

A CATASTROPHE BOND NICHE: MULTIPLE EVENT RISK

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ABSTRACT

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. The issuance to investors of \$260 million of bonds, exposed principally to terrorism risk, reveals a latent appetite within the capital markets for specialized forms of risk. A special class of catastrophe bonds is studied here: multiple event instruments which either cannot or are extremely unlikely to default until at least two major events have occurred. A review is presented of Golden Goal Finance Ltd. and some recent natural peril multiple event transactions, as well as related securitizations such as Vita Capital for mortality risk.

1. SECURITIZATION OF NATURAL PERIL RISK

At somewhat above a billion dollars per year, the issuance of catastrophe bonds remains, after a decade of market development, a tiny proportion of the catastrophe insurance business, falling well short of early optimistic projections of annual issuance of \$5 billion. 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. One such promising corner of opportunity is the coverage of multiple event risk, whereby an investor would not, or would be extremely unlikely to lose any principal if, (within a designated time period), only one major event occurred, but the investor might well lose principal if two or more major events occurred.

There are three 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. 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. Thirdly, adequate protection may be costly or hard to obtain in a hard insurance market, and securitization may be price competitive. With high investor demand for catastrophe bonds during a period of stock market instability, and only a limited supply to meet this demand, spreads have been declining.

One of the pillars of the catastrophe bond market is Swiss Re, which has since 9/11 sought to clarify its exposure to multiple event risk, and explored securitization opportunities. Litigation following the destruction of the twin towers of the World Trade Center has highlighted the very significant difference to an insurer, such as Swiss Re, of having to pay catastrophe claims for two major events rather than one. Wary of its potential exposure to a rare sequence of major natural catastrophes (Atlantic hurricane; European windstorm; California; Japanese earthquake) occurring in a short period of time, Swiss Re has issued Arbor Capital II, which has a minute annual expected loss of about 1 basis point, and accordingly achieved an A1 rating from Moody's, and an A+ rating from S&P. The spread above LIBOR for this minuscule risk was 100 basis points. This \$27 million risk transfer of multiple event risk might have appealed to investors as yet unfamiliar with catastrophe bonds.

A less remote multiple event securitization, appealing to regular catastrophe bond investors, is Trinom A-2, covering second event risk for European and US windstorm, as well as US earthquake. This has provided retrocessional cover for Converium. It was rated Ba1 by Moody's, BB+ by S&P, and BB by Fitch. The annual expected loss of this tranche is calculated to be 67 basis points. The coupon spread above LIBOR was 400 basis points.

Single country multiple event securitizations include Phoenix Quake Wind, which covers second event Japanese earthquake and typhoon. This was issued on behalf of Zenkyoren, the Japanese National Mutual Insurance Federation of Agricultural Cooperatives. This securitization was rated Baa3 by Moody's, and BBB+ by S&P. The annual expected loss of this bond is calculated to be 22 basis points. The coupon spread above LIBOR was 245 basis points.

To gain financial protection of the French national electricity distribution network against windstorm disruption, such as occurred in the aftermath of the Martin storm of December 1999, Electricité de France (EDF) has recently issued a catastrophe bond Pylon Ltd.: the first securitization of European windstorm risk not involving an insurer. The senior tranche A is exposed to the risk of two or more major French windstorms occurring. The 70 million Euro Class A tranche was rated A2 by Moody's, and BBB+ by S&P. Interestingly, a higher S&P rating would have required a triple rather than double event trigger, as was a feature of the senior tranche of Atlas II, which is discussed below. The annual attachment probability of the senior tranche of Pylon Ltd. is calculated to be 4 basis points. The coupon spread above EURIBOR was set at 175 basis points.

Some securitizations have transferred second event risk in conjunction with the event risk of an entirely different and unrelated peril. Such structural complexity was anathema to the first generation of catastrophe bond investors during the 1990's, but at the end of

2000, this complexity may have been a technical hurdle for investors to overcome, but it was no longer a big obstacle in marketing. Indeed, progressively over the years, both rating agencies and investors have gained increasing experience and confidence in dealing with more complicated types of risk analysis. Evidence of this growing maturity is the Class A tranche of Mediterranean Re, issued by Assurances Generales de France (AGF), one of the largest insurers in France. Whereas the French natural catastrophe reinsurance pool is quite broad in its coverage, it does not include French windstorm or Monaco earthquake risks, both of which are significant for AGF. The senior Class A tranche is 83% associated with Monaco earthquake risk, but there is also a 17% exposure to second event French windstorm risk. This tranche was rated Ba3 by Moody's, BBB+ by S&P, and BBB by Fitch. The annual expected loss of this tranche is calculated to be 22 basis points. The coupon spread above LIBOR was 260 basis points.

1.1 ATLAS II: the first A rated catastrophe bond

From a narrow insurance market perspective, the most significant and costly natural disasters are earthquakes and windstorms affecting USA and Japan, as well as windstorms in Europe. Years in which multiple such disasters have occurred are comparatively few. The global insurance market is too young to have memories of a month, such as in December 1703, when a destructive European windstorm and Tokyo earthquake occurred within weeks of each other. Another poor year would have been 1854, when major destructive earthquakes struck Japan during both the summer and winter. Repetition of either historical event sequence in 2004 would cause loss of principal to holders of Atlas II Class B Notes, issued by the leading French reinsurer SCOR.

Atlas II was the first catastrophe bond dealing specifically with multiple event risk, providing \$150 million coverage to SCOR once a major Californian or Japanese earthquake or European windstorm has already occurred during the year. It requires at least two events in a year, (which may be any combination of major Californian or Japanese earthquakes, or European windstorms), to cause loss of principal to the junior Class B tranche. A loss to the senior Class A tranche requires even more events to occur: either three events in a year, or two events in each of two years.

The Class A Notes were rated A3 by Moody's, and A- by S&P; the first A rating assigned to a catastrophe bond. From the outset of catastrophe bond rating, S&P had adopted a general policy of not awarding an A rating to this new asset class. But the senior tranche of Atlas II was exceptional in having a triple event trigger, and so a precedent was set with this tranche being assigned an A- rating. The annual expected loss of this tranche is calculated to be 5 basis points. The coupon spread above LIBOR was 238 basis points.

2. SECURITIZATION OF TERRORISM RISK

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 militant Islamists, terrorism has become world-wide a catastrophe risk. With terrorism cover being comparatively scarce and expensive, the idea of a terrorism catastrophe bond was proposed early on by Kunreuther¹. Although conceptually such a financial instrument would appear to provide a viable alternative to insurance, risk ambiguity was considered too great for a terrorism bond to be palatable for the rating agencies and investors. A further unknown factor was the investment appetite for terrorism risk. Would any investor be interested or authorized to buy a terrorism bond? Even if such investors did exist, would they demand a double-digit coupon spread, e.g. in excess of 10%, in recognition of the terrorism risk ambiguity?

Doubts over the viability of new types of catastrophe bond are themselves not new: similar sentiments were expressed a decade ago over the apparently audacious concept of an earthquake catastrophe bond. 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; where investors could be comfortable with the risk analysis, allowing for the risk ambiguity; and where there was no moral hazard of the issuer having any incentive to encourage a terrorist attack. Regardless of its potential effectiveness at exposing hidden information, the aborted Pentagon terrorism futures market, experimented by DARPA, suffered irredeemably from moral hazard: a market player might have an obvious financial inducement to perpetrate, and benefit from, a terrorist attack against a public figure, on whose political office or life, odds were placed.

A suitable terrorism securitization 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 terrorist threat to sports events cannot be ignored. The Black September attack on the Israeli Olympic team in Munich in 1972 remains one of the most notorious acts of terrorism ever committed. Three decades later, the terrorist threat to sports events is still live: shortly after President Bush's state visit to England in November 2003, an arrest was made of a British Pakistani, who was an acquaintance of the shoe-bomber Richard Reid, and is thought to have been planning a terrorist attack at a football stadium.

AXA's withdrawal of FIFA's coverage reflected widespread insurance market anxiety over the terrorist threat after 9/11. But the 2002 World Cup in Korea/Japan was eventually covered, thanks to the timely intervention of the Berkshire Hathaway Group subsidiary National Indemnity Company. However, the high cost of this coverage has been reason enough for FIFA to seek the alternative solution of securitization for the next football World Cup, to be hosted by Germany.

¹ Kunreuther H. The role of insurance in managing extreme events: terrorism, RISQUES (2002)

After a year of deft and patient financial engineering planning by CSFB, this alternative has been achieved through the \$260 million transaction Golden Goal Finance Ltd. Back-to-back with this deal, FIFA have immediately 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 options were considered, but the latter turned out to be less expensive. Unlike the carefully planned but shelved California Earthquake Authority securitization of 1996, there was no eleventh hour intervention by Warren Buffett's National Indemnity Company to undercut the FIFA cancellation bond. Such an intervention was one of a number of external contingencies over the year, which might have thwarted the transaction.

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 the 9/11 hijackings. 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 November-December 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 there is a range 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. Apart from intelligence and security sources, information sources relevant to parameterization include the historical precedents of past World Cups, such as the 1998 tournament in France, against which insidious attacks were planned in Marseilles and Paris by the Algerian Islamic terrorist organization (GIA).

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, additional clarity in identifying sources of risk ambiguity is warranted, and may be insisted upon 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. This factor of about eight between the two figures contrasts with a smaller figure of about three typical for natural hazards. 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 to replicate the analysis inputting his own personal subjective choice of parameters, and so performing his own alternative assessment.

An investment grade rating of A3 was given by Moody's Investor Service, following several meetings, in New York and London, discussing the risk analysis in depth. 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 persuaded by 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 transactions². Consistent with this perspective of extracting terrorism risk from rating decisions, S&P declined from the outset 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 of course had the protection of this event cancellation bond.

The Moody's investment grade rating assigned to Golden Goal Finance Ltd. was important for the successful placement of the \$260 million issue to the capital markets. The bond sale was fully subscribed at a modest spread of 150 basis points above LIBOR, which was less than FIFA had expected to pay, and actually less than the spread on comparable recent natural hazard bonds. Investor confidence in the German government to maintain tight tournament security was a factor in the keen bond pricing, as was familiarity with FIFA as an organization, and knowledge of the world of football: 80% of the bonds were sold in various European football-playing countries, although local securities regulations prohibited their sale in Italy.

3. SECURITIZATION OF MORTALITY RISK

Since 9/11, awareness amongst life reinsurers has been raised 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 recently been undertaken by Swiss Re. Vita Capital is the first transaction to transfer this kind of risk to the capital markets.

² Reactions Magazine, Fifa's Golden Goal, November 2003

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 the mortality index is 30% higher than expected up to the end of 2006, based on 2002 mortality in these countries. In terms of an absolute number of extra deaths, this may be of the order of three quarters of a million.

Mortality catastrophes which would score a high index value are those striking middle-aged men in the USA. 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, but the intent of Al Qaeda to develop or acquire such a capability is beyond doubt. Literature on nuclear weapons has been discovered in Al Qaeda training camps in Afghanistan, and past attempts are known to have been made by Osama bin Laden to purchase uranium. Furthermore, technical information on anthrax, including direction to buy *Bacillus anthracis*, (the bacterium that causes anthrax), was found on the computer hard drive of Khalid Sheikh Mohammed, chief of Al Qaeda military operations until his arrest in March 2003.

Subject to intense global counter-terrorism pressure, Al Qaeda operatives no longer have the personal liberty or laboratory access to pursue their WMD ambitions at will. Nevertheless, the threat is persistent, and the operational WMD capability of Al Qaeda is anticipated to increase during this decade. But, given the present technology gap, it is extremely unlikely that their capability will have increased sufficiently over the next three years for a WMD attack alone to trigger loss to Vita Capital investors.

It is theoretically conceivable that more than half a million people might be killed with a fine anthrax aerosol sprayed over a city on a cool, calm night, but this would require perfect weather conditions, poor intelligence, negligent security, and a highly advanced level of technical sophistication in weapon manufacture and delivery well beyond the foreseeable means of any terrorist group. Similarly, it is conceivable, but extremely difficult for terrorists to achieve such enormous lethality via an urban detonation of a large nuclear bomb device³. Technically, such a terrorist attack would be very demanding in terms of skilled manpower, as well as immensely hard to perpetrate, especially given the rigorous US security⁴ which prevented this threat from materializing at any time during the Cold War.

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

³ The Hiroshima bomb killed around 100,000 people.

⁴ CIA assistant director, personal communication

not one but several different uncommon disasters. In addition to a WMD atrocity, there might be a global pandemic of respiratory illness. Such pandemics are believed to have occurred for at least 300 years at random intervals, and are caused by shifts of the major antigenic determinants of the virus, resulting from exchange of gene segments between human and avian or swine influenza viruses. There were three such pandemics in the 20th century, in 1957, 1968, and the most lethal in 1918. But this latter catastrophe is not readily replicated; global post-war demobilization on a massive scale was a unique factor in the spread of the 1918 pandemic. Furthermore, the World Health Organization now coordinates a global surveillance operation FluNet, which did not exist in 1918. A major objective of FluNet is the selection of strains included in influenza vaccines. Despite these annual epidemiological precautions, inter-pandemic excess mortality in the USA has been about 20,000. Meltzer et al.⁵ have used a Monte Carlo simulation, using historical influenza epidemic and pandemic illness and death rates, to infer excess US mortality in a future pandemic reaching levels of several hundred thousand.

The trigger threshold for Vita Capital might thus be attainable before the end of 2006 if pessimistic lethality estimates are made for both a pandemic and a WMD terrorist attack. Taking a pandemic rate of three per century, and a conservative one per cent probability for a devastating WMD attack during the period of the bond, killing several hundred thousand people, a simple estimate of the 3-year joint event probability is of the order of ten basis points. Securitizing either of these events on their own might be considered unduly fraught with risk ambiguity. However, taken jointly, securitization becomes viable, because single event risk ambiguity is mitigated by the second event likelihood. Thus sensitivity analysis on the Vita Capital risk would yield attachment probabilities within an acceptable range for investment grade bonds. As with Golden Goal Finance Ltd, this bond was rated A3 by Moody's, with a similar spread. Notwithstanding the implicit US and European exposure to terrorism risk, (which was not removed), this bond was rated A+ by S&P.

A noteworthy and laudable feature of this transaction is the far-sighted vision of Swiss Re in transferring a remote, but cataclysmic insurance risk, to the capital markets. Adventurous investors are accustomed to taking on long-tail actuarial risk through buying selected portfolios of life policies, so why not catastrophic mortality as well. An excess mortality of three quarters of a million would have a devastating effect on the life insurance market. The economic loss would be in hundreds of billions of dollars. Rather than adopt the negative pessimistic view that such an apocalypse is not survivable by insurers anyway, Swiss Re has taken assertive action to protect against this remote contingency, by moving this risk beyond the restricted capital base of the insurance industry. This initiative may show the way for other insurance sectors exposed to apparently uninsurable risks of extreme rarity but potentially devastating and ruinous industry consequence.

⁵ Meltzer M.I., Cox N.J., Fukuda K. The economic impact of pandemic influenza in the United States: priorities for intervention. *Emerging Infect Dis.* 1999;5:659-671.

4. 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 Posner⁶ have pointed out that, provided a risk analysis is unbiased, the fact that there may be epistemic uncertainty in the results may not merit special compensation for an investor, since the 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 has been known in practice to affect, and indeed upset, 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 for risk analysts to provide a high percentile confidence figure.

In this context, it is worth exploring differences in the risk ambiguity between single and multiple event securitizations. Consider, for simplicity, a catastrophe bond exposed to an occasional hazard describable by a Poisson process with some low rate λ . Suppose that the bond is structured with two tranches A and B, such that loss of principal of the junior tranche B is triggered by the occurrence of one event, and loss of principal of the senior tranche A is triggered by the occurrence of a second event. The probability of tranche B being hit is $1 - \exp(-\lambda)$, which is approximately λ , while the probability of the senior tranche A being hit is $1 - \exp(-\lambda)(1 + \lambda)$, which is approximately λ^2 .

The relative proportional error in estimating the attachment probability of the senior tranche A is approximately double that of estimating that of the junior tranche B. But the absolute error in estimating the attachment probability of the senior tranche A is mitigated by the low rate factor λ . Uncertainty estimation needs also to allow for some degree of physical interaction between consecutive events, which might inflate the error in the risk analysis for the senior tranche. The sensitivity to the Poisson assumption of event independence may be gauged by considering an alternative, such as the negative binomial distribution, which incorporates event contagion. This may add a few basis points to the senior tranche risk.

Is it worth an investor buying a second event bond, with its modest spread? Let the spread above the risk-free rate be denoted as $S(A)$ and $S(B)$ for tranches A and B. For small λ , the Sharpe Ratio for the senior tranche A exceeds that of the junior tranche B provided: $S(A) > \lambda^2 + \lambda^{1/2} \cdot [S(B) - \lambda]$. Typically, for a junior tranche B with attachment

⁶ 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)

probability a little above 1%, the spread $S(B)$ above the risk-free rate has been in the range 500 to 750 basis points. By contrast, for a senior tranche A with attachment probability of a handful of basis points, the spread $S(A)$ above the risk-free rate has been in the range 150 to 250 basis points. With such comparatively generous spreads, the Sharpe Ratios for the senior double event tranche are significantly higher than they are for the junior single event tranche. But if only a modest investment is made in catastrophe bonds uncorrelated with the original portfolio, then the return standard deviation for the new portfolio will be dominated by the contribution of the original portfolio, and the overall portfolio Sharpe Ratio may be enhanced more by adding the tranche with the higher expected return, which is the junior tranche B.

Of course, whether an investment manager prefers one tranche over another depends on many considerations - investment grade quality 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 a quantity of the junior tranche, assuming that they are permitted to buy sub-investment grade bonds.

5. CONCLUSIONS

Multi-event catastrophe bonds 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 much wider range of institutional investors than the typical first event securitization. To the extent that investor psychology may influence bond pricing, the optimistic dictum of lightning not striking twice may suppress personal anxiety over the level of risk ambiguity. From an issuer's perspective, second event bonds may be more price-competitive against standard insurance than first event bonds. Because of the risk volatility associated with high layers of coverage, insurance for such layers tends to include a substantial risk loading. In a hard market, this loading may be swelled by an attractive profit margin.

The testing of investor appetite for novel forms of alternative risk transfer is allowing the boundaries of catastrophe bond issuance to be extended gradually. One of the explanations for the comparatively high spreads on natural catastrophe bonds has been the small world of investors familiar with these bonds. As shown by the success of Golden Goal Finance Ltd., new capital markets investors may be drawn towards the purchase of catastrophe bonds exposed to other perils. Terrorism risk, as embedded within event cancellation risk, workers compensation risk, or mortality risk, is 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 Alternative Risk Transfer opportunities exploiting this market niche are being created. Now that this seemingly formidable securitization frontier has been breached, further probing of investor appetite will allow more direct manifestations of terrorism risk to be securitized, perhaps bundled up with more conventional risks. Just as earthquake and windstorm risks are now routinely pooled for multi-peril catastrophe bonds, so in the future one may anticipate that such pooling may also include terrorism risk, perhaps cloaked in the guise of event cancellation, business interruption, workers compensation, or excess mortality. Just as second event bonds are issued for natural perils, one may contemplate the issuance of second event bonds covering man-made as well as natural peril risks. For example, a workers compensation bond might cover Los Angeles earthquake and terrorism, but cause loss of principal only if a second event occurred. With terrorist targeting of postcard tourist attractions, some site-specific securitizations may also prove to be worthwhile.