate and transparent price for each product exchanged (Grossman, Luque and Muniesa, 2008). It is also essential to provide investors with a world resembling the one posited by Markowitz, in which financial investment opportunities circulate freely in a space without limits. In other words, seeing derivatives as a risk transfer mechanism supposes a vision which corresponds to the model of perfect competition defined by economists and that assumes the operation of four conditions (Garcia-Parpet, 2007 : 25-26) : 1/ Each economic agent acts as if prices were given. None of the buyer or sellers should be strong enough to be able to exercise a noticeable influence over prices. This is the condition of *atomicity*; 2/ The product is *homogeneous*. This means that it should have the same significance for all concerned, and that it should be identifiable without considering its seller and buyer; 3/ The market is *fluid*. This means that exchange counterparties are free to enter or to exit the market; 4/ The market is *transparent*. Economic agents should have perfect knowledge of the quantity, quality and price of the products on offer.

The following table synthesizes the main differences between an insurance market and a derivatives market.

INSERT TABLE 1 ABOUT HERE

Reckoning that, at a very general level, risk protection can be granted through an insurance mechanism as well as a derivatives mechanism allow us to open a black box and understand that there is no logical reason why the development of derivatives markets would obligatorily align the interests of investors as risk buyers with those of risk protection seekers, as risk sellers. This reminds us that the success of new derivatives products requires a specific process. For a new market to be created, new, exotic risks, must be drawn into the sphere of financial markets and *not* that of insurance, under the guise of derivative instruments. To enter a world characterized by perfect competition, anonymity, liquidity and the reciprocal independence of risk takers and risk hedgers, there have to be objectively defined financial products. This process is best designed as a process of risk "commodification" or

"objectification" (DeGoede, 2004; LiPuma and Lee, 2005; Thrift, 2004). Following Callon (1998) and Callon and Muniesa (2003), we can expect it to involve "framing": that is, the production or co-production by buyers and sellers, together, of a definition of what a market transaction formally includes. It is likely that a large variety of media will be required to perform this framing successfully (Lepinay, 2007), and that a series of compromises will have to be reached before a new market can come into existence. We can also anticipate that the *risk commodification* process will require "disentanglement" (Callon, 1998: 253), by which agents and entities will have to extricate themselves from their outside market networks of interactions, in order to enter an unmistakably demarcated "stage"[7].

In this paper, we propose to study empirically the difficulties involved in risk commodification. By focusing on the market for weather derivatives, we will consider from what exactly agents must disentangle themselves. We will show that to draw such a thing as weather risk into the market sphere of derivatives requires an acknowledgment of the existence of other "spheres", of other systems of values, which interact with one another around the very notion of weather risk. More precisely, we propose to characterize these spheres and the interactions between "spheres", using the theoretical apparatus developed by Boltanski and Thevenot (1991/2006). Drawing on their definitions, we will describe the "commodification of weather risk" process as a *justification* process, by which derivatives promoters try to drag risks into a world that Boltanski and Thevenot define as the *Market World*, although other agents refer to utterly different *worlds*. We thus make full use of the distinction proposed by Boltanski and Thevenot, between two facets of the Economic sphere: the *Market* and the *Industrial* ones. We will demonstrate that the structure of the market under study is best described as the results of attempts to reach compromises between *worlds*.

1.2 Economies of worth as a conceptual matrix

Boltanski and Thevenot (1991/2006) picture individuals who tend to live in different *worlds*, defined as "a grammar of worth": in other words, a specific justification regime or form of evaluation (Lamont and Thevenot, 2000: 5). Against mainstream economic theory assumptions, and the idea that actors compete in a perfect and universal market on the basis of optimizing rationality, this theoretical framework emphasizes complex operations of cultural adjustments and evaluation, in order to face economic uncertainty (Eulriet, 2008). It focuses on the general question of *agreement*, by taking full account of the imperative to *justify*, which is a necessary condition when coordinating human behaviour. A *justification* regime is characterized by a "common superior principle" that may be referred to when involving justice in a case of dispute or conflict. Boltanski and Thevenot identify six different worlds that are defined by six evaluation principles: 1/ The *Market World*, in which the highest value is market performance. A person acting normally in this world must not only rely on the objectivity of the good to reach agreement on a transaction, but also on its independence from the various actors engaged in the transaction. "This distance has to produce indifference with regard to all the qualities that are foreign to those of buyer or seller in the persons with whom one is dealing" (2006: 202). Competition is the higher common principle, and the circulation of goods and persons should have no limits. 2/ The *Industrial World*, which promotes industrial efficiency. Here, the ideal situation is one in which the solution to a problem is realistic and responds usefully to needs. The higher common principle lies in efficiency and performance. 3/ The *Civic World*, in which the higher common principle is civic solidarity. In this world, beings have a taste for what is common, what unites them. Judgement is the

[7] Slater (2002). See also Cronon (1991), cited in MacKenzie (2006).

expression of the general will, which may be made manifest through the achievement of awareness, or by collective reflection, or in the form of mobilization around a cause (2006: 192). In this world, "whatever dilutes, splinters or restrains is unworthy" (2006: 193). 4/ The *World of Fame,* which values renown. There, the worth of each being depends on the opinion of others. The aim is to attract attention, to convince other people, to obtain respect from them, "to earn or win" their support (2006: 180); and, finally, to capture the attention of the public. 5/ The *World of Inspiration,* which values creativity, spontaneity and originality. 6/ The *Domestic World*, which values trustworthiness, as expressed in tradition and hierarchy.

Our main argument is that the promoters of derivatives markets find themselves in a situation in which the condition of success lies in overcoming potential conflicts between their ideal *world* and the other *worlds* to which potential market participants may be attached. For promoters, the ideal solution is to succeed in rallying all actors to their vision. Boltanski and Thevenot describe less ideal situations, and show that the reduction of tensions between *worlds* can be realized by three alternative forms of agreement: *compromising, arrangements* and *relativization*. C*ompromising* is an agreement by which people agree to suspend a clash—a dispute involving more than one world—without settling it in only one of these three worlds (2006: 277). To work out a compromise requires "finding a formulation acceptable to all". Sometimes, when a compromise is unattainable, the solution has to be reduced to a private *arrangement,* which takes the form of a contingent and local agreement. It is fragile, and oriented toward private interests: "*You do this, which is good for me; I do that, which is good for you*" (2006: 336). Finally, the last way of exiting from a dispute is *relativization*. To escape from a clash, people may agree that nothing really matters. In all cases, actors facing a conflict between worlds have to enter into processes of justification, by which they try to establish relations between worlds, produce agreements and coordinate their actions.

By analyzing the way in which the promoters of weather derivatives attempt to drag weather risk into a *world* that used to be very alien to it, we seek to provide evidence that the market reality we observe is best understood as the result of such a process.

Our use of Boltanski and Thevenot's conceptualization allows us to provide a new characterization of the situations observed in the market, which opens the way for a renewed assessment of the power of derivatives to enhance competition within capitalism without limits. More generally, the unveiling of tensions between systems of value has an opening-the black-box effect and allows us to contribute to the reflection about what is meant by the notion of "market".

2- Methods

Our research is based on an in-depth qualitative study of the development of the European market for weather risk from 1999, the start of the market, to 2008.

Our objective is to understand the intentions and beliefs of the actors, their representation of the market, the "worlds" in which they evolve, their arguments and their own interpretation. We focus on the modes of justification by which actors try to establish relations between worlds, produce agreements and coordinate their actions. Hence, we retain the methodological position that consists of studying justifications in disputes, without "assuming the privilege of a bird's eye view" (Boltanski and Thevenot, 2006: 349). In addition, inductive logic characterizes much of our approach (Lincoln and Guba, 1985).

Data Collection

Our approach focuses on how actors took part in the development of the European market for weather derivatives, and on their perceptions of weather risk[8]. In the first stage, our objective is to offer a precise description of the emergence and development of the market, in order to improve our understanding of our object. In the second stage, we attempt to put forward the views and types of arguments that the agents use when debating.

To reach these objectives, we used multiple sources of empirical evidence, which can be divided into four main categories (Ravasi and Schultz, 2006: 438). Although our study covers a nine-year period of development, our direct observation in the field lasted for two years, from 2006 to 2008.

Semi-structured interviews. We conducted a total of 22 interviews. Our sampling logic moved from purposeful to theoretical (Locke, 2001; Ravesi and Schultz, 2006: 438). We initially interviewed people who could provide useful and general information on the market, its growth, its functioning, its main stakeholders and its operating routines. Our aim was also to identify key persons for subsequent interviews. Later, we selected our informants theoretically, on the basis of our main research questions and interests. That is why we focused our attention not only on promoters of the market, but also on potential end-users, in order to deepen our understanding of the tensions between the different worlds, and of the disputes and agreements in this market. We selected interviewees so as to maximize the variety of profiles and the heterogeneity of perspectives (Jacobides, 2005: 471). The respondents are traders and promoters in banks, re-assurance companies or index providing companies (Merrill Lynch, Swiss Re, Paris Re, Scor, Metnext, Powernext), end-users in companies in different industries (horticulture, tourism, textiles, energy) and legal experts and economists in Paris and London. More precisely, we conducted nine interviews with promoters of the market, two with experts and eleven with end-users. The interviews were semi-structured, and focused on five main questions areas: 1/ The goal of the market for the interviewee; 2/ His/her representation of the market, of its different stakeholders, of cultures of risk; 3/ His/her opinion regarding weather risk management; 4/ The most important events s/he remembers regarding the development of the market; 5/ The most significant or innovative products s/he used to manage weather risk; 6/ The actions undertaken to deal with emerging problems, and attempts to overcome conflicts.

The interviews each lasted between one hour and two and half hours, and most of them were tape-recorded and transcribed. Whenever this was not possible, we took precise field notes. All interviews involved the two researchers of the study, to minimize interviewer bias.

Archival materials. We consulted many categories of archival information such as the studies of Deutsche Bank, the *Société française de statistique*, the *Association française des trésoriers d'entreprises (*AFTE) and the Weather Risk Management Association (WRMA)[9] (see Appendix 2). These materials were used to confirm the main events in the market, to provide details not available via interviews and also to provide textual accounts of debates and discussions. We also studied information, texts and discourses stemming from promoters' websites, such as WRMA and Metnext.

[8] Although a market for weather derivatives exists in the United States, it mostly takes the form of a standardized market within the Chicago Mercantile Exchange (CME). The focus on the European market in this paper is justified by the accessibility of the main actors to the authors.

[9] The goal of WRMA, or the Weather Risk Management Association, is to serve the weather risk industry by providing forums of discussion and information.

Press articles. To review press articles, we used the Factiva database, which provides business news collected from 14,000 sources. In total, we analyzed 250 articles, beginning with research on the key words "weather risk" and "weather derivatives". We also analyzed systematically articles from the professional magazine *Environmental Finance*. The database included issues of this magazine published between 1999 and 2008. We reviewed 198 articles about "weather risk". From these documents, we were able not only to reconstitute events, but also to focus on the representations and discourses of different actors regarding the market for weather risk.

Annual reports. We carefully analyzed 40 annual reports of potential end-users for the year 2007. Our aim was to assess how these actors take weather risk into account in their external communication, and to attain a better understanding of their vision and of their logics regarding weather risk management.

Finally, we also attended one professional seminar in March 2008, the aim of which was to promote the market. This provided a very good opportunity to observe the arguments put forward by promoters, and the ways in which they justified the legitimacy of the market, and of their actions. It also made possible informal conversations with promoters (not counted as interviews).

INSERT TABLE 2 ABOUT HERE

Data Analysis

We first arranged the data into a chronological account, in order to produce a "facts database" of the emergence and development of the market. Appendix 3 provides a chronology.

In the second stage, we tried to capture the "justificatory accounts" of the different actors (Greenwood and Suddaby, 2006: 32), particularly those of the promoters trying to promote the *Market World*. We initially conducted a primary analysis of these accounts, and identified the sentences and the words commonly used by these actors to justify their activity. We identified an initial set of narratives, reviewed them carefully and interpreted the data, using what we knew about the subject based on documents, press articles and the systematic analysis of all the interview transcripts (Berg, 2004; Greenwood and Suddaby, 2006). We were then able to analyze diverse cultures of risk, different kinds of justification stemming from diverse actors and different attempts to find an agreement on this particular market.

The third stage of data analysis was more directly linked to our research question. After identifying broad themes in the data, we reduced them to more precise categories. We focused on four main categories: 1/ The lack of growth in the market; 2/ The existence of different *worlds*, *i.e.,* the different views and logics of actors regarding weather risk management; 3/ The emergence of *disputes*, *i.e.,* of debates and discussions regarding the usefulness of weather derivatives; 4/ The search for an agreement by promoters, *i.e.,* the different attempts to overcome conflicts between worlds.

As the research progressed, we sought to verify the emerging categories by using other data sources, especially professional press articles and annual reports. These data were collected after we had established the emerging themes from the interviews and archival materials. It was then possible to verify the main actors in the market, and their specific concerns.

INSERT TABLE 3 ABOUT HERE

3. Case study

The market for weather derivatives is usually considered to have been born in 1997, with three noticeable transactions involving the firms Koch Industries, Enron and Willis[10]. At present, it involves, as its principal actors, promoters (mainly re-insurance companies, large investment banks, hedge funds, weather index providers and energy companies) and end-users, such as industrial firms in different sectors: for example, the retail, leisure, textile and construction industries. The promoters belong to an association that aims to develop the market, the Weather Risk Management Association (WRMA), founded in 1999 by leading participants in the market.

The principle of weather derivatives is to use weather variables, such as temperature or precipitation, as the basis of risk indices, thus allowing for the transfer of weather risk from a risk seller to a risk taker. For example, in a typical temperature transaction, if the weather is too warm—e.g., the average temperature over a defined period exceeds a pre-agreed threshold—the buyer is entitled to receive a payment from the seller, depending on the extent to which the average temperature has exceeded the threshold[11]. Weather risk can be expressed in terms of temperature, precipitation, snowfall, wind or any other measurable variable. The amount of the payment received by the buyer is determined by her sensitivity to adverse change in the weather. It is important not to confuse weather derivatives with securities such as Cat (standing for catastrophe) Bonds. The latter trigger payment only if a major event, such as a hurricane or an earthquake, occurs, whereas weather derivatives rely on the concept of dealing with normal weather conditions; or, to put it in the words of their promoters, with frequent events inducing small amounts of risk rather than rare events causing the risk of major losses.

In what follows, we provide some information on the history and development of the market. In a further sub-section, we contrast the most visible features of the market with the real issues with which the promoters have to cope when trying to generate demand on the part of weather-risk protection seekers. Lastly, we propose an interpretation of the weather derivatives market, using the conceptual framework developed by Boltanski and Thevenot (1991/2006).

3.*1 The market for weather derivatives: History and development*

[10] WRMA Website.
[11] WRMA Website.

The market for weather derivatives began with a few private transactions in the United States that involved a transfer of weather risk between private counterparties, in the autumn of 1997. The market then developed along the two lines usually followed by financial innovations. First, a market for standardized contracts was created on the Chicago Mercantile Exchange (CME) in 1999. Euronext attempted to launch a similar market on London's LIFFE in 2001, but had no success whatsoever, and the weather contracts had to be withdrawn from the market in 2003, due to a lack of transactions. A timid attempt to give it a second chance resulted in the creation in May 2007 of MetNext, a Euronext-Nyse and Meteo France joint venture, the aim of which is to provide weather indices that can be used to tailor weather derivatives. The European market for weather derivatives then developed along the second line often followed by financial innovations, and today it involves only customized contracts exchanged on an over-the-counter (OTC) basis.

Technically, weather derivatives are rather simple financial instruments, and they come in the guise of futures, swaps and options. Contracts in temperature dominate the market. As they are customized, the contracts exchanged on the over-the-counter European market may take sophisticated forms. Paris Re, for example, describes a double trigger option to hedge French vineyard exposure to frost and excess rainfall. The option will trigger if one or both of the two weather indexes involved exceed a pre-agreed threshold, offering the wine producer a payout, computed as a linear function of both indices.[12]

Since 2001, the evolution of the market has been measured by a yearly survey conducted by Price Waterhouse Coopers for the WRMA (Weather Risk Management Association), the industry association[13]. The available data for the period 2001-2006 are summarized in Chart 1.

INSERT CHART 1 ABOUT HERE

The total value of trades reported in the 2005/6 survey is $45.2 billion, compared to $9.7 billion in the 2004/5 survey, with the CME experiencing significant increases in both the number of trades and their value. The WRMA website does not communicate as clearly the figures for years 2006/2008, a sign that may reasonably be interpreted as an attempt to understate the variability in the market. From a press release dated June 2008, we learn that the total value of the notional amount of the whole market declined by $19 billion in 2006/2007, and rose again, to reach $32 billion in 2007-2008. No figures are provided on the proportion of OTC contracts in these figures.

Overall, although the promoters continue to insist on the significant growth of the weather derivatives market in recent years[14], the market in fact remains marginal when compared to other derivatives markets worldwide. The European market, in particular, appears distinctly thin, and seems to have had difficulties taking off.

[12] Documentation produced by Paris RE, 2007.

[13] Founded in 1999 by leading participants in the weather market, the WRMA is the "*industry association for the weather risk management business*".

[14] A recent illustration is given by the declarations of Martin Malinow, the newly elected president of WRMA, commenting on the market data for the year 2008: "The activity we've seen this year is indicative of a strongly growing market," (…) "We have spent the last 10 years creating foundations for growth and we can now begin to reap the rewards."

3.2- Weather derivatives on stage and backstage

Despite the thinness of its actual size, the market for weather derivatives has a great capacity to attract the spotlight. The use of a rather crude measure of press coverage[15] reveals that weather derivatives, which represented less than 0.005% of the total world derivatives markets[16], were mentioned in 34% of the articles devoted to financial derivatives over the period 1997-2007. Far from the spotlight however, the reality of market building involves private face-to-faces between markets promoters and industrial firms, who, as potential risk protection seekers, have to be convinced that weather derivatives constitute a sound solution to their problem. The contrast between these two facets of the market provides an interesting perspective on the understanding of the social processes at stake in the construction of a new financial market.

In the spotlight: The market for weather derivatives success stories

The extensive press coverage received by weather derivatives is certainly related, at least in part, to the facility with which they lend themselves to entertaining headlines. From "*Cover against a rainy day",* to *"Weatherproof Garment Co. is not leaving its fortunes up to Mother Nature anymore*", weather derivatives have the great advantage of being able to tie what is probably the most universally common conversation topic to economic subjects. This provides the kind of good story that the media are known to be fond of. They are new, the principles they rely on are easy to explain, and the risk they are tailored to hedge is largely familiar, and of interest to readers of various types. In other words, weather derivatives provide far better light reading topics than any other financial derivatives. In addition, the surge in debates on global climate change and the potential higher frequency of more extreme weather conditions provides them with a media wave on which they can fruitfully ride.

Besides their intrinsic qualities, another asset of weather derivatives in relation to the media is their ability to dramatize and make visible some of the most striking transactions on the market. The WRMA's website, for example, has a page devoted to "*great transactions*", of which it describes two that are hardly likely to have been chosen by chance. The first, which was also widely publicized in the press, is the transaction by which the World Food Program purchased precipitation cover from Axa Re in order to prefund an emergency response, in the event of a drought affecting Ethiopia in 2006. Presented by its promoters (and in the press) as a way to "*manage human catastrophe risk*", this transaction was justified on the grounds that it would ensure "*efficient use of donor funds*"[17] and *"rapid response to drought emergency"*, since the instrument pays immediately, "*while normal donors response usually require months before funds are available"*. The second transaction exemplifying the interest of weather derivatives on the WRMA website was a deal by which the Sacramento Municipal Utility District (SMUD), a customer-owned generator and distributor of electricity, purchased a three-year derivative to protect it from the volatility of precipitation in California. According to this deal, which was made with two energy-trading firms as risk takers, SMUD was to receive payment when precipitation was less than a given threshold, and to make payment when precipitation exceeded a second threshold. Promoters argued that the rationale of this deal was beneficial to the owner-customers of the mutual SMUD. The WRMA website

[15] We simply counted the articles in Factiva for two requests: financial derivatives on the one hand, and weather derivatives on the other hand.
[16] Measured in notional amounts.
[17] The purchase, according to the WRMA website, of "$7 million of financial resources for less than $1 million, to be available in the event of continued drought emergency".

insists that the "*cost of power to SMUD customers remained among the lowest in the State despite turmoil in California electricity market during this period*".

A third transaction, cited several times by our interviewees and heavily relayed in the press, was a five-year frost day protection contract sold in 2001 by the Dutch Bank ABN AMRO to the administrators of a 'cold weather risk fund' in the Netherlands. This derivative was meant to provide support for the government-mandated fund that pays the wages of construction workers who are unable to work because of inclement weather. This contract, which was further extended in 2003, is said to be the largest-ever weather derivatives transaction.

The attractiveness to the media of weather derivatives, and their capacity to structure transactions, involving, as in the examples above, weather, human misery, the efficient management of humanitarian assistance and the public good, echo the description given in the critical academic literature reviewed previously. In fact, weather derivatives of the kind just depicted seem to typify the binding and blending capacity described by some authors as archetypal of financial derivatives. They seem to abolish the difference between financial securities and non-traded asset forms, and they exemplify the expansion of the financial market sphere into the as-yet non-monetized domains of social life. Everything is as if weather derivatives had the extraordinary power to provide solutions simultaneously to issues expressed by financial investors, government funds, communities, NGOs and International Financial institutions. However, by looking only at the most glamorous side of weather derivatives, one runs the risk of missing the true picture. Exactly as one swallow does not a summer make, the above-mentioned large deals do not make a financial derivatives market, which, to exist, should rally various type of actors around a unique view of what risk is, and how it ought to be managed. In the case of weather derivatives, however, this cannot be taken for granted.

Behind the scenes: the face-to-face between market promoters and industrial firms

As many analysts of financial markets have already noted (Callon, 1998; Huault and Rainelli, forthcoming; Lepinay, 2007; MacKenzie and Millo, 2003) the transformation of a given risk into a financial risk, that is, a risk that can be taken in charge through derivatives instruments, does not go without framing efforts. In what follows, we constrast the view of market promoters with that of industrial firms as regards weather risk and the way it ought to be managed.

What "the market" ought to be: finance rather than insurance

In itself, the idea of seeking protection against bad weather is not new. It usually takes the form of insurance and is well known in agriculture (e.g., drought insurance) or in the management of public events (sporting events, concerts). Insurance products however, are not what the promoters of weather derivatives want to develop. In contrast, as we will show in what follows, their effort consists in advocating the development of a liquid, "financial like" market for weather risk. This view was repeatedly expressed by our interviewees, and it is reflected in the professional association in charge of the promotion of weather derivatives, the Weather Risk Management Association's website[18].

[18] It should also be noted that, in all jurisdictions, insurance products can be sold only by insurance companies. The development of a derivatives market can thus be understood as a way to extract business opportunities from

In the chapter on the history of the market, the WRMA website editor notes that the idea of transferring weather risk had been the subject of insurance consideration for some time. He, however, observes that, prior to 1997, and contrary to the current situation, none of these early initiatives "*developed into a market*". We then learn that the wished-for market presents three main specific characteristics.

First, the weather derivatives market must provide investors with promising investment opportunities in which the usual financial techniques can be exploited. It is defined as a market that manages risk *"in ways compatible with financial markets"*, or else *"dynamically, according to disciplines adapted from commodity and financial trading"*. The website carefully mentions that the weather derivatives market is *"an attractive business opportunity because weather essentially is uncorrelated with secular or systemic risk in general financial markets and provides an opportunity for diversification for traders"*. This argument is typically targeted at investors who, since Markowitz proposed his famous portfolio theory, have diversification as their first commandment. Weather is presented as a risk that

> *can be traded in ways that are common to trading generally*: *weather has volatility*[19]*, the tails of weather risk may move differently from at-the-money positions, correlations between weather in different areas converge and diverge, etc., (…) portfolios of weather risk can be managed by most of the approaches used in managing portfolios of security and commodity risk: including ratio tests, Greek parameters and Value at Risk measures*.

Second, to ensure sufficient incentives for transactions, the market should attract participants with different risk profiles:

> *We need more financial players to speculate. We have to create some kind of free-money. People work hard to do this. So I am optimistic about liquidity.* (Utility company)

> *I think the big theme still for the market place is extension (…) I think the extension of the market needs to happen in three different dimensions at the same time. We need to have expansion of the number of clearers in any individual sector,(…) you need to see a sectoral expansion, for instance: more and more end-user sectors coming in to hedge their risk in the market place. The third area is geographical expansion of the market.* (Utility company)

In June 2008, a press release celebrating the 10th anniversary of the WRMA mentions, among the conclusions of Price Waterhouse Coopers' annual quantitative study on market development, the fact that:

> *The industry also is seeing more diversity of participants with insurance companies, banks, hedge funds and end-users active in the market. As evidence of a healthy increase in the volume of end-user transactions, the survey shows that the proportion of trades reported between WRMA members and non-members rose to 90 percent for 2007-2008*.

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the insurance monopoly, and to give alternative actors opportunities to take advantage of risk transfers, by placing them in the financial markets

[19] The emphasis on the volatility of weather is one of the promoters' prime arguments, as can be seen, for example, in the presentation made by Didier Marteau for AON, in Paris in March 2008, in the book by the same author (Marteau *et al.,* 2004) and on the WRMA and MetNext websites. More volatility means more potential profits for investors in option-like instruments.

Third, the ideal market comprises *"a primary and secondary market in weather risk"*, a condition necessary to provide liquidity in the market, and hence reliable prices for weather risk :

> *I think the ideal market is one which is sort of active and liquid with a lot of activity going on because I think that is the best for pricing efficiency. I think it should be a market where the corporations use weather derivatives as a risk management tool routine, in the same way as they routinely hedge their foreign exchange exposure or their interest rate risk, that it would be a market developed to the point where it will be unusual for a company not to use weather derivatives.* (Promoter)

Finally, the vision of promoters is best summarized by one of our interviewees. Beyond describing the ideal market, according to promoters, the three above-mentioned characteristics allow to contrast the ideal financial solution against the not-wished-for alternative, that of having weather risk managed through insurance mechanisms:

> *If in the end the only solution we come up with are major insurance companies writing risk insurance that happens to help people against some of these things, that would be a very expensive way of dealing with that risk, which needs to be socialized and managed in a way that allows people to trade it and package it, because it will be much more efficient. (*Utility Company*).*

Firms and weather risk

Although weather derivatives, according to the promoters, offer features of interest to various industries seeking protection against adverse climate, the view of industrial firms in Europe reveals, by and large, indifference to the concept.

A study conducted in France, Belgium and Luxembourg, in 2006, of 53 companies chosen for the intensity of their risk management activities (Bertrand, 2007), found that 47% of the enterprises in the sample considered weather risk to have a negligible impact on their economic performance. Only 21% of the firms studied had attempted to assess this impact precisely. One, and only one, of the 53 had put in place a weather risk management strategy, but it involved, however, no financial instruments, and two others said that they might consider doing so. Outside this sample, our analysis of the annual reports of 40 French firms belonging to the market index Cac40 in 2007 provides a further illustration of most firms' lack of interest in weather derivatives. The quasi-totality of firms mention in their annual report the general impact of climate change, while 13 of them note the effect of climate conditions on their financial results. None of them allude to weather risk hedging. One of our interviewees, from a re-insurance company, regrets the situation: *"Weather risk comes 27th in the ranking of the risks usually covered by end-users. This raises questions about the priorities given to the hedging needs for different risks."*

Three reasons seem to account for the lack of interest of most firms to weather risk and/or weather derivatives. The difficulty of appreciating the exact impact of weather risk on sales comes first. For example, Vivarte, a textile group, reckons having been contacted by its reinsurance company regarding the possibility of using weather derivatives. They declined, on the basis of rather ambivalent considerations regarding their exposure to weather risk.

Although weather conditions are at the top of the day-to-day considerations of the local shops, the precise risk seems too difficult to measure:

> *There are so many other factors, such as the economic conditions, which are more important than weather. OK, weather is important on a day-to-day basis, but, in and all, bad weather does not last the whole season, and we catch up a bad week through a better one.* (General Manager)

Beyond its limited impact on results, a second reason that companies often offer, to explain why they do not hedge against weather risk using derivatives, is the price of hedging, which they generally consider too expensive. For example, in 2003, the ski manufacturer Rossignol said that the company was unable to find any "*economically sound solution to externalize weather risk*" on the market. Compagnie des Alpes, a French ski lift operator, terminated its weather derivatives contract two years in advance, on the grounds that the premium was too expensive for the protection it offered. Another end-user underlines:

> *Weather risk can really sink a business. But hedging is simply too expensive and it is very difficult to find counterparts (*A utility company)

The third reason why firms seem to remain reluctant towards the offer of weather derivatives promoters can be traced back to the peculiarity of weather risk exposure, which differs greatly from one end-user to another, and remains heavily tied to operational specificities. While energy providers are largely and clearly exposed to a simple set of meteorological conditions, most industrial or service firms present highly specific risk profiles. To them, weather risk can be associated with all possible combinations of weather events involving temperature, rainfall, snow, wind, sunlight or storms. These weather events can be extremely localized, both in space and in time. The impact of the risk of lack of snow for a given ski-lift operator for example will vary greatly from one spot to another, and from one week to another, depending on which are holiday weeks, and may also combine with additional weather variables such as wind or sun. The Chief Financial Officer of Jardiland, a company that sells plants and equipment to amateur gardeners, describes its exposure in the following terms:

> *We realize 85% of our annual sales over the week- ends of April and May. It is thus extremely important to have favourable weather conditions at these precise periods of time. We need to pay attention to the conjunction of adverse precipitation and temperature during those very week ends. The risk may be high. The effects will be highly negative if we get four bad week-end.*

Overall, the peculiarities of weather risk exposure, in terms of localization and meteorological conditions, entail a demand for close adjustment to clients' needs. Answering this demand requires extensive preparation work and competence in fine-tuned meteorological aspects, as well as a good understanding of the end-user's business, which explains why the proposed contracts remain expensive. Combined with the difficulty of measuring weather risk precisely, this explains why weather derivatives seem unappealing to many firms.

Consequently, instead of resorting to weather derivatives, many of those firms that are most conscious of their exposure to weather risk tend to turn to the operational management of weather risk, and to activity diversification. In this way, they stay closer to the core competencies of the firm, and they design strategies that they consider far less expensive. "*We*

will come to weather derivatives if the market develops" says Philippe Huet from EDF, a company where weather exposure is particularly obvious.

> *We look at the available physical resources before considering resorting to some insurance contract*[20]*…. We would rather use the agreements we have with some of our customers, be they industrial or individuals, which allow us to momentarily stop providing energy if we need to.*

The Compagnie des Alpes, which long ago reckoned its exposure to high temperatures during winter, has adapted its ski resorts. According to Eric Guilpart, its spokesman,

> *thanks to the work we do on the trails in winter but also in summer, skiers can enjoy their favourite sport on snow layers no thicker than 10 cm, where 70 cm were necessary a few years ago.We have reoriented some trails, so that the sun will not melt the snow too rapidly…. Our shareholders used to ask us questions about the way we managed weather risks: our geographical as well as activity diversification has reassured them.*

A similar view is expressed at Jardiland: *"We try to de-seasonalize our activity as much as we can. This explains why we diversify our activities by developing pet sales and Christmas decorations."*

Were climate to change drastically, as experts in global warming, for example, forecast, the people in Vivarte think that they would adapt by managing their textile collections differently.

To summarize, the market for weather derivatives is characterized simultaneously by its thinness, and by its capacity to attract media attention. Extensive press coverage, focusing in particular on highly publicized transactions, contrasts with the difficulties of the daily face-to-face between weather derivatives promoters and industrial firms seeking protection for weather risk. How do the promoters take these difficulties into account? To what extent do these difficulties account for the actual structure of the market, and the type of products that are produced in it? In what follows, we propose to analyze these questions, using the concepts of the Economy of Worth, proposed by Boltanski and Thevenot (1991/2006).

3.3 Analysis of market promotion in terms of justification

In their theoretical framework, Boltanski and Thevenot (1991/2006) picture individuals living in different *worlds,* each characterized by a specific form of evaluation ("a grammar of worth"). The coordination of many activities, including economic ones, requires overcoming potential conflicts between such *worlds*, and this can be achieved through a *justification process* involving several alternative strategies. This theoretical apparatus can be used to interpret three facets of the market for weather derivatives. First, the face-to-face between market promoters and potential end-users can be described as a situation in which the *Market World* characterized by Boltanski and Thevenot comes into conflict with the *Industrial World*, in which end-users frame weather risk and weather risk management. Second, the weather derivatives promotion process can be analyzed as an attempt to overcome this conflict, and the strategies put forward by promoters can be characterized as the search for an *agreement*, in Boltanski and Thevenot's sense. Finally, some of the most visible products developed on the market can be reassessed in new ways.

[20] Note that this potential end-user naturally thinks of protection in terms of insurance rather than financial products.

Weather derivatives: the encounter between conflicting worlds

The reluctance of industrial firms to respond to the efforts of weather derivatives promoters is perceived by the latter largely as a cultural issue. Many of our interviewees complain about industrial companies lacking the appropriate risk culture or, more crudely, showing signs of culture backwardness.

> *Firms are used to hedging against interest risk or foreign exchange risk. They use sophisticated instruments to do so, but at the same time, they do nothing about weather risk, which is of the greatest importance. This difference in approaches is truly surprising. (…) How long will it take for firms to realize that weather risk exists, and that it must be assessed and hedged* ? (Re-insurer)

> *It is like asking people who have their habits … you know, an old couple, 50 years of marriage … to change their habits on Sunday morning. Not to go to mass, or not to go shopping.* (Metnext)

> *One learns at school, one is used to manage risk … interest rate risk for example. You learn at school and you know how to do it. You have models that are operational, you are used to it … and suddenly, there is a new risk, weather risk. And it bothers everybody. Except that weather risk can sink a firm. Except that weather risk is often more important than …many other risks*. (Metnext)

Lamenting about firms' cultural backwardness does not, however, seem to provide market promoters with an accurate view of where the necessity for cultural adjustment lies in reality. It largely overlooks the existence of conflicting interests between a *Market World* and an *Industrial World* view of weather risk. On the one hand, the problem facing promoters can indeed be described as one of succeeding in bringing weather risk into what Boltanski and Thevenot characterize as the *Market World*. This requires weather derivatives to be objectively defined, and as independent as possible of the characteristics of the buyer and the seller. Success in the commodification of weather risk would in fact require it be accepted in a world in which "people are detached from one another, liberated, ready to willingly enter into any possible transaction" and where the higher common principle is competition (Boltanski and Thevenot, 1991/2006).

On the other hand, industrial firms' vision of weather risk management belongs to what Boltanski and Thevenot define as the *Industrial World*, where action is mostly seen as a task of production, and the higher common principle refers to efficiency, performance and productivity. In line with this "grammar of worth", companies tend to frame weather risk in close relation to their specific business, and define its relevance to them in operational terms. If they do it at all, they are inclined to manage weather risk by resorting to tools closely linked to their "savoir faire", and they view proposals from the financial companies as too expensive, or "not sound".

In general, more than cultural differences in mastering weather risk, we observe a gap between the specific responses demanded by the *Industrial World* and the minimum standardization required to develop a financial market. The conflict between the *Market World* and the *Industrial World* thus seems to account for most of the difficulties this market has experienced in taking off.

Promoters largely overlook this issue, and express regrets about the culture backwardness of industrial firms. In what follows, we examine how they attempt to provide solutions that are adapted to the demand stemming from the *Industrial World* framing of their

counterparts, and how they seek to involve worlds other than the *Market World* and the *Industrial World* in the debate.

The promotion process as an attempt to overcome the conflict between worlds

As their view of the lack of a 'relevant risk culture' in industrial firms shows, the ideal situation for promoters would be for end users to rally round their vision of how weather risk ought to be managed. In the terms of Boltanski and Thevenot, this would characterize a *"situation that holds together"* (2006:41), in which beings and objects all belong to the same *world*, with foreign pieces *"naturally"* rejected. Such an ideal situation however, given the *Industrial World's* perspective on weather risk, appears a remote goal.

Although the promoters do not explicitly acknowledge the existence of a *dispute,* they engage pragmatically in various attempts to reach what Boltanski and Thevenot define as *agreements* or, in other words, a reduction of the tension between *worlds.* Theoretically, two alternative approaches are available to them: *compromise* or *arrangement.* Compromising would allow them to suspend the disagreement, without settling it in only one of the worlds involved (2006: 277), and to build relationships with industrial firms on weather risk management that would be deemed "acceptable to all". A *private arrangement* in the form of a contingent and local agreement would be more fragile, and implicitly oriented toward private interests: *"You do this which is good for me; I do that, which is good for you"* (2006: 336).

The first path that market promoters adopt to overcome firms' reluctance belongs to the second of these alternatives. Somewhat paradoxically, this became clear, in our study, from our interviewees' answers to our question about the transactions they remembered as particularly striking. Following Boltanski and Thevenot, particular transactions are the kind of *tests* that the *Market World* will employ to remedy '*disputes*' within the *world* about the *state of worth;* or, in other words, contestations about the place different actors occupy in a given situation. We used questions about striking transactions as a way to understand better the *world* in which the promoters framed weather risk. With remarkable regularity, they provided us a description of transactions in which the main characteristic is the need to be finely adjusted to the specific demand from risk protection seekers.

For example, according to the documentation provided by a re-insurer,

> *As for product example, large travel agencies could buy bad weather protection, which will pay out a percentage of the travel arrangement package for every rainy day within the vacation period. A rainy day will be defined as four or more consecutive rainy hours between 10:00 and 18:00 hours, and a rainy hour means 2 or more millimetres of rainfall in one hour. This could allow the travel agency to sell a marketing package to its client, hedging them from bad weather by its use of a weather derivative.*

One interviewee cited the case of Michelin, which from the 1st November to 20th December, 2005, offered the buyers of four winter tyres a €50 credit, receivable only if the average temperature of the area they lived in remained above 7°C throughout the winter. Allegedly, this "mild winter guarantee" was covered using a weather derivative. Another cited the example of BMW:

> *There was one (weather derivatives deal) that BMW ran for its soft-top car. It's good in April, and if the weather then wasn't good enough, you got a repayment. It was a sort of promotional giving, but it's very simple for a consumer to understand.*

An expert develops a similar view as to what use weather derivatives could be to end-users:

> *This might sound a weird idea, but maybe it isn't. Weather derivatives can indeed be used as marketing tools. It's something we have been talking about. One might say, OK, imagine I am in leisure and sport retail distribution, I am a leisure and sport store, say. I make a big special offer on camping tents and I say to my customers: I will give you a refund if you were not able to use it, because the weather was too bad. For x days, in this case, we refund the article. And we use a weather derivative to cover only this.*

These striking types of transactions were supposed to typify the *world* of promoters, but they reveal instead an effort to overcome the lack of interest of targeted industrial firms, by proposing weather derivatives that closely match their specific exposure or strategy. Such deals, however, are bound to remain local, contingent and difficult to generalize. Moreover, they offer little perspective for risk takers to exchange them on an anonymous secondary financial market, where it would be almost impossible to find counterparties with such precise specific needs. In such deals, what we observe is how the promoters' efforts to enter the *Industrial World* of their would-be clients seem to lead them to abandon, at least temporarily, their initial objective of creating a liquid financial market that would be attractive to financial investors seeking diversification opportunities. To compensate, sellers of protections cash in comfortable margins justified by the sophistication of the structuring needed to adjust to clients' needs.

Overall, the development of a market characterized by fine-tuned transactions sold at high prices seems to be the path resulting from the confrontation of the *market* and the *industrial* world organized by derivatives promoters. Noticeably enough, this results in a market that resembles much more an insurance market than a financial market, the contracts themselves looking more like insurance products (against spoiled vacation or lack of use of the products bought) than financial products.

The second path that market promoters take to develop the market is more concerned with *compromising*. Facing the difficulty of dragging weather risk into the *Market World*, and probably rebuked by the lack of perspective of those solutions that leave it strongly embedded in the *Industrial World*, promoters attempt to seize the opportunities offered by the possibility of framing weather risk within other *Worlds*. The current public debate about global warming, and its consequence of a higher frequency of extreme weather events, for example, is used extensively in promoters' discourse to construct weather derivatives as a solution to a problem that may affect everybody, and thus necessitates widespread awareness.

> *Well, the price of energy is increasing and the climate is becoming more and more erratic. Actors' awareness is increasing consequently. Some people have begun to realize that climate could have an impact on their results. And thus that something had to be done, that something could be done. Some actors that were not present on the market have begun to come to it.* (Re-insurer)
>
> *Truly, with what happens in the world as regards climate, weather derivatives are certainly trendy. Everybody speaks of them. Look, I brought you this, the magazine Challenge, this morning's issue. See "hot and cold (coup de chaud et coup de froid)", firms tell what they*

have to go through. For example Go Sport, who underwent a terrible month of April due to weather conditions. (Weather index provider)

Awareness is increasing everywhere. Especially in firms. But also at individual level and at government level. At all levels, awareness increases regarding the enormous impact of meteorology on economy. Look at the rights to pollute, the Grenelle de l'environnement[21]*, which is under preparation. Everything hinges on environment and climate change. And firms are readier and readier to take that step.* (Metnext)

It is perhaps optimistic, but one feels that this context, you see, climate change, the need to adapt, all this creates a real buzz around, you know, weather risk. (Expert)

The framing strategy revealed here thus consists in trying to suspend the disagreement between the *Industrial* and *Market Worlds,* and proposes a perspective that would be acceptable to all, because it is located within the *Civic World*, where *beings all belong to a collective that includes and transcends them*" and "*the general will may be manifested through the achievement of awareness, or by a collective reflection, or in the form of mobilization around a cause.* (Boltanski and Thevenot, 2006: 192)

Global warming and the media buzz it triggers provide weather derivatives promoters with an opportunity to pursue such a strategy, but transforming general awareness into practical actions on the part of firms seems, however, to remain difficult as the results of our analysis of annual reports of the Cac40 firms illustrates.

You see, they use the argument according to which it would be socially responsible to identify and hedge the risks. It's a convenient selling argument (Potential end-user)

Spotlight transactions: a renewed interpretation

Finally, Boltanski and Thevenot's conceptualization can be used to assess the role played by those much publicized weather derivatives transactions that happen to involve international financial institutions or local authorities, rather than industrial firms. The deal signed by Axa Re, now Paris Re, and the World Food Program, to help Ethiopia hedge the risk of drought affecting its crops, is not only described at length on the WRMA website. It was also often mentioned and commented on by many of our interviewees that belonged to the category of promoters. Of particular interest is their emphasis on the efficiency of weather derivatives in "managing human catastrophe risk".[22]

What we have done is the first charity-oriented weather derivative; we dealt with the World Food Program. The idea was to cover all Ethiopia, the totality of the crops in Ethiopia, to avoid famine. In case of famine, we would have sent money to Ethiopia, to provide help. The product was to look at all the climatic zones in Ethiopia, then construct an index based on the quantity of rain in each zone, which of course is correlated with crop yields all over the country. The contract is very, very complex. There are about 30 or 35 weather stations, the contract is really complex. And then, according to the index, we pay or we don't pay. The money is sent to the WFP, before the end of the crop, before the beginning of the famine. This is preventive aid instead of emergency aid. (Re-insurer)

[21] A French government initiative to require all stakeholders to contribute to the definition of a policy for environmental protection.
[22] WRMA Website, Chapter "Great Transactions".

> (*A*) *disaster occurs, the media step in, people die on direct live TV, and the money flows in immediately. But emergency help is five times as expensive as preventive help … and less efficient. … The best way is to strike a deal, a weather derivative deal that allows money to arrive on time.* (Re-insurer)

In a similar vein, the second of the two transactions publicized on the WRMA site is justified as particularly suited for a *"mutual, (which seeks) to minimize costs to its owner-customers",* and it is deemed successful because it resulted effectively in the "*cost of power to customers remaining among the lowest in the State despite turmoil in California electricity market during this period*".

How can one qualify these extraordinary transactions, which seem to embody simultaneously the hopes of promoters of derivatives in general (Schiller (2007)), and the fear of criticism (Bryan and Rafferty (2006))? What role does the publicity given to them play in the promotion process?

Looking at the transactions themselves, Boltanski and Thevenot's framework provides a first answer, by permitting us to see them as *private arrangements,* this time between the *Market World* and the *Civic World*. The 2006 WFP-Axa Re transaction, for example, was signed in response to a tender offer from the WFP, reflecting the will of the World Bank to engage in innovative risk-transfer policies[23]. Such a transaction is of course unlikely to foster in itself the development of a liquid and active market for weather derivatives. It does, however, provide its promoters with some profits[24], and risk protection seekers with a solution that suits the type of policy they want to put in place. Moreover, from the point of view of promoters, they offer interesting publicity opportunities. Mutual advantages thus seem at first sight to typify this kind of transaction, and the *private arrangement* qualification appears equally well suited to them, as it was for most tailor-made transactions with industrial firms, although the *worlds* at stake differ. It is of interest to add that for the World Bank, such transactions resort to insurance contracts rather than financial products:

> *I know there is a debate as to whether these schemes must be seen as insurance or financial products. We, at the World Bank, prefer to see them as insurance products. It has some consequences as regards regulation and supervision (…). When you look at how the pricing is done, it has more to do with the actuarial approach than with a financial one.(World Bank end user)*

There is however more to the story, because unveiling the role played by such transactions cannot be achieved merely by describing their nature. We also need an interpretation of the publicity they are given, and an assessment of the part they play in market promotion. The use of arguments related to the common good suggests a process in line with the compromising attempts we described above. In this view, the publicity given to transactions involving the common good would be seen as an attempt to overcome the conflict between the *Market World* and the *Industrial World* by reference to the higher principles of a world alien to those two, namely the *Civic World*.

> *There was one of these meetings in New York to try and get some attention … it's not easy. I think one trend would be the use of weather derivatives by some of the sovereign and supranational organizations at very early stages,… people like the World Food Programme and the World Bank have been using weather derivatives,…. For example, in Ethiopia the*

[23] See Cummins and Mahul (2009).
[24] It should be noted here that the WFP options were not exercised, and that the deal was terminated in 2007.

crops were protected using weather derivatives…. That I think would end-carry… I think it will be accepted in the mainstream. (*Promoter*)

This contract was over publicized (….) You see the promoters utilize this as a communication tool, a way to enter new markets (End user)

Compared to the compromising attempt to use global warming as a selling argument, the emphasis on specific public good transactions, however, appears less far-reaching. Promoters can not expect that the visibility given to a few highly noticeable deals to do more than generally promoting weather derivatives and significantly impact market liquidity in the short term. A question thus remains as regards the discrepancy between the publicity given to these deals and the real impact they have on the development of the market as a whole, or their typicality as to what the usual weather derivatives really are. The answer we propose is that this discrepancy and the fascination exerted by these deals precisely stem for the way they have to bind and blend objects that belong to utterly different *worlds.* Boltanski and Thevenot characterize c*omposite setups* as situations in which people are made uncomfortable, because circumstances bring things from different worlds together, in an ambiguous manner. In such situations, the uneasiness is all the more important, as different solutions seem equally likely, and there is strong uncertainty about the state of mind of the people involved, and about the worlds to which they refer[25]. Our thesis is that the capacity of deals such as the Axa Re/ WFP one to attract attention reflects the uneasiness created by the the unusual encounter of the *Civic World* and the *Market World*, uneasiness which is evoked by some of our interviewees as follows:

Of course there was a question: " Is it possible to use a financial product to develop aid and relief, while, at the same time, in a way, enriching the financial risk takers?" But ... overall, we have had few negative comments, none from the journalists anyway. (Re-insurer)

Truly, this is a potential issue for public debate, and we discussed it openly…. But we had no real negative feedback. One of the arguments put forward by the World Bank and the WFP was that it was useful for them to be able to give a rapid response to the demand in emergency aid…. One can say it is a free market approach, a financial one, but well, nowadays, that's the dominant approach all over the world, isn't it? (Re-insurer)

Seeing those deals as composite set-ups, in Boltanski and Thevenot's sense, one perceives that their very specificity lies in the the somewhat awkward encounter between the *Market* and the *Civic Worlds*. One is also able to predict that they are likely to continue to attract the spotlight, and to trigger enthusiasm and criticism well in excess of their actual frequency and typicality.

4- Discussion and conclusion

Through their acute analysis of the commodification of risks performed by derivatives, Bryan and Rafferty (2006) discuss the role financial innovations play in fostering capitalism's ability

[25] Boltanski and Thevenot (1991/2006) give as an illustration a situation in which an operator offers a gift to the expert that came to control the productive capacities of the machine he works on, and takes the opportunity to ask the expert for a reference for his son, whom he describes as a well brought up unemployed computer specialist. This situation offers a mix of domestic and industrial world references that render it highly ambiguous.

to organize the competition "of all against all" (Thrift, 2004). They particularly emphasize the mechanism by which derivatives technically permit the instantaneous comparison of all kinds of assets across time and space.

However, we show that the extension of the financial sphere through the creation of new derivatives markets requires market promoters to be able to impose their value system on other spheres of economic action. We provide evidence of the difficulty of this process. By analyzing the way promoters of the European weather derivatives market must contest other spheres to propose and stabilize their own logic, we document the way in which risk objects are constructed and made thinkable within the financial field. Taking advantage of the particular situation offered by weather derivatives—where the objectified risk is remote from the world of finance, and involves the interaction of different spheres and different evaluative principles around the notion of risk—we demonstrate the importance of values in risk commodification.

Practically, building on Boltanski and Thevenot's framework (1991, 2006), we describe promotion of the weather derivatives market as a justification process. We document the way promoters try to extract risk from the industrial world to bring it into the market world and we show that the final market structure remains remote from the aim of its initiators. The promoters face low demand, which they attempt to overcome by offering extremely fine-tuned products, adapted to the very particular needs of their targeted customer. These solutions remain local, contingent and difficult to generalize, reflecting the fact that weather risk is not easily disembedded from the type of demand stemming from the industrial world. We characterize promoters' offers as private arrangements, where the proposed products, instead of being independent of the actors involved in the transactions, are closely related to the operations of the risk sellers, who act as purchasers of the contracts. The lack of liquidity of the resulting contracts prevents competition between promoters from developing fully. Consequently, the market we observe, characterized by personalized relationships and the weakness of competition mechanisms, is remote from the ideal pictured in the market world.

Besides, the attempts of promoters to use higher common principles from worlds alien to the market world (e.g., the civic world) lead to the creation of composite setups, in Boltanski and Thevenot's sense, of which the World Food Program is a perfect illustration. The use of civic world principles in the market world makes people uncomfortable, because it brings together things from different worlds in an ambiguous manner. The emergence of resultant hybrid practices (Miller *et al.,* 2008), in which the logics of the civic and market world sit together uneasily (Drori, 2006), is not likely to foster significantly the financial market for the more usual weather derivatives. Despite the great capacity composite set ups have to attract attention, their potential driving effect on market development is dubious.

Overall, our analysis shows that it is not easy to bridge the gap between the observed market structure and the ideal type of the market world. This leads to the prediction that the development of a successful financial market for weather derivatives may remain a remote objective. Despite several attempts at improvement over the last ten years, the market's thinness, and lack of standardization and liquidity, do not appear to be temporary problems. This suggests that the "bending and blending capacities of derivatives" (Bryan and Rafferty, 2006) may not be unlimited. We conclude that both critics and supporters of the project of finance —to commodify all types of risks and exchange them on financial markets—overstate the feasibility of commodification. Their mistake is to devote insufficient attention to the process required, and to overlook the existence of many interactive value systems, not only between the economic sphere and other spheres of action but also within the economic sphere itself.

Our findings contribute to the analysis of the process of risk commodification in several ways.

First, other analyses have already focused on compatibility between different modes of qualifying and valuing goods (Beunza and Stark, 2004; Kaplan and Murray, forthcoming; Sjögren and Helgesson, 2007; Stark, 2000). They reinforce ideas (like Zelizer, 2005) that insist on markets as cultures. But what we offer here is a precise and concrete description of a derivatives market as a meeting place between different worlds. We attribute our main results about the structuring role of value conflicts to our concentration on the process of commodification, rather than on the resulting orders. By analyzing critical tensions and creative arrangements, along the lines advocated by Thevenot (2007), we hope to make a contribution to the material sociology of market recently developed by other authors (Callon, 1998; Callon and Muniesa, 2005; Callon, Millo and Muniesa, 2007; Huault and Rainelli, 2009; Lepinay, 2007; MacKenzie and Millo, 2003; Smith, 2007). We argue that the market can be seen as a compromise between distinct logics of action, different value systems and different higher common principles. This is a new way to understand the process of risk commodification, in which the market world interacts with non-market worlds.

Second, our analysis unveils the role played by value conflicts in the structuring of the market. Two conflicts of value are of special significance for the market we observe. The first unexpectedly opposes two value systems within the economic sphere, the industrial and the market world. Thevenot (2001) points to the role played by the Arrow-Debreu presentation in explaining the lack of awareness of this internal tension among economists. By suggesting a conceptual integration, which treats production and consumer functions similarly, the mainstream economic approach to economics overlooks the idea that "the market world must not be confused with a sphere of economic relations" (Boltanski and Thevenot, 2006: 193–194). Our analysis, conversely, provides empirical support for the notion that "economic actions are based on at least two main forms of coordination, one by the marketplace, the other by an industrial order, and that each has its own way of setting up a reality test" (Boltanski and Thevenot, 2006: 193–194). The second conflict of values is less surprising and opposes market and civic systems of "worth", with their own metrics and standards of evidence. Our work shows that the obviousness of this conflict might create an optical illusion about the apparently unlimited capacity of derivatives to extend financial imperialism to all spheres of human activity. In fact, the opposite is true: we show that obviously conflicting values make certain hybrid forms of transaction highly visible, but that this visibility largely hides the atypicality and lack of driving power that characterize these transactions.

Third, our paper contributes to the on-going debate on the performativity of financial theory. We demonstrate the failure of an attempt to disentangle risk from the industrial world to promote market liquidity (MacKenzie and Millo, 2003; MacKenzie *et al.* 2007). This suggests that there may be a limit to the extension of financial theory to the objectification (LiPuma and Lee, 2005) and commodification of new risks, and perhaps some limits to performativity.

Finally, our work opens debate about the way promoters of financial markets can turn obstacles into opportunities. Our case exemplifies how the promoters of weather derivatives take advantage of the specificities of the industrial world to imagine very fine-tuned solutions for their clients, and to generate important margins. Ultimately, then, questions arise about the discrepancy between empirical reality and the rhetorical arguments given for the creation of financial innovations; the durability of this discrepancy; and its desirability for various market stakeholders.

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Table 1: Main differences between an Insurance and a Derivatives Market

	Insurance market	*Derivatives market*
Objective of the market	Protection against risk	Protection against risk Exploitation of new financial opportunities
Nature of the product	Fine-tuned solutions Heterogeneity	Objective definition Homogeneity Free circulation
Characteristics of the actors	Mutual identification (face-to-face relationships) Networks and personal recognition	Anonymity Atomicity Great number of actors (condition of liquidity)
Nature of exchange	Interpersonal	Impersonal

Table 2: Main sources

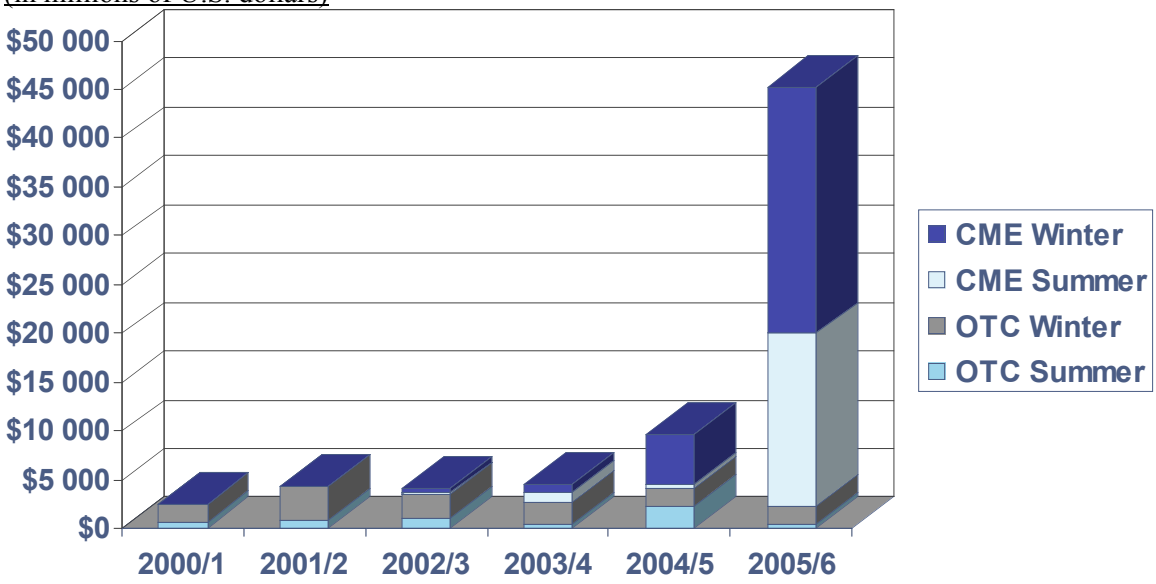
Sources	**Objectives**
Interviews	First stage: - Obtaining general information on the market - Becoming familiar with the context - Identifying actors for subsequent interviews Second stage - Exploring perceptions, representations and arguments of actors and how they try to reach an agreement.
Archival materials and websites	Confirming main events on the market Giving textual accounts of debates and discussions
Press articles (Factiva database and *Environmental Finance*)	Reconstituting main steps of development of the market to construct a chronology Focusing on representations and discourses of actors
Annual reports	Assessing how firms take weather risk management into account in their communication

Table 3: Summary of main themes and data sources with illustrations and verbatims.

Themes	Data sources	Verbatims or illustrations
Growth of the market and relative success	Interviews with promoters and economic experts	"*I am optimistic about the development of the market, because weather has a tremendous impact on the economy, generally speaking*". "*The weather derivatives market is an attractive business opportunity*"
	Press articles	Attractiveness to media Emphasis on the future growth of the market
	Books and reports (e.g.:WRMA's inquiries)	Emphasis on great transactions Statistics on the development of the market
Existence of different "worlds"	Interviews with promoters and industrial firms	*"We have to manage this risk in ways compatible to financial markets"* *"Weather is a risk that can be traded in ways that are common to trading generally"* *"We have difficulties in assessing the exact impact of weather risk on sales"* *"There are so many other factors which are more important than weather"*
	Press articles Reports	Great indifference to the concept by industrial firms
	WRMA Website	Emphasis on the volatility of weather, which means more potential profits for promoters
Emergence of disputes and conflicts	Interviews with promoters and industrial firms	*"Firms would say, oh yes, we have weather risk…but they do not do anything"* *"People have difficulty establishing a relationship between climate and finance"* *"We need contracts and solutions that are adapted to our specific business"*
Attempts to solve conflicts	Interviews with promoters	*"As for product example, large travel agencies could buy bad weather protection, which will pay out a percentage of the travel arrangement package for every rainy day within the vacation period"* *"It is perhaps optimistic but one feels that this context, you see climate change, the need to adapt, all this creates a real buzz around, you know, weather risk"*
	Press articles	World Food Program

Source: inspired by Greenwood and Suddaby, 2006: 33.

Chart 1. Total Notional Value of weather risk contracts: 2000/1-2005/6 (in millions of U.S. dollars)



Appendices

Appendix 1: List of interviews

Name	Date	Location
Jean-Christophe GARAIX, Re-insurer	May 2007, 2nd	Paris
Philippe CHAUVANCY, Index Provider	May 2007, 7th	Paris
Jean CARLE, Metnext	June 2007, 25th	Paris
Jens BOENING, Banker	September 2007, 5th	London
Christian de PERTHUIS, Expert	January 2008, 7th	Paris
Geroid LANE, Utility End-User	January 2008, 10th	London
Marcel STAEHLI, Re-insurer	January 2008 28th	Zurich
Sophie CHEMARIN, Expert	February 2008, 7th	Paris
Eric GUILPART, End-user	February 2008, 11th	Paris
Emmanuel DUROUSSEAU, Insurer	February 2008, 11th	Paris
Claude BROWN, Promoter	February 2008, 25th	London
Michael BATE, Utility End-User	February 2008, 25th	London
Jas BADYAL, Utility End-User	February 2008, 26th	London
Lionel GREEN, Utility End-User	February 2008, 26th	London
Lieven BLOYAERT, End-User	February 2008, 28h	Brussels
Antoine METZGER, End-User	April 2008, 1st	Paris
Bertrand DAVID, End-User	June 2008, 26th	Paris
Olivier MAHUL, World Bank	February 2009, 9th	Paris
Vincent REMAY, Promoter	February 2009, 4th	Paris
Brigitte LE RIDOU, Promoter	February 2009, 4th	Paris
René AID, End-User	February 2009, 9th	Paris
Olivier SORBA, End-User	February 2009, 13th	Paris

Appendix 2: List of documents consulted

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Appendix 3: Chronology of main events on the weather derivatives market

Sep-99	**First weather derivative on a standardized market in the US (CME)**
Oct-99	**Launching of a new activity dedicated to weather derivatives :** Goldman Sachs and Merrill Lynch decide to launch a new structure to attract institutional investors and to promote the weather derivatives market
Nov-99	**Koch Energy Trading launches the first bond linked to climate.**
March-00	Enron and Koch use Internet technologies to promote transparency and to boost transactions.
Oct-00	**WorldFoodProgram**. A research team from the World Bank explores the way to link climate and insurance, in order to help developing courntries.
Feb-01	**Protection of fragile economies against weather risk.** The World Bank and the International Finance Corporation take the initiative to propose governments annd firms, protection against weather risk.

Jul-01	**Six European Banks enter the weather derivatives market.**
Jul-01	**Partnership between Axa and Meteo France for the development of weather derivatives**
Nov-01	**Transaction.** ABN AMRO makes a first deal on the weather derivatives market
Dec-01	**Launching of new products**. The LIFFE launches futures based on temperature in three European cities.
March-02	**Clearing house.** Powernext considers the possibility of creating a clearing house for weather derivatives on OTC markets.
Jun-02	**Enron crisis and decline of the weather derivatives market**
Jun-02	**Societe Generale investment bank launches its first weather linked bond.**
Feb-03	**Standardization of weather contracts.** ISDA makes rapid progress in standardizing weather contracts.
Nov-03	**Transaction.** Abn Amro sells a protection against weather risk. It is based on cold temperatures in Amsterdam. The contract is sold to « Cold weather risk fund » administrators. This derivative was meant to provide support for the government-mandated fund that pays the wages of construction workers who are unable to work because of inclement weather.
Jan-04	EDF hedges against risk of storm. The product is structured by CDC Ixis Capital Market.
Jun-04	**Increase in market liquidity thanks to hedge funds.**

Nov-05	**Powernext and MeteoFrance launch temperature indices.**
Dec-05	**Hedge funds contribute to the market liquidity and to the development of the weather derivatives market.**
Ap-06	**Weather derivatives in Ethiopia.** An insurance contract is signed between the World Food Program and AxaRe
May-07	**Metnext Creation.** Meteo France and Euronext create a joint-venture specialized in weather derivatives.
Sept-07	Merrill lynch launches a protection for Italian farmers.
Jan-08	Launching of a climate index by UBS