

PART II

Chapter 8

Current Challenges in the Securitization of Terrorism Risk

by

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The successful securitization of terrorism risk, pioneered in October 2003 through Golden Goal Finance Ltd., suggests that the catastrophe bond market may yet be expanded through innovation, enterprise, and industry on the part of investment bankers, lawyers, and risk analysts. But, as with this initial transaction, the opportunity for securitization will depend on a confluence of circumstances. As with natural catastrophe bonds, the potential exists for a specialized niche market for terrorism securitization.

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1. Investor demand for risk-linked securities

At somewhat above a billion dollars per year, the issuance of catastrophe bonds remains a tiny proportion of the catastrophe insurance market. Nevertheless, those involved in structuring and analyzing the risk of these bonds continue to search for corners of the catastrophe insurance market, where risk might be alternatively transferred to the capital markets in an efficient manner. The high relative cost of securitization, compared with the cost of conventional insurance cover, has been the key factor in suppressing the volume of issuance. Although, theoretically, capital markets investors with little exposure to natural catastrophe risk might be expected to be prepared to take this risk more cheaply than insurers, this has not proven to be the case.

Not expert in the underlying disaster science, and wary of an exotic asset class, the select band of eligible capital markets investors in risk-linked securities have been cautious and choosy about their holdings, and insistent on attractive investment returns. For a 1% expected loss, an investor in the late 1990's would have demanded a coupon of around 6% above LIBOR. Following the sharp downturn in the global equity markets, and some notorious corporate bond defaults, the cat bond coupons payable to investors have declined in recent years to levels which are becoming more competitive with insurance. Currently, the market appetite for cat bonds far exceeds the volume of issuance, and there is little prospect of a significant growth in issuance, given the competitiveness of the reinsurance market.

Can this market appetite for natural catastrophe bonds be satiated with a supplementary diet of bonds carrying some exposure to man-made catastrophes? The idea of a terrorism catastrophe bond was proposed early on by Kunreuther¹. But there has been market scepticism over whether there would be any actual issuance. Would anyone want, or be permitted, to invest in such bonds? Doubts over the viability of new types of catastrophe bond are themselves not new or surprising: similar sentiments were expressed a decade ago over the bizarre and apparently audacious concept of an earthquake catastrophe bond.

The over-subscription of Golden Goal Finance Ltd shows that, under the right circumstances, investors are prepared to buy bonds with a default potential explicitly tied to terrorism risk. Part of the challenge of terrorism risk securitization is to overcome investor reluctance to be seen overtly to be buying bonds with an explicit terrorism risk exposure. To some extent, this is a presentational problem, requiring terrorism risk to be wrapped cleverly within a more palatable financial product. In this way, the terrorism risk

exposure would appear as an auxiliary, or subsidiary, if not altogether implicit risk.

Many investments carry an implicit exposure to terrorism risk. It is an intentional feature of global terrorism that there should be an insidious continuous background threat of Islamist violence. Osama bin Laden himself reiterated, in a speech timed for broadcast shortly before the US presidential election, the continued Islamist policy to bleed America to the point of bankruptcy. A spectacular terrorist attack could not only cause significant numbers of casualties, but it could impact severely on a diverse range of businesses. The high loss leverage between the modest cost of an Al Qaeda operation and the very large cost to the US economy has been a source of boastful comments by Osama bin Laden.

Corporations may be able to recover reasonably over a period of time from loss of property or inventory, or even loss of key personnel, but reputational brand damage may be commercially disastrous – even terminal. Where there are alternative products for consumers to choose from, customer loyalty to specific brands might be rapidly eroded as a consequence of terrorist acts aimed against them. For example, the Lockerbie disaster of 1988 exacerbated the financial problems of PanAm, and forced the sale of aircraft and routes. The company collapsed in 1991. Similar financial misfortune may follow in the wake of terrorist attacks on cruise ships and other transport/tourist infrastructure. Other businesses vulnerable to terrorist attack are in the retail sector. The lethal poisoning of food or beverages with ricin has been rumored as an attack scenario. (The use of ricin is not fanciful: it was discovered in 2003 being ground from castor beans by Algerian refugees in London). This contamination might trigger the kind of commercial disaster that struck the bottled water firm Perrier in 1992 as a result of benzene pollution.

A number of mortgage-backed securities and corporate bonds have a non-trivial exposure to terrorism risk. For any particular corporate bond, the additional default risk associated with terrorism will typically be very low; sufficiently low for it not to figure in the bond rating, with its core focus on corporate susceptibility to adverse economic conditions. The ambiguity over the evolution of economic conditions would thus be considered to be a far more important factor than the ambiguity in terrorism risk evaluation.

But imagine, hypothetically, the task of explicitly extracting the terrorism risk from a corporate bond, e.g. for a food processing firm, and attempting to securitize it on its own. Rating agencies and investors would balk at dealing with a bare isolated terrorism risk, even if they would readily cope with it, if it were well diluted with a basket of other more conventional economic risks. The investment banking community is

renowned for creativity and ingenuity in structuring securitizations to meet the joint needs of the issuer and the investor. A plain vanilla securitization of the terrorism risk to a premier skyscraper office block in Manhattan will have minimal chance of success - but then the same can be said of an earthquake risk securitization for an office block astride the San Andreas Fault, or the hurricane risk for a hotel in Miami Beach.

2. Supply and demand for terrorism insurance

Prior to September 11th, 2001, terrorism was not a catastrophe insurance risk. With the threat since then of extreme loss to western interests resulting from actions of militant Islamists, terrorism has become world-wide a catastrophe risk. There are some specialist professional underwriters of terrorism risk, with long experience of handling political risks of all kinds. However, by and large, insurers are cautious over their exposure to terrorism risk, accepting such exposure if compulsory, as with US workers compensation, but being reluctant and hesitant to accept terrorism risk voluntarily. The shortage of willing insurers of terrorism risk engenders a chronic market imbalance between supply and demand. As a consequence, some terrorism premium rates may be unduly inflated.

Apparent inefficiencies in the market pricing of terrorism risk may catch the attention of terrorism risk analysts. Excessive, possibly exorbitant, prices for some risk classes, as might be charged by so-called insurers of last resort, may encourage the search for an alternative securitization route to transfer the terrorism risk. Practical opportunities for securitizing terrorism risk will depend on locating an ample spread between the market insurance premium for terrorism cover and the notional actuarial terrorism risk, as calculated by terrorism risk analysts. The existence in 2004 of a commercial global terrorism risk model, developed partly to assist in underwriting for the US Overseas Private Investment Corporation (OPIC), allows the opportunistic search for such spreads to be extended worldwide. At the same time, such underwriting aids should narrow the range of volatility in terrorism insurance pricing.

Some terrorism risks are perceived to be so high as to be currently commercially uninsurable. A classic post-9/11 example is aviation war risks coverage. Not just western airlines are affected, even the Singapore aviation industry is relying on government intervention for war risks coverage. Thought has been given to how the capital markets might relieve this government burden; so far, contingent finance has been the most promising suggestion.

3. Risk ambiguity

The risk analysis undertaken for a catastrophe bond transaction will routinely estimate the annual probability of attachment and exhaustion, as well as the annual expected principal loss. As part of the bond rating and marketing process, stress tests on the risk analysis may be requested. These stress tests examine a range of more conservative model assumptions on event frequency and severity, which explore the bounds of epistemic uncertainty, (otherwise referred to as parameter risk). Froot and Posner² have pointed out that, provided a risk analysis is unbiased, the fact that there may be epistemic uncertainty in the results does not merit special compensation for an investor, since the higher moments of the excess return distribution are unaffected. The premise of this statement holds true in that risk analysts aim to be unbiased; such bias as may be introduced by risk analysts tends to be in a conservative direction, and so in favor of the investor. But notwithstanding the theory, the degree of risk ambiguity is known in practice to affect the risk appetite of the comparatively small and select set of institutional investors who buy catastrophe bonds. Apart from a best estimate of risk, investors may be keen to have a high percentile confidence figure.

With a decade of satisfactory experience, investors in hurricane catastrophe bonds have become comfortable with hurricane risk analysis. This remains so, even after the stress of the turbulent 2004 hurricane season, which bondholders survived without loss. As Hurricane Jeanne made landfall in September 2004, the fourth hurricane to strike Florida in two months, one desperate homeowner fired his handgun in frustration at the incoming hurricane, and one irate teenager questioned Weather Channel meteorologists why hurricanes can't be 'killed' when they are young, to prevent them from causing Americans harm. Past vain meteorological attempts have been made to seed hurricanes; to try to steer them; and thought has even been given to bombing them, but the plain truth is that there was nothing that the President of the United States, nor his brother, the Governor of Florida, could do to stop one hurricane after another battering Florida during the 2004 hurricane season.

There is a misperception that major terrorist attacks may occur entirely at the whim of militants, and that therefore the frequency of attacks is beyond quantification. This might be the case where counter-terrorism forces are weak, but this is not the case in the leading western democracies. The powerlessness to stop landfalling hurricanes is in marked contrast with terrorism. After 9/11, lawyers worked around the clock to draft the Patriot Act, which provided urgent new legal powers to combat terrorism, even at a cost to the civil liberties of some Muslim Americans, who have felt

harassed. There is no Patriot Act respected by natural hazards. In contrast with windstorms, terrorism is a control process, to which the principles of cybernetics apply. After any future spectacular terrorist attack against a western democracy, the government would respond swiftly to heighten security, so as to prevent a recurrence. As demonstrated in 2004, it is possible to have four landfalling hurricanes in Florida, but if several separate major terrorist attacks occurred within the USA, senior politicians would be forced to step up security sharply or resign for poor risk management. For democratic states, counter-terrorism actions have to be commensurate with the threat. After a major attack, extended political license is granted to detain suspects, keep aliens under surveillance, tighten borders and put extra law enforcement officers on the street. The post 9/11 counter-terrorism response already has included the closure and indictment of several prominent Muslim charities, the detention and deportation of hundreds of Muslim immigrants, as well as interviews requisitioned by the FBI with Muslim individuals.

Rather as tropical storms form in the Atlantic Basin, so terrorist attacks may be planned by individual cells. But whereas it is a matter of meteorological fortune whether these tropical storms develop into landfalling hurricanes, planned attacks may be interdicted or otherwise foiled by concerted counter-terrorism action. Since 9/11, the capability of western counter-terrorism forces has been greatly augmented. In the USA, fewer than 20% of planned attacks should materialize as spectacular terrorist successes.

4. Moral hazard and basis risk

As tragically demonstrated on 9/11, terrorists attack at a time of their own choosing, and so have the opportunity to make money on their criminal actions by buying derivatives. It is surmised that Al Qaeda profited by shorting certain insurance and airline stocks, which inevitably slumped after 9/11. Any potential securitization of terrorism risk should avoid a situation arising whereby anyone, especially a terrorist, might gain financial advantage in perpetrating an act of terrorism. The ill-fated Policy Analysis Market conceived by DARPA with good intentions and persuasive theoretical backing, suffered acutely from this defect. Through the placing of odds on terrorist events such as political assassination, financial inducements might have been created for heinous crimes such as murder. More generally, Joseph Stiglitz noted that: *'The system creates a strong incentive for someone to buy futures in a violent act and then carry out the act—the insider information problem'*.

As with a purchaser of insurance, an issuer of a terrorism risk securitization should have an absolutely clear incentive to avoid falling victim to terrorism. There should be no element of moral hazard, whereby the issuer might have an inducement to alter behavior, such as to lower security standards, or to incite terrorism. Furthermore, the issuer should not stand to benefit in any way from a terrorist attack. In particular, the potential payout to the issuer from an attack should be less than its terrorism loss. Because of this moral imperative, payouts should relate directly to the loss suffered, with no prospect of undue excess gain to the issuer because of basis risk.

The absence of moral hazard is patently obvious in the case of Golden Goal Finance Ltd., which is described next. The World Cup is FIFA's flagship premier event, and the most important source of income, and any disruption would have been entirely detrimental to its future.

5. Golden Goal Finance Ltd

As with all new asset classes, the right opportunity would have to arise for initial implementation; one where the bond was price-competitive with insurance and where investors could be comfortable with the risk analysis, allowing for the risk ambiguity. A suitable opportunity arose in connection with the cancellation risk of the football World Cup, organized by FIFA, (the international federation of football associations). Ever since AXA withdrew its insurance coverage following 9/11, finding appropriate replacement coverage has been a challenge for FIFA. The 2002 World Cup in Korea/Japan was successfully covered, through the timely intervention of the Berkshire Hathaway Group subsidiary National Indemnity Co. However, the high cost of this coverage has been reason enough to seek the alternative solution of securitization for the next football World Cup, to be hosted by Germany. After a year of financial engineering planning by CSFB, this alternative has been achieved through the \$260 million transaction Golden Goal Finance Ltd. With this in place, FIFA have subsequently been able to securitize about \$260 million of future sponsorship revenue, which required that the event cancellation risk be mitigated as far as possible, either through insurance or a catastrophe bond. Both were considered, but the latter turned out to be less expensive.

The securitization of cancellation risk through Golden Goal Finance Ltd. is especially resilient since the 18th world cup can be relocated elsewhere, and postponed for a year, if needs be. This latter flexibility essentially makes this a second event transaction, because if any event were to occur in 2006 sufficient to prevent tournament completion during the scheduled year, then it might be re-scheduled for 2007. An apposite sporting precedent for such

re-scheduling was set by the postponement of the 2001 Ryder Cup until 2002, because of the understandable reluctance of US golfers to fly in the aftermath of 9/11. Both relocation and postponement are FIFA options with historical precedent: the FIFA women's world cup in 2003 was relocated from China to USA because of the SARS (Severe Acute Respiratory Syndrome) epidemic, and the FIFA youth world cup in 2003 was postponed from the Spring to the Autumn because of the proximity of the Iraq war to the host nation, the United Arab Emirates.

The resilience of the transaction is reflected in the risk analysis, which included a logic-tree framework to make explicit the sources of epistemic uncertainty. Given the presence of such uncertainty, no unique risk model exists; instead a range exists of alternative plausible models, and their parameterization. Rigor in the treatment of epistemic uncertainty is manifest computationally in the construction of a logic-tree, the branches of which reflect the diversity in model parameterization for key factors such as target attractiveness; weapon capability; level of security; interdiction by intelligence services; and curtailment after an attack. Information sources relevant to parameterization include the historical precedents of past World Cups, such as the 1998 tournament in France, against which an attack was planned by the Algerian Islamic terrorist organization (GIA), but interdicted by the French security service.

Although for several decades, a logic-tree has been customary within quantitative risk analyses for safety-critical industrial installations, the construction of a logic-tree is not yet standard in catastrophe bond risk analysis, because logic-trees are not incorporated within catastrophe models for insurance portfolio analysis. However, a logic-tree was constructed for the Tokyo earthquake bond Parametric Re, which was the first securitization of the parametric type: the trigger for loss of principal was a seismological determination of event epicenter and magnitude, which is not dependent on any portfolio analysis. For innovative securitizations, clarity in identifying sources of risk ambiguity is especially appreciated by rating agencies and investors.

For Golden Goal Finance Ltd., a conservative best estimate of about 5 basis points was obtained for the terrorism cancellation risk, and the range of logic-tree possibilities yielded terrorism risk results as high as 37 basis points. The risk ambiguity was made transparent in the Offering Circular, in that the calculational framework was explicitly described in sufficient detail as to permit the reader freedom to input his own parameters, and perform an alternative assessment.

An investment grade rating of A3 was given by Moody's Investor Service, following several meetings discussing the risk analysis. The

preparedness of Moody's to consider rating Golden Goal Finance Ltd. reflects a critical but open attitude towards terrorism risk assessment, and is consistent with their preparedness to down-rate some commercial mortgage-backed securities, heavily exposed to city center macro-terrorism. By contrast, S&P, being less open, a priori, to the technical agenda of terrorism risk assessment, did not alter its ratings on these CMBS deals, but ensured that investors knew what insurance provisions were in place on the buildings backing the transactions³. Consistent with this perspective, from the outset, S&P was not in a position to consider rating the FIFA cancellation bond, but did consider worthy of an A-rating FIFA's subsequent securitization of its World Cup sponsorship earnings, which now had the protection of this event cancellation bond.

A successful placement of the \$260 million issue of Golden Goal Finance Ltd. to the capital markets was made by CSFB. All the bonds were sold at a coupon of 150 basis points above LIBOR, which was very satisfactory for FIFA. Investor confidence in the German government to maintain tight security was a factor in the bond pricing, as was familiarity with FIFA, and the world of football: 80% of the bonds were sold in Europe. It should be stressed that, although the German government is responsible for national security, the decision on cancellation rests entirely with FIFA, and not the German government. If there were popular sentiment from within the global footballing community for the World Cup to be cancelled, FIFA would do so, notwithstanding government representations.

In the year since the bonds were issued, both the European Football (UEFA) Cup competition and the Athens Olympic Games have been completed without terrorist incident, which is a vindication of the game theoretic principles underlying the risk analysis. Both of these major sports events in 2004 had rigorous, extensive, and exemplary military-style security, which served as a strong deterrent against a terrorism attack. NATO provided strategic support to Portugal for the European Football Cup, and nearly \$1.5 billion was spent on security at the Olympic Games. Given the hardness of these two international sports targets, terrorists have not diverted attention to these, but instead concentrated on attacking softer western targets, most notably in Iraq, where the likelihood of attack success has been so much higher.

6. Securitization of mortality risk

Since 9/11, awareness amongst life reinsurers has been heightened of mortality as a catastrophe risk, for which securitization might be an attractive possibility if coverage is unduly expensive or difficult to obtain. The 2002/2003 winter outbreak of SARS has further concentrated the minds

of life actuaries on the potential for catastrophic loss, to the extent that a securitization of catastrophe mortality risk has been undertaken by Swiss Re. Vita Capital is the first transaction to transfer this kind of risk to the capital markets.

Excess mortality is measured with respect to a mortality risk index, weighted according to Swiss Re's exposure, which is segmented according to gender (35% female; 65% male), age; and country (70% US; 15% UK; 7.5% France; 5% Switzerland; 2.5% Italy). The age weighting is geared towards individuals in middle age (e.g. 40% aged 35 - 44), which precludes efficient hedging of the mortality risk of life insurance policies with the longevity risk of annuity policies. The trigger threshold for excess mortality rate is 30% higher than expected, based on 2002 mortality in these countries.

This huge excess mortality might be attributable to a global pandemic alone, (Nature's own weapon of mass destruction), but this is very unlikely, given the choice of index weightings. The country weighting is loaded in favor of parts of the world with advanced medical care facilities for disease control, and the age weighting of the mortality index is loaded in favor of people less prone to dying from disease than the young and elderly. The US death rate from pneumonia and influenza among those aged 25 to 44 is about 20% of those aged 45 to 64, and only 4% of those aged 65 or more.

Mortality catastrophes which would score a high index value are those striking middle-aged men in the USA. More so than pandemics, terrorist attacks on down-town urban centers might target such a population group. Fear of such catastrophic attacks is a driver of foreign policy in Washington and London, aimed at denying terrorists access to weapons of mass destruction. Currently, the WMD capability of Islamist militants is low. As shown in Iraq, such capability is not easy to acquire and retain. However, the intent of Al Qaeda to develop or acquire such a capability is evident. Literature on nuclear weapons has been discovered in Al Qaeda training camps in Afghanistan, and information on anthrax was found on the computer of Khalid Sheikh Mohammed, chief of military operations until his arrest in March 2003.

The operational WMD capability of Al Qaeda may well increase over the next three years. But even with enhanced capability, it is extremely unlikely that a single WMD attack could trigger loss to Vita Capital investors. In principle, it might be possible to kill hundreds of thousands of people with a fine anthrax aerosol sprayed over a city on a cool, calm night, but this would require perfect weather and security conditions, and a level of technical sophistication in weaponry well beyond the means of any terrorist group. The urban detonation of a nuclear bomb would not have such a

lethality rate either. As a benchmark, about 100,000 died from the atomic bomb dropped on Hiroshima.

With the assigned weights of the mortality index, the trigger threshold of excess mortality is most likely to arise, within the three years of the transaction, from the occurrence of not one but several different disasters: perhaps a recurrence of the 1918 influenza pandemic and a WMD atrocity. The risk posed by such multiple disaster contingencies should be of the order of a few basis points. Accordingly, as with Golden Goal Finance Ltd, this bond was rated A3 by Moody's. Notwithstanding the exposure to terrorism risk, this bond was rated A+ by S&P.

With the precedent of this transfer of mortality risk to the capital markets, the prospect exists of other financial instruments being developed which transfer casualty risk from insurers. Workers compensation coverage is an example.

7. Multiple event risk

A promising corner of opportunity for securitization is the coverage of multiple event risk, whereby an investor would not lose any principal if, within a designated time period, only one event occurred, but the investor might lose principal if two or more events occurred. As with the World Cup, a number of other high profile sports tournaments fall into the category of being postponable and replayable at a later date, if necessary. Some major high profile public entertainment extravaganzas are also postponable.

There are several clear reasons why multiple event risk might be an attractive prospect for securitization. First, from the perspective of both an investor and a bond rating agency, the prior occurrence of one event before principal is at risk affords a distinct warning for the bond to be put on sale, or put on watch. A topical example is Zenkyoren's Phoenix securitization of second-event Japanese earthquake risk. The 6.8 magnitude earthquake which struck northwest Japan on 23rd October 2004 had the immediate effect of reducing the value of the bonds in secondary trading, but no principal was yet lost.

Secondly, a sequence of two or more catastrophe events in a short period of time could well expose an insurer to financial stress and jeopardize its credit rating. Protection against such a contingency should be a priority for insurance risk management, but adequate protection may be costly or hard to obtain.

Of course, whether an investment manager prefers one tranche over another depends on many considerations - investment grade being one.

Multiple event catastrophe bonds are typically of investment grade, and hence are attractive to those institutional investors restricted only to purchasing investment grade bonds. To date, the more highly rated multiple event tranches have been particularly popular among investors. Allocation of an over-subscribed senior tranche to investors may even be made conditional on their purchase of some of the junior tranche, if they are able to do so.

Multi-event catastrophe bonds thus fill a narrow but significant insurance market niche. They are successfully marketable because their comparatively low risk enables them often to achieve investment grade ratings, so appealing to a wider range of institutional investors than the typical first event securitization. Furthermore, given the high loss threshold, the cost of issuance may be more price-competitive against standard insurance than first event bonds.

8. Opportunities for securitizing terrorism risk

With a shortage of natural catastrophe bond issuance, investors are willing to consider the purchase of catastrophe bonds exposed to other perils. The probing of investor appetite for novel forms of alternative risk transfer is allowing the boundaries of catastrophe bond issuance to be extended. Terrorism risk, as embodied within event cancellation risk, workers compensation risk, or mortality risk, is potentially securitizable.

Packaging of this man-made catastrophe risk as a multi-event transaction helps to gain the confidence of both rating agencies and investors. At least when packaged in this way, capital markets investors have shown preparedness to take on terrorism risk. Other ART opportunities exploiting this market niche are being explored. Now that this seemingly formidable securitization frontier has been breached, perhaps further probing of investor appetite will allow terrorism risk to be securitized in other ways, perhaps bundled up with more familiar and well established catastrophe risks, such as earthquake and windstorm, which would serve to dilute the overall terrorism component.

An ideal terrorism risk portfolio would comprise properties which were either extremely well protected, or were not mainstream government or commercial iconic targets. To the extent that market pricing may give insufficient credit for excellent security, or may unduly penalize properties lacking the prime qualities attractive to terrorists, risk arbitrage opportunities for terrorism securitization may possibly arise.

Notes

- 1 Kunreuther H. The role of insurance in managing extreme events: terrorism, Risques (2002).
- 2 Froot K.A., Posner S.E. The pricing of event risks with parameter uncertainty, Geneva papers on Risk and Insurance Theory, Vol.27, No.2, (2001).
- 3 Reactions Magazine, Fifa's Golden Goal, (November 2003).

Annex 1

List of Speakers and Presentations at the Conference*

Session 1 - Insurability of catastrophic risks

- Economics of catastrophe risk insurance, *Christian Gollier (University of Toulouse)*.
- Insurability of terrorism risk: challenges and perspectives, *Howard Kunreuther and Erwann Michel-Kerjan (Wharton School, University of Pennsylvania)*.
- Industrial, technological and other catastrophes, *Christian Lahnstein (Munich Re)*.
- Recent trends in the catastrophe risk insurance/reinsurance market, *Patrick Murphy O'Connor (Benfield)*.
- Role of the reinsurance industry in the management of weather related risks, *Peter Zimmerli (Swiss Re)*.
- Issues and options in the management of terrorism risk through insurance, *Robert Reville (Rand Corporation)*.
- Current state of the coverage for war and terrorism risks - including NBC - in the aviation sector, *Eugene Hoeven (IATA)*
- Free market solutions for terrorism risks coverage, *Ben Garston (MAP Underwriting and Lloyd's Terrorism Panel)*.

* Power point presentations summarising papers included in this publication as well as other presentations made at the conference are available on the OECD Insurance homepage: <http://www.oecd.org/daf/insurance>.

- Improving insurability and affordability: the role of insurance in hazard identification, risk assessment, risk prevention and mitigation for industrial/chemical accidents, *Satyananda Mishra, IAS, Disaster Management Institute, Bhopal - Government of Madhya Pradesh, India*).

Session 2 - Financial market solutions to manage catastrophic risks

- International financing solutions to catastrophic risk exposures, *Torben Juul Andersen (Copenhagen Business School)*.
- The use of risk linked securities to manage catastrophic risks, including terrorism, *Christian Mumenthaler (Swiss Re)*.
- Current challenges in terrorism risk securitization, *Gordon Woo (RMS)*.
- Financing catastrophic risks in non-OECD countries: challenges and perspectives, *Reinhard Mechler (IIASA)*.
- Current market trends for catastrophe bonds and risk linked securities, *Christopher McGhee (MMC Securities, Guy Carpenter)*.
- The potential for new risk transfer instruments to cover terrorism risks, *Michele David (The Bond Market Association)*.
- Rating agency's perspective on catastrophe bonds and risk linked securities, *Rodrigo Araya (Moody's)*.

Session 3 - Role of governments and development of public-private partnerships for catastrophe risk management

- Role of governments in natural catastrophe risk management and financing in OECD countries, *Paul K. Freeman (University of Denver)*.
- Catastrophe insurance programs in emerging countries: field experience, *Eugene Gurenko (World Bank, Financial Sector Operations and Policy Department)*.
- Potential role for governments in terrorism coverage, *Dwight Jaffee (Haas School of Business, UC Berkeley)*.
- Public-private partnerships to cover terrorism risks in OECD countries, *John Cooke (International Economic Relations Consultant, London)*.

- Role of the US government in the prevention and mitigation of terrorism risks, *Robert Liscouski (Infrastructure Protection Office, Department of Homeland Security, USA)*.
- Disaster risk management policy in Japan, *Kazuhiro Kawachimaru (NIPPONKOA Insurance Company Ltd)*.
- The Spanish experience in the management of extraordinary risks, including terrorism, *Ignacio Machetti (Consorcio de Compensación de Seguros)*.
- A stakeholder approach for developing a public-private partnership: the Hungarian case, *Reinhard Mechler (IIASA)*.
- Disaster risk management policy in China, *Yuanchang Zheng and Jianguo Mu (Department of Disaster and Social Relief, Ministry of Civil Affairs)*.
- The French experience in natural catastrophe risk management, *Suzanne Vallet (Caisse Centrale de Réassurance)*.
- Earthquake risk management policy in Indonesia, *Werner Bugl (PT Asuransi, MAIPARK Indonesia)*.
- Disaster risk management policy in Mexico, *Carlos Bayo Martinez (FONDEN)*.
- Disaster risk management policy in the Philippines, *Ronald I. Flores (Department of National Defense, Office of Civil Defense, National Disasters Coordinating Council)*.
- Disaster management in India, *D. Madan (Under Secretary, National Disaster Management Division, Ministry of Home Affairs, Government of India)*.
- Management of extraordinary risks, including terrorism, in India: achievements and perspectives, *C. S. Rao (Indian Insurance Regulatory and Development Authority)*.

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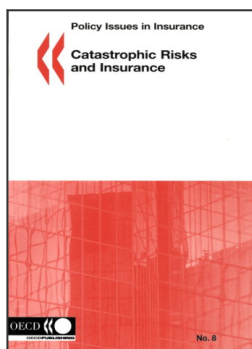
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* Background Note of Mr Kawachimaru's presentation (NIPPONKOA Insurance Company Ltd), based on *Governmental Earthquake Insurance System in Japan*, from *Earthquake Insurance in Japan*, written and published in March 2003 by Non-Life Insurance Rating Organization of Japan.



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