

# An Analysis of the Risk Management in the Case of Terrorism

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*The management of crises caused by terrorist attacks proved an insufficient capacity of the governments to manage extreme risks in most of the recent cases. After the '90s, the philosophy of terrorism changed and it therefore requires immediate governmental intervention. The mega terrorism that occurred on the private insurance markets triggered the loss of the functionality character. A financial analysis of the terrorism processes, considered as catastrophic risk, by using the risk theories, risk management and financial risks is proposed. This kind of analysis should include the specific aspects of the terrorism processes. Also, an insurance system based on the public-private partnership against the catastrophic risk is proposed. It will be demonstrated that the main problem is the assessment of risk in the very low demand for this type of risk coverage.*

**Key words:** terrorism, risk management, governmental intervention, insurance, public-private partnership

## Introduction

The events of September 11<sup>th</sup> and March 11<sup>th</sup> have determined participants in insurance and reinsurance markets to drastically re-evaluate their estimates of potential insured property losses from terrorist attacks. In order to analyze the dynamics of the insurance-reinsurance market response (a possible explanation for the significant flows of new capital directed to the reinsurance industry) it is necessary to discuss the terrorism risk in the context of risks normally handled on the insurance/reinsurance markets, the role of the government in resolving insurance/ reinsurance supply problems related to terrorism and the general principles that a government terrorist program should adhere to and provide a critical view on the present inefficiency of the proposals on this market.

The evaluation of alternative forms of governmental intervention implies an analysis of the factors which motivate them. The theory provides the evaluation background of the specific market dysfunctions that motivate the intervention. In this paper is proposed a comparative analysis of different forms of governmental intervention. It is important to combine economic theory instruments with the insurance industry and with the government, because, sometimes it is suggested that there are many differences between the economic theory and institutional structure; the economic theory shows that the assumptions are in conflict with the institutional reality. Institutions frequently seem to act independently from economic objectives. In this paper, the analysis strategy begins from the analogy between the insurance markets of terrorism and of natural calamities.

In the specific literature there are intense discussions about the management of the catastrophic risk.

The potential loss caused by catastrophes requires a specific capacity of the insurance market; the market seems to be insufficient. An example could be the failures on the insurance market after the major natural disaster: hurricane Andrew. The hurricane Andrew caused losses which were less than the established average estimates of each day: the catastrophic events brought out losses of 100 billion dollars or more to the insurers, which can cause the collapse of the insurance market. The ART transactions (alternative risk transfer) appeared, as an instrument for avoiding the collapse was necessary. These transactions appeared at the same time because of the increasing number of catastrophes at the end of the 80's and at the beginning of the 90's. These transactions transferred the catastrophic risk to investors by means of the insurance market. An important segment of the papers published on the subject of the catastrophic risk management focuses on ART and their potential of covering the catastrophic risk (Lewis, Murdock, 1999).

The role of the government in managing (reducing and covering) the terrorism risk has grown after 9/11. This development was required by the fact that the insurance companies from all over the world cancelled their insurance policies with the companies of air transport and with the airports. The terrorist attacks from New York and Washington have caused a reconsideration of the exposure to losses in air traffic, as the insurance companies were compelled to offer coverage for all these events. The aircrafts without sufficient coverage of the obligations were not allowed to take off, and the air traffic was in danger of ceasing its activity. Confronted with this scenario, many governments offered state guarantees for the airline companies of those countries. Many states participate, in different ways, at settlements, introduced for covering the risk of terrorism, for dividing the risk. This led to political debates which considered the advantages and the disadvantages of the governmental intervention in these states in the insurances industry for the risk of terrorism (Priest, 1996).

Finally, the problems of the protection against natural catastrophes (as demonstrated by the floods of August 2002 in Europe) concern not only the type of supply, but also the type of demand. The floods of August 2002 in Central Europe proved that the problems of the catastrophic risk management did not occur only from the point of view of the offer, but also from the point of view of the demand for covering the losses. One can notice that just a few of the victims of the floods had an insurance against these losses and, moreover, in Germany, the density of insurances against this kind of hazard was very low (Schwartz, Wagner, 2002). As a result, the political strategists took into account the development of the bases for compulsory insurance against fundamental risks such as floods and storms.

### **Terrorism risk vs. natural catastrophic risk**

The distinctive characteristic of the two forms of extreme risk (natural disasters and terrorism – both accompanied by considerable losses) refers to the uncertainty caused by the human intervention. The actuarial methods of evaluating the risk of terrorism are not developed enough in the field and represent an objective for subsequent research;

the effect created by the interdependence of the terrorism risk will also be analyzed through the general pattern of interdependent security.

The effects of extreme natural disasters such as hurricanes, typhoons, floods and earthquakes represent a serious threat to human life, properties, local communities and the economic growth of the entire nation.

The considerable damage caused, among others, by hurricane Andrew in Florida in 1992, by the Northridge earthquake in California in 1994, by the Kobe earthquake in Japan in 1995, by the Kocaeli earthquake in Turkey in 1999, by the Lothar and Martin storms in Europe in 1999, the Bleuj and Gujarat earthquakes in India in 2001, the tropical storm Allison in the USA in 2001, the floods in Germany in 2002, the tsunami in Indonesia in 2004, hurricane Katrina in the USA in 2005, all these have challenged the capacity of the insurance and reinsurance market and underlined the decreasing possibilities of covering the catastrophic risk.

Because of the increasing number of natural disasters which occurred during the last years, the risks triggered by the constant interaction between human activities and the environment are diverse, varied and often catastrophic because of their consequences. The development of a crisis plan, with specific targets as a response to the strategy, needs proactive contributions from the economic national and international players involved: governments, public officials, international organizations, financial institutions and private entities.

The nature of the risk, the probability of loss, and the possible amount of the damage and the capacity of absorbing the consequences of the damage depend on the individual attitude towards risk. Under reasonable circumstances and equal access to information, the economic players can calculate the value of the risk based on the amount of the damage and the possibility of the disaster to happen. The decision must be taken on the basis of this evaluation of the risk. Consequently, the economic players can display the following types of behaviour: *aversion to the risk*, *preference for the risk*, *neutral to the risk*.

The mechanism of the traditional insurance has four phases: *evaluation of the risk* (by statistical and probabilistic analyses); *transfer of the risk* (the transfer of the negative consequences by means of insurance policies); *creation of common funds of risk* (placing homogeneous, yet independent, risks in a common fund, allowing insurers to diversify the risk and to benefit in accordance with the law of big numbers); *allotment of the risk and the correct evaluation of the risk allowances*.

Because the amount of foreseen damage increases, the financial ability of the insurers to cover them can be seriously affected. In the event of financially differentiated exposure level, the insurers may become themselves averse to risk. In this context, co-insurers and re-insurers have the right of preference, before the first insurers, who are eager to give a part of the assumed risk in exchange for the money already collected.

The traditional insurance agreements can be of two types: *proportional treaties (agreements)* (in which the re-insurers take a share of the risk transferred by the first insurers) and *treaties of stop loss type* (in which the re-insurers take a bigger share of the risk according to a certain index).

Everybody agrees with the fact that, in order to be insurable, the risk must be predictable, based on past experience and statistical calculus. The majority of the problems appear when: there is *some generalized uncertainty* – which can undermine the ability of the insurer to correctly evaluate the risk; or there are *asymmetric pieces of information* – in the advantage of prospective insurances, generating distortions and problems in connection with *the adverse selection* and *the moral hazard*.

The traditional mechanism of insurance is not capable to cope with the risk of natural catastrophes, as the predictability of the risk, its space diversification and the financial capacity of the market show serious limitations. The amount of the foreseen losses and the asymmetric information influence the predictability of the risks, and the evaluation needs the conjugated efforts of the groups of insurers and re-insurers. We must underline the fact that the way the information is distributed and the concentration of the market needs a correct and fair approach of the antitrust policies and of the competitive ones.

The considerable losses caused by the natural catastrophes in the last years caused a temporary absence of the reinsurance of catastrophe because of the shortage of supply and the withdrawal from the market of the catastrophic risk (Holzhen and Lechner, 1998). Apart from this, natural disasters can cause even more serious losses (60 billion for hurricane Andrew, 100 billion for the earthquake from California (Durbin, 2001) and 160 billion for hurricane Katrina).

All these brought about chain reactions which can cause the insolvency of the reinsurance market. Moreover, a significant part of the capacity of the reinsurance market is not available because of liquidity (Cummins, 2002).

Consequently, other solutions are necessary, such as *the ART solution (alternative transfer of the risk)*. The stress was first of all placed on the instruments which could facilitate the direct transfer of the risk using the financial market, by means of the famous bonds. The capacity could have been increased if the bond issues had brought important funds from investors who were not active in the field of insurance. The solution of the transfer of the risk towards the capital market can be observed since 1992. The Chicago Board of Trade (CBOT) introduced as instruments, at the end of 1992, *the catastrophic index and the options of catastrophic risk* (Durbin, 1996). The CBOT options weren't very successful on the capital market, and therefore, after a few years, the transfer of the risk on the capital market was performed by using the titles negotiated outside the stock exchange, for example: *cat bonds*, instruments which made possible the direct transfer of the risk towards the investors. If the transactions with titles of risk have technical parameters which describe the intensity of the catastrophic event, as the intensity of an earthquake on the Richter scale, the force of a hurricane etc., the speculation could be completely excluded. The utility of these parameters appears when they are correlated with the consequences of the insurance of the event.

A case of ART is the *“trigger”* model that can be used if the number of combinations of possible parametric achievements and the results are not known for each case, if they are not explicitly specified, where the procedure for determining the compensation is the following: if the event occurs, a simulation based on the observed parameters is made and this generates an estimate of the losses for the real portfolio of the owner.

The entire capacity of the re-insurance market is not sufficient for covering the catastrophe risk and the demand for the ART solution is justified by the assumption that there is a limited offer for the traditional instruments of hedging. This element requires the increase of the capacity of financing a risk that can be generated either by the extension of the capital funds owned by the insurance industry or by entries on the insurance market.

There exist many ways to transfer of the risk towards the financial market. The economic evaluation of each instrument depends mainly on the specific plan chosen and on the institutional characteristics. The risk securities depend on fundamental random variables and offer an instrument for covering the moral hazard. From the financial mathematics point of view the coverage of the insurance/reinsurance can be completely correlated with the loss, it induces changes in the clients' behaviour and the analysis of this phenomenon can be performed by using *models of the evaluation of the interdependent security*. The evolution of the risk bonds, in the case of the capital market, does not directly depend on the specific loss; the loss is correlated with a set of random variables. A specific element is basis risk that represents the difference between the loss and the coverage; another aspect is the so-called cost of transaction, imposed by the market of the respective instrument, and represents a difference between the risk securities and the reinsurance.

The risk of the insurance is not correlated or is low correlated with the risk of the market, which means that the price of the bonds could include reduced premiums of risk. Another potential advantage of the bonds of catastrophic risk is the fact that *the risk of non-payment* can be elegantly avoided. As disasters determine a significant risk of insolvency for the reinsurance companies which are active on the market; their agreements are subject to the risk of non-payment. This is correlated with the possibility of accumulated losses, typical for catastrophic events. The threat of accumulating losses brings about a strong correlation between the portfolios of the first insurers and the compensations from the portfolio of agreements of the re-insurers. For a first insurer, this brings about an increase of the risk of non-payment or of the risk of loan as related to the reinsurances of catastrophic risk. The bonds are not greatly affected by the risk of non-payment. The funds invested in titles of catastrophic risk are collected in advance, which means that the loan risk of the first insurer is reduced to the risk of non-payment corrected with the investments made by the endorser (Laster and Ratim, 2001). However, the titles of risk associated with the insurances did not have the expected success on the market. The fastest increase in the volume of transactions of these financial instruments was at the end of the 90's when the premiums of reinsurance grew (Durbin, 2001).

The impact of the future major disasters on the market of reinsurance and the impact on the price can bring about a new growth in the volume of the market of the titles of catastrophic risk (known as a technique of private management of risk, combined with a component of the public management of risk). The coverage generated by risk bonds could be an interesting alternative to the solution of the traditional insurance.

Kunreuther (2002) suggests the incorporation of the risk bonds in the approach of the public – private partnership. The involvement of the government usually appears after the catastrophes which cause shock on the level of the industry of insurances and

of reinsurances. The growth of the price of reinsurance in the event of a natural catastrophe induces, for a certain period of time, a negotiation and a segmentation of the market of the risk bonds which the re-insurers must reconsider in their own portfolios.

The legal framework and the various means of the government intervention are different from one country to another and the comparative analysis allows for the better understanding of the complex managerial process in this field. Many states have implemented the complex government strategy for the management of risk. The most important institutional agreements imply public-private partnerships, such as: France – the diagram of compensation in the event of national disasters CAT; Spain – Consorcio de Compensación de Seguros; USA – National Flood Insurance Program – NFIP; California – California Earthquake Authority (CEA); Florida – Florida Natural Catastrophe (Hurricane) Fund; Hawaii – Hawaii Hurricane Relief Fund (HHRF); New Zealand – Earthquake Commission (EQC); Japan – Japanese Earthquake Reinsurance (JER); Turkey – Turkish Catastrophe Insurance Pool (TCIP); Norway etc.

### **Terrorism risk and the insurance-reinsurance markets**

Terrorism risk is not materially very different from other risks that are handled by insurance and reinsurance markets, but questions have been raised about the feasibility of financing such a large event through insurance/reinsurance markets. Events of this nature may be more efficiently handled through capital markets via financially engineered instruments such as catastrophic bonds. One risk for the involvement of the government in the terrorism insurance market is that it would potentially discourage the development of these private market alternatives.

The uncertainty of this risk is another feature of terrorism coverage that initially seems different from other catastrophic risks. This fact makes it difficult for insurers to estimate the probability and severity of loss. Nevertheless, the insurance industry has provided coverage for other uncertain events which lacked statistical reliability such as political risk insurance and satellite launches. The private market can develop pricing for terrorism coverage as it has for other uncertain and unique risks. Therefore, any governmental involvement should not discourage private industry from returning to this market.

The management of crisis caused by the terrorist attacks proved an insufficient capacity of the governments of administrating the extreme risks in most of the recent cases. In this case, the necessity, the mechanisms and the means of the initial government intervention are justified.

The risk of terrorism is social and requires an immediate and urgent governmental intervention. The mega terrorism caused the loss of the functionality character on the private insurance markets. The insurance against terrorism may be limited according to the CBNR type of attack (chemical, biological, nuclear, and radiological). Russel (2002) shows that the intervention of the state is an absolutely necessary answer. Kunreuther and Michel Kerjan (2004) have shown that the international terrorism presents a set of strictly specific characteristics, which amplifies the importance of the public sector. Priest (1996, 2003) agrees that the governmental intervention on the insurance market is not desirable. Robert Merton (2004) shows that the institutional structure must act in the sense of the elimination of the first incorrect effects and of roughness of the market, ig-

nored in most of the economic models. The institutional structures most act so that the economic models to be universally applied even when a simple comparison of the models hypothesizes and of the real institutions suggests something else.

This approach shows that even if the countries are different in their institutional structure (prices and traditions), a single analysis framework should be valid for the accomplishment of the economic objectives.

*The empirical knowledge on the private antiterrorist markets is very limited, as the governmental interventions dominate these markets in most countries (the public-private system in which a substantial part of the risk is governmentally sustained).*

The management plans in which the government might have an insurance role (Kunreuter, 2004, OECD, 2004) take into account reinsurance for the high level risks. The most evaluated insurances against terrorism are in France (GAREAT), Germany (EXREMUS), U.K. (Pool RE) and U.S.A. (TRIA). The concept of *possible creditor* is connected with ex-post payments of the bonuses (Jaffe, Russel, 2003) and is applied for the terrorism coverage if the governmental agency, most probably The Central Bank, is relieving credits to insurance companies that need cash.

### **The new challenges facing insurers in managing extreme events**

There are two important implications for insurance companies that operate in catastrophic insurance; the companies cannot limit losses or their variation through *portfolio diversification policies*; the annual rate of losses (refunds reported on the total of the collected rate) is extremely volatile based on extremely high values. The result is that insurance companies must have remarkable capital and foreign currency reserves to confront such events. The governments through have a strategic advantage tax links and dominate the majority of the world market. The insurance industry admits that following a catastrophic attack there are a lot of companies that can go bankrupt and need urgent governmental support. In many countries the insurance against terrorism is based on government participation.

The magnitude of the last terrorist attacks requires new thinking about managing terrorism risk. In the next years after the terrorist attacks there was considerable demand from insurance against these events from many businesses, but little coverage available. A new appreciation by insurers of these risks led them to charge higher prices for coverage in a non typical market.

This fact led the US Congress to vote the TRIA (Terrorism Risk Insurance Act) in November 2002 and insurers are now required to offer insurance against terrorism as a separate endorsement to an existing commercial policy. Firms can voluntary purchase this coverage and each insurer is financially responsible for a certain portion of the loss as a function of its total premiums written. The terrorist coverage is available, but the demand for such protection has been low, because the business men feel that a future terrorist attack will not happen to them and because they perceive the premium to be too high.

This type of risk is unlikely to occur, even if it can trigger devastating consequences, such as the reluctance on the part of the potential risk transfers to incur the high cost associated with them. For insurers, low frequency and high impact risk is difficult to sell.

The challenge is to help stakeholders to understand this nature of low frequency, high impact event and appreciate correctly the transfer of these risks.

The access to risk capital is very limited both for the elementary insurers and for the insurers. The limited access to necessary capital can lead to bankruptcy (wreck risk). Besides the common character of catastrophic risks, the terrorism risk has the unique characteristic that it is produced by human intervention. The impact of this characteristic is essential, regardless of the type of intervention required a critical analysis. For example, the government seems to have superior information regarding the possibility and location of a future terrorist attack, a fact that justifies why private companies avoid covering these risks. It is also possible that terrorists will not choose to attack an insured target, a fact that increases the private companies' ability in offering insurance against terrorism.

The initial decision of governmental intervention after a major attack starts from the next motivations: the government has the best information regarding the characteristics of future attacks; as a result of private insurance market failure against terrorism there can be major macro-economical losses (the government intervention can diminish these losses – Russel, 2002); regardless of the immediate macro-economic effects, if a subsequent attack is produced there would exist a serious regress regarding the initial intervention.

### **Means of intervention on catastrophic insurance markets**

An initial way of intervention refers to the *initiatives regarding the market's functionality boost-up* (re-creation of private markets not the creation of a public substitute). In order to organize an analytical background of intervention forms, it is useful that *the micro-markets* (through which selling policies and damages application appear) and *the risk insurance functions* are distinguished. Many current governmental interventions represent public-private corporations, with the private markets based on the functioning of the market microstructure, while the government is responsible for insurance functions. Alternative market microstructures mechanisms will be analyzed with the attention focused on alternative means to improve risks and the way this is divided between the public and the private sectors. Key mechanisms observed in different governmental interventions start from the following: dividing the risk between the government, the investors on the capital market and insurance companies; there are mandates for the involvement in the governmental plan; how the government accomplishes cost subsidizing for the insurance offered; which are the limitations covered at terrorism risk levels; maximum limits regarding the exposure of insurance companies and government; the private companies' part in assigning standards and risk policies; provisions adopted at the end of the participation.

The *optimal methods of governmental intervention in the insurance market against terrorism* starts from the following aspects: what should be the global extension of government participation; which should be the duration of the intervention (necessary for the private capacity to remake, or the long term approach that reflects fundamental market failure); what is the governmental financial intervention modality (elementary insurers, last instance re-insures, last instance ex-post creditors).



### **The limits of governmental intervention on the market**

It is very difficult to determine the fact that through its intervention, the government cancels the purpose of private insurance. The possibility that government interventions can diminish private companies' interest can be analyzed starting from the *moral hazard* principle in which the insurance provision transfers to the market players the ability of engaging a higher risk. On the other hand, insurers use *a risk based price setting* especially to co-interest the insured parts to take their own measures to diminish risks. Given the public nature of terrorism risks, some efforts will be influenced by other factors other than strictly defined economic initiatives. Individuals generally anticipate governmental intervention in case of a catastrophic event, regardless of the governmental program. For example in the USA this part is insured by FEMA (Federal Emergency Management Agency). The Victim Compensation Fund, created after September 2001, is a governmental compensation method.

*The failure of catastrophic risks on private markets leads to another way of governmental intervention* that is a valid worldwide characteristic. In case of natural disasters the fundamental impediments regarding the mobilization of large sums are due to: accounting restrictions; provision taxation; taking over risk; re-insurance when confronted with similar capital problems (Frott 2001); the transfer mechanisms failure of the catastrophic risks on the capital market (a standard evaluation procedure doesn't exist), there are no protection mechanisms against hedging risks: the lop-sided risk characteristics; the catastrophic risk liabilities (cat bond) didn't achieve their purpose.

The involvement of the human factor in terrorism makes this risk more difficult to ensure. The main effects introduced by human nature are: the government has better ways of obtaining information than the private markets: if the insurance rates reflect the detailed ratings, then they only count on the information that is directly available to the private insurance firms (a more precise evaluation could only be made by using the governmental information, and this ambiguity concerning the limited access to information leads to higher rates); the governmental disposition to act *as the last instance insurer* influences the credibility of the programs that aim at stopping the terrorist attacks from the beginning; the terrorists will choose the targets strategically and their strategy includes target selection based upon the insurance level (Kunreuther, Michael Kerjan 2004); the action that the individuals and firms take in order to understate the damages that result from a terrorist attack depend on the strategy that the terrorists will choose when they select the targets.

*The macroeconomic effects* of the terrorists attacks are higher than those caused by natural disasters, as the direct losses can be more considerable and the failure in stopping the attack will be seen like a governmental failure; the terrorists' goal is to maximize the global impact on the economy.

### **Conclusions**

The magnitude of the last terrorist attacks requires new thinking about managing terrorism risk. This type of risk is unlikely to occur, even if it can trigger devastating conse-

quences, such as the reluctance on the part of the potential risk transfers to incur the high cost associated with the risk transfer.

The paper presented the analogy between terrorism risk and natural catastrophe risk, the catastrophic events insurance/reinsurance market, the possibilities to transfer risk to capital markets, the means of governmental intervention in the catastrophic insurance market, and the limits imposed on the intervention in catastrophic insurance market.

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