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# **A Market for Weather Risk ? Conflicting Metrics, Attempts to Compromising, and Limits to Commensuration**

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## **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 commensuration process by which promoters try to draw weather risk into the financial world. By offering a concrete description of a derivatives market as a meeting place between different metrics, our results highlight the failure of a process of commensuration—a phenomenon not so often studied empirically in the literature—and its unexpected results.

Compared to existing research, we use the theoretical framework provided by Boltanski and Thévenot (2006) to enrich the literature on commensuration specifically as regards the different forms of agreement to which commensuration attempts can lead. Our results highlight the crucial role of a common interest for commensuration to succeed, and the conditions necessary for this common interest to occur. We conclude 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.

## **Keywords**

commensuration, compromise, risk commodification, derivatives markets, social studies of finance.

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## Introduction

Derivatives are 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.<sup>1</sup> Some authors (e.g., Bryan and Rafferty 2006; Pryke 2007) criticize derivatives for causing what they see as a radical transformation of capitalism. Others express concern about the expansion of the abstract risk metric 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 perform requires market promoters to impose a certain metric on other spheres of economic action that do not share it from the start. In this paper, we interpret the process of risk commodification as a process of commensuration (Espeland and Stevens 1998) by which market promoters try to construct a compromise across the contested values and multiple logics of action associated with a would-be financial product.

Obviously, the risk commodification process required by the creation of a new derivatives market is all the more complicated when the risk is remote from the world of finance; it then involves different groups, with different value systems, using multiple interpretations (Lounsbury 2007) and competing ways of describing risks “As they interact, the various market participants promote different event conflicting, operative agendas, each rooted in a different worldview” (Millo and MacKenzie 2009: 640; see also MacKenzie and Millo 2003). To wit, 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 2010).

Generally speaking, successful efforts at commensuration have been examined in great detail in the literature. In particular, authors have shown how moral (Quinn 2008; Zelizer 2005), cultural (Porter 1996) or even political (Carruthers and Stinchcombe 1999; Cronon 1991) obstacles have been overcome. However, while Espeland and Stevens (1998: 323) note that, “we are more likely to notice failure of commensuration than its widespread varied success,” few cases of failures have been empirically documented in the literature. As a result, there is still room for further research into the conditions necessary for commensuration to succeed, and into the characteristics of the agreement to be reached. Our objective in this paper is to highlight the failure of a process of commensuration, and its unexpected results. Our research is driven by two main questions: What are the conditions for commensuration to succeed? What form do agreements take when these conditions are not met?

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 (OTC)<sup>2</sup> markets in Europe. They are little standardized. They involve various categories of actors, each with a different value system, from the worlds

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<sup>1</sup> Derivatives markets are markets on which financial instruments (options, futures, swaps) are traded, with the aim of providing protection against market risk, i.e., the risk of variation in the price of some underlying asset. They also provide speculators and financiers with potentially lucrative investment opportunities. In December 2007, notional amounts of US\$677 trillion (that is, 12 times world GDP) were involved in over-the-counter (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).

<sup>2</sup> Over-the-counter markets are financial markets where trading occurs directly between two parties, as opposed to exchange trading, which takes place on organized exchanges.

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 commensuration, and their attempts to bring weather risk into the financial sphere. Our findings contribute to the study of the process of commensuration in several ways.

We show that the commensuration process we study runs into severe obstacles, resulting in a market structure that has been failing to develop any kind of liquidity or volume over the years of its existence. Although market liquidity can be deemed problematic for most financial products exchanged on OTC markets, the apparent inability of the market of weather derivatives simply to take off makes it a particularly interesting case study of financial innovation. Focusing on the persistence of different metrics on this market, we analyze the failure of market promoters as the failure of a process of commensuration.

Additionally, we attempt to contribute to the enrichment of the literature on commensuration by using the theoretical framework provided by Boltanski and Thévenot (2006). The perspective their framework provides allows precise characterization of the different forms of agreement to which attempts at commensuration can lead. Specifically, we show that actors of the market for weather derivatives either engage in hybrid form of transactions based on private arrangements or find themselves developing solutions that can be defined as *composites set-ups* (Boltanski and Thévenot 2006). The forms of agreement they reach do not contribute effectively to the extension of the financial sphere. In other words, the compromise that would allow commensuration to succeed is not reached.

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 show that the notion of compromise is linked to the notion of common interest and that some specific conditions are necessary for this common interest to occur. Finally, we suggest 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.

The rest of this paper is in four parts. First, we focus on the commensuration process, and the efforts associated with it. 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 commensuration 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.

## Commensuration as the construction of a compromise

### *The concept of commensuration*

As Espeland and Stevens note (1998: 316–17), commensuration is the process through which different objects, attributes or people are compared, according to a common metric. It transforms qualities into quantities and it is a way to reduce and simplify disparate information into numbers. The authors also add that commensuration is a way to standardize relations between different things, to depersonalize and to reduce the relevance of the context (1998: 321). It is not inevitable, however. As a social process (Desrosières 1990, 1998), commensuration requires lots of work and effort to accomplish, since it integrates disparate value systems, reconfigures them, establishes new interpretive frameworks (Espeland and Stevens 1998; Stevens and Espeland 2004) and, somehow, changes the world. Using a case study of law schools, Espeland and Sauder (2007) explain, for example, why rankings have permeated the legal education system, how they change perceptions, and how they “recreate social worlds.” This process has an important rhetorical aspect (Carruthers and Espeland 1991), and requires significant resources and organization, as the example of the construction of financial markets illustrates: “Commensuration makes possible precise comparisons across vast cultural and geographical that allow transactions fundamental to global markets (...) Sophisticated forms of commensuration have transformed our financial markets” (Espeland and Stevens 1998: 325–6).

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 under the guise of derivative instruments. To enter a world ideally characterized by perfect competition and liquidity, and practically defined by tradability,<sup>3</sup> they have to be objectively defined financial products. This process is best designed as a process of risk “objectification” (De Goede 2004; LiPuma and Lee 2005; Thrift 2004), a process that can be related to the concept of commensuration, where the efforts of market promoters is to align the actors on a common metric characterized by tradability. Following Callon (1998) and Callon and Muniesa (2005), 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 commensuration process will require “disentanglement” (Callon 1998: 253), by which agents and entities will have to be detached, and extricate themselves from their outside market networks of interactions, in order to enter an unmistakably demarcated “stage” (Cronon 1991; Slater 2002).

### *Overcoming the obstacles to commensuration*

But commensuration sometimes runs into severe obstacles. “Isolating objects from their context, grouping them in the same frame, establishing original relations between them (...) are all costly activities” (Callon and Muniesa 2005: 1232). This is the kind of analysis that

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<sup>3</sup> Although promoters of financial innovation rely on the assumption of perfectly competitive markets as a matrix to develop pricing and hedging models, OTC markets mostly remain illiquid and dominated by strong players. However, tradability on a secondary market is a necessity for a derivative market to provide attractive investment opportunities to financiers, and thus to exist in the long run.

Cronon (1991) offers in his famous book, *Nature's Metropolis*. Examining Chicago's relationships to its rural hinterland during the second half of the nineteenth century, and more particularly how some entities became commodities or even "futures," Cronon focuses on the concrete obstacles to commensuration that the promoters of the first commodity futures market met. The transformation of grain into quantifiable and standardized commodities encountered strong resistance from the structures they replaced or even altered. However, the emergence of technological changes such as the railroad, grain elevators, or grading systems, and the rise of the European demand for grain during the Crimean War, created problems that all communities had an interest in solving, although not all agreed on the solutions. As Cronon mentions, grain elevators and grading systems had helped transmute wheat and corn into monetary abstractions. By imposing their own order on the world of first nature, the city's traders invented a world of second nature in which they could buy and sell grain as a commodity almost independently from grain as crop. Grain lost its physicality and natural qualities and was reduced to quantifiable criteria; it was exchanged according to its market value.

In several cases, scholars have analyzed resistance and obstacles that commensuration processes have to face and overcome, because commensuration also transgresses deeply moral and cultural boundaries (Espeland and Stevens 1998: 326). Zelizer (1985) focused on the moral aspects of commensuration and analyzed how certain categories, such as children and money, became incommensurable. Building on Zelizer (1983, 1985, 2005), Quinn (2008) adopts an institutionalist approach to describe in great detail the changing secondary market for life insurance in the United States. She shows the change in product categorization (Lounsbury and Crumley 2007), and how the trade of life insurance has grown from "a scattered practice" (sacred revulsion) into a rationalized field (rationalization) and has confronted considerable moral ambivalence. From this analysis, Quinn draws implications dealing with the importance of morals in the construction of markets (Fourcade and Healy 2007; Lounsbury and Hirsch 2010). Accordingly, Weber, Heinz, and DeSoucey (2008) argue that a movement is more likely to succeed in creating a new market when it uses cultural codes that are widely shared in society or in proximate groups of potential producers and consumers. In their view, the main challenge is bridging the social distance between producers and consumers, stimulating cultural understanding among participants, and agreeing on quality dimensions that allow for the valuation of products.

Besides, the success of commensuration may depend on an "intrusive institutional apparatus" and specific organizational activities (Carruthers and Stinchcombe 1999). As standardization is a social and cognitive achievement, the role of the State can be central to catalyze homogenization and commensuration. For example, by formalizing, standardizing, pooling together large numbers of home mortgages, and guaranteeing the income stream from the pools, Fannie Mae (the Federal National Mortgage Association) makes them more liquid (Carruthers and Stinchcombe 1999: 359). In his history of quantification, Porter (1996) also examines how institutional involvement and government regulation have been necessary to the "objectification" of life insurance in the nineteenth century. Insurance was originally seen as a local problem and actuaries were supposed to calculate on the basis of dependent risk, which applies within a given company at a given time (1996: 102). Actuaries believed in their subjectivity, their own expert judgment and appreciation and not "in rates determinate upon tables of mortality." Mechanical calculation or mathematical solutions to insurance problems provoked skeptical responses. However, while Victorian actuaries did not really believe in the possibility of standardization, and of reducing their work to calculative routines, the push for objectivity came instead from Parliament and from regulatory authorities, which aimed to clear up the problem of proliferating insolvent life insurance companies. Historically, the

process by which idiosyncratic risks are pooled to be handled homogeneously appears unnatural and occasionally requiring strong state intervention.

In the cases depicted, obstacles to commensuration are often related to moral (Quinn 2008), political (Carruthers and Stinchcombe 1999), or deeply rooted cultural resistance (Porter, 1996). We observe then, building on Espeland and Stevens (1998: 332) that the difficulties “occur at the borderland between institutional spheres, where different modes of valuing overlap and conflict.” We hypothesize that the success of commensuration depends on specific historical conditions (Cronon 1991; Quinn 2008) or State intervention (Carruthers and Stinchcombe 1999; Porter 1996). But it also relies on the construction of something as a common interest, between different spheres, whose nature has to be defined more precisely.

### *The nature of the compromise involved in commensuration*

For Desrosières (1998), quantifying involves a series of explicit conventions of equivalence (Thévenot 1984), implicating comparisons and negotiations, leading to translation into numbers. It relies on compromises and something built around a common interest. Millo and MacKenzie (2009) for example show that the Black & Scholes model for option valuation was constructed as a boundary object between traders, regulators, and clearing houses. Rather than the accuracy of the method, its ability to accommodate different practices while allowing the connections between the actors to be strengthened (Millo and MacKenzie 2009: 651) seems to have played a determinant role in its adoption.

To us, these developments can be usefully related to the notion of *compromise* developed by Boltanski and Thévenot (2006). Boltanski and Thévenot (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 Thévenot 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. The reduction of tensions between different spheres can be realized through compromise, which 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 (Boltanski and Thévenot 2006: 277–8). One way of solidifying a compromise is to place objects composed of elements stemming from different worlds at the service of the *common interest*. To work out a compromise requires “finding a formulation acceptable to all.” But what is also crucial is that in a compromise, “the participants do not attempt to clarify the principle of their agreement; they are favorably disposed toward the notion of a common good without actively seeking one. This objective is achieved by seeking the general interest” (2006: 278). So, the presupposition of a common good is required in order to establish a compromise, but the compromise will not hold up if the parties involved try to move ahead toward clarification. “A compromise can be worked out more easily when it can be made to accommodate beings or qualities that are *ambiguous* in the sense that they may derive, depending on the way they are understood, from more than one world” (Boltanski and Thévenot 2006: 279). In other words, a compromise is characterized by its ambiguity and its plasticity.

In his recent book, David Stark (2009: 191–5) concurs with this view when he emphasizes the importance of misunderstanding in the process of coordination. This misunderstanding is not chaotic but structured and organized. It refers to conflicting attributions that actors make and

to multivalent entities: “The misunderstandings produced through such discordant attributions may in fact facilitate as opposed to thwart coordination among heterogeneous actors within and across organisations” (2009: 192). Quoting Galison (1997: 804), Stark also notes that because the interactions are based on incompatible valuations and understandings of the objects exchanged, exchange can take place without reducing the diversity of cultures.

This follows Boltanski and Thévenot (2006: 336) who argue that trying to stabilize a compromise by giving it a solid foundation may shatter the compromise and shift it back into discord. “The compromise will no longer look like an agreement among all parties in view of a common good, but like a circumstantial agreement among people who get along well together.” Attempts to reach a general interest allow compromise to be something other than a local, or bilateral agreement, in which people make concessions to one another. Otherwise, the solution is 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). The term “private” refers to something that ignores the common good. In such a case, a compromise is reduced to a private arrangement that benefits the parties involved. The unspecified common good at which a compromise is aimed, is reduced to an interest (2006: 338), which makes generalization difficult.

Building on the literature on commensuration enriched by Boltanski and Thévenot’s theoretical framework, we analyze in this paper the way market promoters try to construct a compromise across multiple logics of action associated with a financial product and appeal to the notion of common good. We highlight the failure of the process of commensuration—i.e., the persistence of different metrics—and its unexpected results in terms of the construction of a compromise.

## **Methodology**

Our research is based on an in-depth qualitative study of the emergence and 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, their metrics, their arguments, and their own interpretation. We focus on the modes of commensuration by which the promoters of the market try to establish relations between spheres of action, produce agreements, and coordinate their actions. 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<sup>4</sup>. 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 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

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<sup>4</sup> Although a market for weather derivatives exists in the United States, for the most part it 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.



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; Ravasi 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 individuals for subsequent interviews. Later, we selected our informants theoretically, on the basis of our main research questions and interests. We focused our attention not only on promoters of the market, but also on potential end-users, to deepen our understanding of the tensions between the different spheres, and 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 were 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 six main questions areas: 1) the goal of the market for the interviewee; 2) interviewees' representation of the market, of its different stakeholders, of cultures of risk; 3) their opinion of weather risk management; 4) the most important events they remember about the development of the market; 5) the most significant or innovative products they 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 the interviews involved the two researchers of this 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)<sup>5</sup>. 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. They were useful to assess how market promoters "understood and organized their world" (Lounsbury and Crumley 2007: 998).

### *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

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<sup>5</sup> The goal of the WRMA is to serve the weather risk industry by providing forums of discussion and information.

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).

### *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. The appendix 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 financial vision. We initially conducted an analysis of these accounts, and identified the sentences commonly used by these actors to justify their activity. We identified an initial set of narratives, reviewed them, 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 regarding commensuration. 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 actors’ views and logics 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 through compromise.

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.

## Case study

### *The market for weather derivatives: history and development*

The birth of the market for weather derivatives is usually considered to have taken place in 1997. At present, the principal actors involved are 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 the WRMA, founded in 1999 by leading participants in the market<sup>6</sup>, and which aims to develop 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. Weather risk can be expressed in terms of temperature, precipitation, snowfall, wind or any other measurable variable. The amount of the payment received by buyers is determined by their sensitivity to adverse change in the weather. It is important not to confuse weather derivatives with securities such as Cat (catastrophe) Bonds. The latter trigger payment only if a major event occurs, such as a hurricane or an earthquake, 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.

The market for weather derivatives began in the autumn of 1997, with a few private transactions in the United States involving a transfer of weather risk between private counterparties. 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 in May 2007 resulted in the creation of MetNext, a Euronext-Nyse and Météo 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 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 OTC European market may take sophisticated forms.

Since 2001, the evolution of the market has been measured by a yearly survey conducted by Price Waterhouse Coopers for the WRMA. The available data for the period 2001–6 are summarized in Figure 1.

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<sup>6</sup> Of course, given the nature of the WRMA, which aims to promote weather derivatives, this source of information has been used with due precaution.

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INSERT FIGURE 1 ABOUT HERE

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The total value of trades reported in the 2005–6 survey is US\$45.2 billion, compared to US\$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 2006–8, 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 US\$19 billion in 2006–7, and rose again, to reach US\$32 billion in 2007–8<sup>7</sup>. 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,<sup>8</sup> 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 (Barrieu and Scaillet 2009).

*Behind the scenes: incommensurability between different metrics?*

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<sup>9</sup> reveals that weather derivatives, which represented less than 0.005% of the total world derivatives markets,<sup>10</sup> 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.

*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 or in the management of public events. Insurance products, however, are *not* what the promoters of weather derivatives want to develop. Their effort consists of 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 WRMA’s website<sup>11</sup>.

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<sup>7</sup> A recent press article gives a figure of \$15 billion for the period 2008-2009.

<sup>8</sup> 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.”

<sup>9</sup> We simply counted the articles in Factiva for two requests: financial derivatives on the one hand, and weather derivatives on the other hand.

<sup>10</sup> Measured in notional amounts.

<sup>11</sup> 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. However, he 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 two 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,<sup>12</sup> 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.<sup>13</sup>

Second, the ideal market comprises “a primary and secondary market in weather risk,” 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)

It should be noted that, by allowing for the re-trading of derivatives, the existence of a secondary market not only enhances pricing efficiency but also offers attractive investment opportunities to financiers in quest of liquid vehicles for their money.

Finally, the vision of promoters is best summarized by one of our interviewees. Beyond describing the ideal market, according to promoters, the two 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

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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.

<sup>12</sup> 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.

<sup>13</sup> WRMA website, chapter “Trading Weather Risk”

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 by and large reveals indifference to the concept.

In 2006, a study conducted in France, Belgium, and Luxembourg 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 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. In their annual reports, the quasi-totality of firms mention the general impact of climate change, while 13 of them note the effect of climate conditions on their financial results. None of them, however, allude to weather risk hedging.

Three reasons seem to account for the lack of interest most firms show in 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.

The third reason why firms seem to remain reluctant to take up 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 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, while on the other hand, industrial firms never mention the tradability of weather risk hedges as a desirable feature of the instrument. 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 look at the available physical resources before considering resorting to some insurance contract<sup>14</sup>... 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. (Utility company)

...thanks to the work we do on the trails in winter but also in summer, skiers can enjoy their favorite 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. (Spokesman of a ski lift operator company)

Generally speaking, the reluctance of industrial firms to respond to the efforts of weather derivatives promoters is perceived by the latter largely as a cultural issue.

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 firms' cultural backwardness, however, does not seem to provide market promoters with an accurate view of where the necessity for cultural adjustment lies in reality. It overlooks the crux of the conflict at stake: while protection seekers look for sound solutions in line with their operational business, weather derivatives promoters propose a solution whose characteristic feature is tradability. Drawing on Boltanski and Thévenot (2006), we propose to define this face to face between promoters and industrial firms as the encounter of two different worlds. In their approach to weather risk management companies tend to refer to a *grammar of worth*, which Boltanski and Thévenot define as that of the *industrial world*, where action is mostly seen as a task of production, and the *higher common principle* refers to efficiency, performance and productivity. Namely, because of the peculiarities of weather risk exposure, industrial firms 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

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<sup>14</sup> Note that this potential end-user naturally thinks of protection in terms of insurance rather than financial products.

will be especially suspicious towards proposals from the derivatives promoters that could be deemed as too expensive, or “not sound.”

Facing them, what derivatives promoters try to do is to disentangle weather risk management from insurance mechanisms and bring it into what Boltanski and Thévenot characterize as the *market world*. What they indeed try to do is to produce derivatives that would be sufficiently independent of the characteristics of the buyer and the seller, to be resold on a secondary market. In their perspective, success in the commodification of weather risk requires it to be accepted in a world, in which “people are detached from one another, liberated, ready to willingly enter into any possible transaction” (Boltanski and Thévenot 2006). To understand the implications of their attempt, it is of interest to reckon that the needs expressed by industrial firms could very well be handled through insurance mechanisms. 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 and the risk protection seeker 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 supposes that weather risk becomes quantified according to the value scale of financial risk management methods such as models from the Black and Scholes family for example. This in turn requires the goods exchanged between risk takers and risk sellers to be defined in such a way that the risk takers will be able to resell them on a secondary market whenever they wish. This possibility -which we call tradability thereafter- is essential to provide “liquidity,” a notion encompassing a mechanism by which an accurate and transparent price for each product exchanged can be produced (Grossman, Luque and Muniesa 2008). Although ideal liquidity is seldom reached on OTC markets, sufficient liquidity is essential for investors to be able to sell as easily as possible what they previously bought. Table 1 synthesizes the main differences between the different metrics and conception of weather risk management involved in insurance and derivatives markets.

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INSERT TABLE 1 ABOUT HERE

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In what follows, we propose to analyze the efforts of weather derivatives promoters as an attempt of commensuration through which weather risk would be quantified and managed according to the metrics of financial risk management methods, of which tradability is a distinctive feature. As this metrics enters in conflict with that borne by the view industrial firms have of weather risk management, we contend the process by which promoters try to achieve commensuration can be studied as a process of compromise building in Boltanski and Thévenot’s sense.

In the next section, we examine how promoters attempt to come to an agreement with the industrial world framing of their counterparts, and how they seek to involve worlds other than the market and the industrial worlds in the debate.



## *The efforts of commensuration as attempts to reach a compromise*

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. Their efforts of commensuration aim to drag weather risk into the financial sphere and to align the actors on a common metric characterized by financial risk management quantification and tradability. Such a situation however, given the firms' perspective on weather risk and the different conceptions at stake, appears a remote goal.

To remedy this problem, promoters attempt to reduce the tension between different spheres of action, trying to integrate different value systems and to establish new interpretive frameworks, building on agreements. More specifically, in order to put their metric forward, promoters appeal to social and societal justifications that can be linked to a kind of common interest. They refer to different value systems belonging to different worlds, a process which can be related to the notion of compromise in Boltanski and Thévenot's sense.

### *Compromise?*

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.

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. (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*,<sup>15</sup> which is under preparation. Everything hinges on environment and climate change. And firms are readier and readier to take that step. (Metnext)

The framing strategy and the efforts of commensuration revealed here consist of attempts 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." (Boltanski and Thévenot 2006: 192)

Global warming and the media buzz it triggers provide weather derivatives promoters with an opportunity to pursue such a strategy and to accommodate different views around a common interest. However, transforming general awareness into practical actions on the part of firms seems to remain difficult. This strategy does not work, as the results of our analysis of annual reports of the Cac40 firms illustrates. Although firms recognize the reality of climate change,

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<sup>15</sup> A French government initiative to require all stakeholders to contribute to the definition of a policy for environmental protection.

and, for some, the risk it involves for their business, this does not translate into their adhering to weather derivatives as a solution. Indeed, the use of global warming arguments by promoters is often denounced by potential end-users and industrial groups as being in the interests of the financial sphere and as a rather crude argument:

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)

Instead of melting the interests of different parties, global warming justification is unmasked as serving the interests of promoters only. This unwanted clarification emphasizes the failure of promoters to build something ambiguous enough to encompass their interests into something that would appear as transcending them.

Besides, references to the civic world can also be observed in those much-publicized weather derivatives transactions that happen to involve international financial institutions or local authorities, rather than industrial firms. The deal signed in 2006 by Axa Re, now Paris Re, and the World Food Program<sup>16</sup>, 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 by many of our interviewees who fell into the category of promoters. Of particular interest is their emphasis on the efficiency of weather derivatives in “managing human catastrophe risk.”<sup>17</sup>

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. 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 preventative aid instead of emergency aid. (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.” This 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, 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,” according to its promoters.<sup>18</sup>

The use of arguments related to the common good suggests a process in line with the efforts towards compromise we described above. Compared to the attempt to use global warming as a selling argument, it however, appears less far-reaching. Promoters can probably not expect a few deals, however visible they are rendered, to do more than generally promote weather derivatives.

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<sup>16</sup> Technically, the derivative was a call option on precipitation converted in crop-water stress that would trigger if crop-water stress attained a pre-specified level.

<sup>17</sup> WRMA website, “Great Transactions.”

<sup>18</sup> The deal consisted of a “collar” on precipitation, where the SMUD received a payment should precipitation be less than a certain threshold and made a payment should it be above a second.

The discrepancy between the publicity given to these deals and their typicality, in terms of what constitutes the “usual” weather derivatives, along with the general ability weather derivatives have to attract media coverage, however, raise questions. We argue that the fascination exerted by these deals stems from the way they try to bind and blend objects that belong to utterly different worlds, leading to situations that Boltanski and Thévenot characterize as *composite setups*; i.e., situations in which people are made uncomfortable, because circumstances bring things from different worlds together<sup>19</sup>

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)

We contend that the visibility given to such deals actually reflects the perception of incommensurability between the worlds they bring together. In that perspective, the ability these deals have to attract the spotlight, and to trigger enthusiasm and criticism well in excess of their actual frequency and typicality provides insights into the role of ambiguity clarification in compromise building. While *composite set-ups* unambiguously bring together worlds that are perceived as incommensurable, they generate a need for clarification. For uneasiness to be alleviated, actors have to agree on which of the worlds in presence should overcome. Compromise on the other hand, can only be built by reframing the conflict between worlds within a perspective where they do not appear so clearly anymore, an objective that weather derivative promoters seem to find difficult to attain.

### *Private arrangements*

The second path that market promoters adopt to overcome firms’ reluctance and to pursue their efforts of commensuration belongs to what Boltanski and Thévenot call *private arrangements*, i.e., contingent and local agreements, oriented toward private interests. Somewhat paradoxically, this became clear, in our study, from our interviewees’ answers to our question about transactions they remembered as particularly striking. 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 two or more millimeters 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.

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<sup>19</sup> Boltanski and Thévenot (2006) give as an illustration a situation in which an operator offers a gift to the expert who comes 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 bizarre.

One interviewee cited the case of Michelin, which from November 1 to December 20, 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 about the 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, oriented toward private interest and, as such, difficult to generalize. More importantly, 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 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 worlds organized by derivatives promoters. Noticeably enough, this results in something that resembles an insurance market much more 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. Once again, the result of promoters’ efforts to integrate different value systems can be seen as forms of agreement that do not resemble the compromise necessary for commensuration to occur.

Our case study illustrates how certain forms of agreement, namely *private arrangements* and *composite set-ups*, arise in certain conditions from unsuccessful commensuration efforts. Market promoters tried to rally the other actors around their vision, to foster their value system and their metric on other spheres of action. But instead of achieving compromise where different views could be accommodated in a plastic and ambiguous manner, promoters’ solutions remain either too explicit—composite set-ups—or too local and difficult to generalize -private arrangements-. Weather risk remains embedded in the industrial world and the market we observe, characterized by personal relationships and tailor-made solutions, is remote from the ideal pictured in the financial sphere. Resembling more an insurance market, it seems bound to remain thin, offering little tradability and few investment opportunities for financiers in the search of new risks to bet on.

## Discussion and conclusion

In this paper, we have analyzed the attempts to develop a weather derivatives market in Europe as a commensuration problem. While several significant studies of the commensuration literature focus on moral issues (e.g. Healy 2004; Quinn 2008; Zelizer 1983, 1985), our case study documents the problem of reconciling different worldviews stemming rather from cognitive value systems, an issue which echoes to the work of Porter (1996) and Cronon (1991) among others. We depict promoters of weather derivatives as trying to impose a metric, which would allow them to develop a financial market, where derivatives would be easily tradable on a secondary market and thus offer investment as well as hedging opportunities. In their effort, they are confronted with the worldview of industrial firms, which does not readily welcome the financial metric. For the objectives of market promoters to be reached, an agreement must be found which requires the integration of competing cognitive systems and the establishment of new interpretive frameworks.

Using Boltanski and Thévenot's lens, we proposed to see the commensuration problem of the weather derivatives market promoters as the search for a *compromise*. From this theoretical framework, we derive that the necessary condition for an agreement to arise between market promoters and their would-be customers is the social construction of a problem, which solution could be seen as serving a *common interest* despite conflicting worldviews. The steps weather derivatives market promoters take in that direction are attempts to present financial weather derivatives as a sound and responsible solution to the general threat of global warming or as a particularly efficient response to common good issues -such as the struggle against famine or the well being of citizens using a public service-. However, these attempts do not allow them to build the desired compromise with industrial firms.

What seems to characterize this lack of success is the visibility of the promoters' maneuvers, which echoes with two important notions that can be drawn from Boltanski and Thévenot's framework. First, clarification is the enemy of compromise, which requires parties involved to avoid making things explicit, and to nurture enough ambiguity to accommodate beings and qualities that may derive, depending on the way they are understood, from more than one world (Boltanski and Thévenot 2006). Clarification avoidance is thus a central mechanism of compromise building. Second, ambiguity in commensuration issues can only be created and sustained, if actors recognize that the solution they are proposed provides, however ambiguously, a response to a problem of common interest to the various parties. The search for a compromise can then be seen as a search for a solution to this problem, and ambiguity is a means to allow this compromise to hold, despite preexisting value systems or cultural codes. Our case study documents the difficulty met by promoters in constructing a *common interest* problem, of which secondary market tradable weather derivatives could be seen as a solution. Finally, we find that the attempt to reach a compromise, when it fails, might produce agreements that take the form of *private arrangements* and *composite set ups*.

We think our case study contributes to enrich the literature on commensuration in three directions. First, we document a case of failure, whereas a significant part of the literature concentrates on how commensuration difficulties have been overcome. Second, our evidence shows that conflicting cognitive worldviews might pose the same kind of difficulties as differing moral attitudes when it comes to the construction of new markets (see also Millo and Mac Kenzie 2009). Although in our case study actors are much less at odds than in the second market for life insurance (Quinn 2008) or in the organs transplant industry (Healy, 2004), commensuration issues occur and appear to be quite intricate. Finally, the use of Boltanski & Thévenot's framework to account for our case study allows us to identify a few mechanisms

that seem to condition the success of commensuration and to highlight the characteristics of the agreement to be reached. It gives us insight on the kind of dynamic processes at stake in commensuration situations, that we think can be used to reread previous studies on commensuration.

Generally speaking, commensuration issues can be defined as stemming from the uneasy encounter of seemingly irreconcilable worldviews, be they moral or cognitive. Some of the purest illustrations are documented in the literature on morals and markets, picturing for example the uneasiness created by the commodification of human organs -think of “the uncomfortable image of paying cash for a warm kidney”- (Healy 2004: 345) or the sale of life insurance owned by HIV positives in the midst of the AIDS epidemics (Quinn, 2008).

The efforts of commensuration promoters can therefore be understood as an attempt to drag this type of situations away from their composite set-up configuration, to put it in Boltanski and Thévenot’s words, and reach what these authors call a *compromise*.

Interestingly enough, in our case study, *composite set ups* do not appear from the scratch. They are not part of the initial situation faced by financial promoters. Rather, they result from a failed attempt of their part to overcome what they identify as a cultural conflict and which we describe as cognitive differences in the interpretation of what weather risk is and the way it should be managed.

As noticed in Boltanski and Thévenot, the social construction of a *compromise* requires commensuration promoters to avoid the direct confrontation of conflicting *worlds*, for instance by referring to alternative worlds. In Quinn (2008) for example, the notion of “rationalized reconciliation” can be seen as a resort to the *market world*, which permits to overcome the “ghoulish” elements of the secondary market for life insurance. What we learn from our case study is that not any world can be dragged into the situation, lest promoters find themselves creating new *composite set ups*, which although highly visible (and visible because they are composite set ups<sup>20</sup>), do not help them advance the commensuration process in the least (see also Healy 2004).

Along the road that separates *composite set-ups* from *compromises*, *private arrangements* might arise, where the clash between the initially conflicting worldviews is momentarily suspended and various actors involved in the commensuration issue adopt local solutions. A question then arises as to whether these private arrangements do pave the way for later compromise or emphasize the limits put to the ambition of commensuration promoters. For example, Quinn (2008) depicts how contingent agreements (called viaticals) were struck between entrepreneurs willing to sell life insurance on a secondary market and individual HIV positives at the second phase of the development of the market, taking the form of what the author calls “consumerist consolation”. These, she argues, have paved the way for the notion that “offering up one’s death for the speculation of strangers in exchange for cash, is increasingly acceptable in America” (Quinn 2008: 776). The private arrangements born in the midst of the AIDS epidemics “led to a widespread recognition of life insurance as something to be traded” and to the development of a more general, rationalized and securitized market. Healy (2004: 342), for his part, also describes situations that Boltanski and Thévenot’s framework would recast as private arrangements where disguised payments, benefits and gifts are made to donor families in the organ transplant industry. He although notices that, “programs such as these could make those who have already struggled to accept organ

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<sup>20</sup> Quinn, (2008: 742) notices that "press coverage of the industry is saturated with the conception" she calls "sacred revulsion", and according to which life insurance policies should be sanctified as a thing "worthy to be protected from the market place."

donation uncomfortable about it again” -thus bringing back the notion of composite set-ups as the result of commensuration efforts- and concludes that markets do not inevitably win out. Our conclusions about the ability of *private arrangements* to facilitate the building of later compromises are more in line with Healy’s conclusion than with Quinn’s. Building on Boltanski and Thévenot, we argue that the notion of *common interest* is crucial to understand these diverging results. Whatever the moral or cognitive conflicts at stake, the key to the building of a compromise seems to lie in the recognition by various actors that the solution proposed provides a suited answer to a problem of common interest. What Healy’s and our work show is that when the double occurrence of such a problem and its challenging solution is not supported by large trends in socio economic conditions such as the AIDS epidemics (Quinn 2008), the problem posed by the dependence of families on the income of the husband breadwinner at the end of the 19<sup>th</sup> century (Zelizer 1983), or others (Carruthers and Stinchcombe 1999; Cronon 1991), it is more difficult for promoters to succeed in the social construction of the conditions necessary to build a compromise. In our case study, ambiguity over the interests served by the proposed solution lacks and uneasiness remains, because conflicting actors have not enough common interest to sustain the former and look for astute ways to discard the latter. The idiosyncrasy of weather risk cannot in itself account for the failure we document since this feature was shared and later overcome in the case of home mortgages (Carruthers and Stinchcombe 1999) or life insurance at the beginning of the industry (Porter 1996). The ability to meet specific historical or social conditions therefore seems to play a role in the success or failure of commensuration, a dimension that, noticeably enough, does not seem to have attracted much academic literature.

To wit, using Boltanski and Thévenot's framework, we show that having one metric overcoming the others requires this metric's promoters to enter into compromising. Documenting their failure, we provide insights into what seems to be a necessary condition for a genuine compromise to be reached. Enriching the literature of commensuration, we argue that the triumph of a given metric over others is facilitated when this metric appears as providing a solution to a problem common to various parties and as plastic enough to meet the specific needs of these various parties.

Overall, we demonstrate the failure of an attempt to commensurate a risk that remains remote from the world of finance, and the difficulty of disentangling it from the industrial world to promote market activity. This suggests that there may be a limit to the extension of financial theory to the objectification (LiPuma and Lee 2005; Huault and Rainelli 2009) and commensuration of new risks. We concur with Healy (2004) who asserts that markets do not inevitably succeed and that there is no slippery slope towards commodification. We conclude that there are limits to the thesis of financial theory, according to which all kinds of risks can be transformed into financial risk at any time (Shiller 2003), and exchanged on financial markets regardless on any social or historical conditions.

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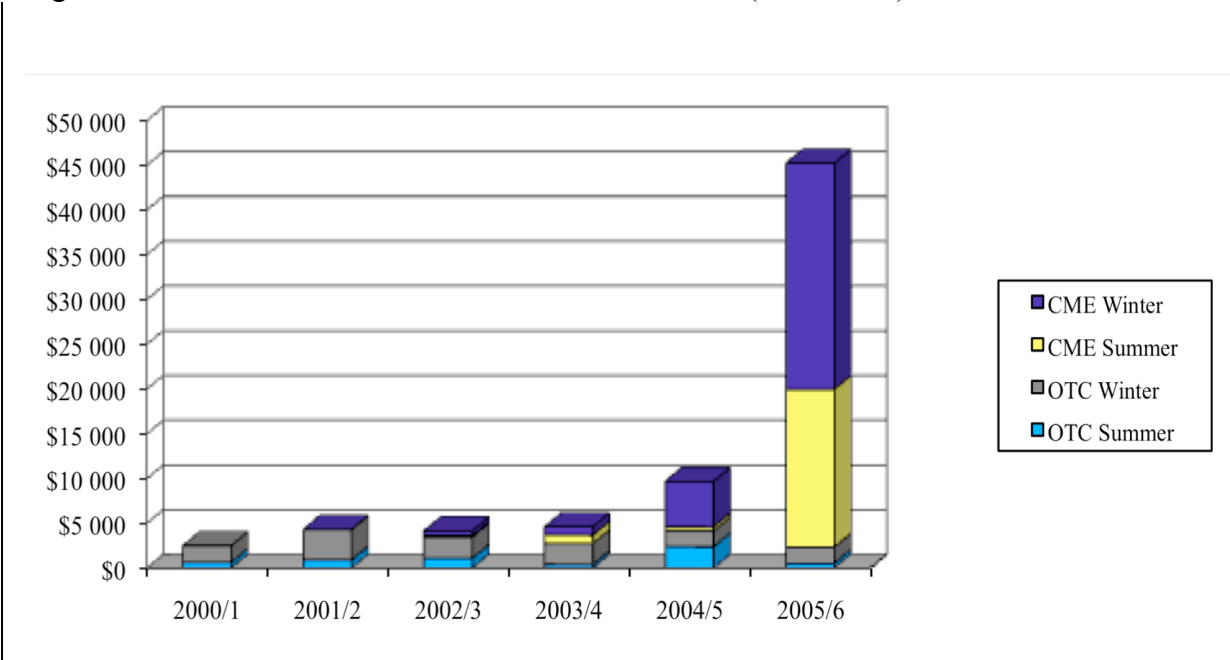
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Table 1: Main differences between an insurance and a derivatives market.

	<i>Insurance market</i>	<i>Derivatives market</i>
<i>Objective of the market</i>	Protection against risk	Protection against risk Exploitation of new financial opportunities
<i>Nature of the product</i>	Fine-tuned solutions Heterogeneity	Tradable on a secondary market irrespective of the nature and tradability of the underlying.  Sufficiently objective definition to allow for re-trading on a secondary market.  Sufficient homogeneity to allow for re-trading on a secondary market.  Has volatility, is uncorrelated with other financial assets, can be managed like other financial assets to pursue hedging or arbitrage strategies Free circulation
<i>Characteristics of the actors</i>	Mutual identification (face-to-face relationships)  Networks and personal recognition  Monopoly on insurance products	Actors with different risk profiles  Great number of actors
<i>Nature of exchange</i>	Interpersonal	Sufficiently impersonal for tradability on a secondary market to remain possible

Figure 1 : Total notional value of weather risk contracts (2000-2006) in \$US millions



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

September 1999	<b>First weather derivative on a standardized market in the US (CME)</b>
October 1999	<b>Launching of a new activity dedicated to weather derivatives:</b> Goldman Sachs and Merrill Lynch decide to launch a new structure to attract institutional investors and to promote the weather derivatives market
November 1999	<b>Koch Energy Trading launches the first bond linked to climate</b>
March 2000	Enron and Koch use Internet technologies to promote transparency and to boost transactions
October 2000	<b>World Food Program</b> A research team from the World Bank explores the way to link climate and insurance, to help developing countries
February 2001	<b>Protection of fragile economies against weather risk</b> The World Bank and the International Finance Corporation take the initiative to propose governments and firms protection against weather risk
July 2001	<b>Six European banks enter the weather derivatives market</b>
July 2001	<b>Partnership between Axa and Meteo France for the development of weather derivatives</b>
November 2001	<b>Transaction:</b> ABN AMRO makes a first deal on the weather derivatives market
December 2001	<b>Launching of new products:</b> LIFFE launches futures based on temperature in three European cities

March 2002	<b>Clearing house:</b> Powernext considers the possibility of creating a clearing house for weather derivatives on OTC markets
June 2002	<b>Enron crisis and decline of the weather derivatives market</b>
June 2002	<b>Société Générale investment bank launches its first weather-linked bond.</b>
February 2003	<b>Standardization of weather contracts:</b> ISDA makes rapid progress in standardizing weather contracts
November 2003	<b>Transaction:</b> 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.
January 2004	EDF hedges against risk of storm. The product is structured by CDC Ixis Capital Market
June 2004	<b>Increase in market liquidity thanks to hedge funds</b>
November 2005	<b>Powernext and MeteoFrance launch temperature indices</b>
December 2005	<b>Hedge funds contribute to the market liquidity and to the development of the weather derivatives market</b>
April 2006	<b>Weather derivatives in Ethiopia:</b> an insurance contract is signed between the World Food Program and AxaRe
May 2007	<b>Metnext creation:</b> Meteo France and Euronext create a joint-venture specialized in weather derivatives



September 2007	Merrill lynch launches a protection for Italian farmers
Jan-08	Launching of a climate index by UBS