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## **Transfer of Insurance Risk – will Risk Securitization replace Traditional Reinsurance as the preferred means ?**

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This paper first highlights the current challenges for the reinsurance business as well as for the reinsurance companies transacting the reinsurance business with their clients (named cedants or reinsureds).

After that, the concept of Alternative Risk Transfer transactions effected via Insurance Securitization (or named Insurance Linked Securities), and more specifically, via Cat Bonds will be introduced.

Finally the advantages and disadvantages of Cat Bonds in comparison to traditional reinsurance will be analyzed.

### **Current Challenges for the reinsurance and the reinsurers**

A couple of aspects should be mentioned concerning the current challenges to reinsurance and consequently to the reinsurance companies in respect of their traditional business:

1. The traditional business model for reinsurance has not been efficient, though it has been working since the foundation of the first reinsurance company (Cologne Re) in 1846,
2. The characteristics of loss events have substantially changed in a qualitative manner.

To 1. Two examples should illustrate the thesis that the business model of reinsurance has not been efficient:

- a. The value production chain of insurance and reinsurance contains a variety of related parties:

The risk management process via (re-) insurance works by balancing risks in the portfolio, by balancing the individual risk over time and by atomizing risks (the latter in particular generates a substantial number of links within the value production chain). The large number of parties in this chain (insurer, reinsurer, retrocessionaire, etc. and at each step brokers are included) leads to the participation of many entities who would like to share in the generated profit. Such an approach obviously creates substantial frictional cost.

- b. The steep price increase in the retrocession market following the hurricane season 2005 (prices quadrupled in the renewal 2005 / 2006) also illustrates the inefficiency of traditional reinsurance: Either the risk transfer price was substantially wrong for the reinsurance contract year 2005 (ie. too cheap), or it was substantially wrong for the reinsurance contract year 2006 (ie. too expensive), or both. Either case illustrates that the price was not arrived at by objective reasoning but was heavily influenced by the mechanism of offer and demand and the immanent nature of business cycles. This approach, however, would strongly contradict the claimed scientific and rational foundation of pricing methods for the reinsurance contracts.

To 2. The qualitative change in loss event should be illustrated by two examples:

- a. The World Trade Center (WTC) loss in 2001; the insured loss amounted to US\$ 21.3bn<sup>1</sup>.

At least three lessons can and should be learned from this loss event:

- Before WTC, terror was not identified as a material peril under insurance policies or if so, it was covered free of charge. Following WTC this mis-judgement was corrected: terror is usually excluded from reinsurance coverage and can be reinsured against via separate / specialized reinsurance covers.
- WTC presented an accumulation of a variety of losses across several lines of business, just like life insurance, property insurance, liability insurance, aviation insurance, etc. Such an accumulation had not been thought possible before. The belief of balancing effects between independent lines of business was scattered by this event, at least in its generality.
- WTC also embodied a horrendous PML (Probable Maximum Loss) mis-estimation: Rather than 18 floors in one tower (as had been estimated to be the PML event), 108 floors times two towers (ie. 216 floors) were the real worst case scenario as tragically pointed out by WTC.

High compensation payments after loss events are in the end the business purpose of reinsurance companies and must therefore be acceptable to reinsurers. However, what cannot be acceptable to the reinsurance industry are surprises in the sense that whatever loss event could hit a risk should have been known and considered beforehand at the time of underwriting the risk. If a loss event strikes a risk that had not been identified before during the process of underwriting, this constitutes a severe flaw in the risk assessment.

In this sense, WTC posed three surprises to the reinsurance industry: terror is indeed a substantial peril, there can be accumulation risk between different lines of business and there is exposure for a PML mis-estimation by a multiple order.

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<sup>1</sup> Insurance Information Institute; <http://www.iii.org/media/facts/statsbyissue/catastrophes/>

- b. Hurricane Katrina in 2005; the insured loss amounting to approx. US\$ 45bn<sup>2</sup>.

The Hurricane season 2005 on the US East-Coast was the by far most expensive Natural Catastrophe (Nat Cat) season with estimated US\$ 73bn, followed by the hurricane season 2004 with estimated loss payments amounting to US\$ 30bn.

Whilst the loss volume was gigantic, another remarkable aspect was the failure of the available Cat-Models: They failed to forecast the loss activity by a big margin and, even worse, they proved the insufficiency of human nature approach to risk management. It is a mood point whether the Cat modelling companies had stressed the point that flood was covered or not, the main point is that underwriters decided to take the simulated outcome estimation as reality which can be calculated in a deterministic way and so they ignored the stochastic nature of the world. Einstein's quotation "All models are wrong, some models are helpful" is nevertheless true: It is better to use a model than to use none, however, it is utmost important to be aware of how such a simulated estimation for the outcome of a loss event needs to be interpreted: Just as one possible way to look at a risk amongst many more possible alternatives.

In a nutshell, the reinsurance industry faces substantial challenges and finds itself suddenly in the middle of a stress test.

### **Capital market instruments for the management of insurance risk**

With a view to the current challenges to the traditional reinsurance business model as described above, possible implications are that the reinsurance market will not be able to provide sufficient risk transfer capacity to their clients (ie. the insurance companies) and / or that the available capacity will become substantially more expensive. Therefore it might be of interest to look into different mechanisms and markets offering risk transfer capacity to insurance companies.

There are several different approaches to tapping on the capital market as a capacity for transferring insurance risks into; this paper will mainly deal with the concept of Cat Bonds in the P&C market<sup>3</sup>. The concept of Cat Bonds belongs to the area of Insurance Securitization or Insurance Linked Securities (ILS), which in turn form part of the Alternative Risk Transfer (ART).

A short view back in history: The first approach to accessing the capital market as a source for risk transfer capacity was endeavoured in 1993 by Dr. Richard Sandor and Morton Lane by developing the concept of Insurance Derivatives. The cause for this idea was hurricane Andrew in 1992 (insured loss amounted to approx. US \$ 20bn) which seemed to generate a capacity crisis in the Nat Cat market (which in the end did not happen due to substantial supply with fresh capital to existing and newly founded reinsurance companies: 2<sup>nd</sup> Bermuda Generation companies just like Partner Re). They even claimed that 'in 3 years' time there will be no traditional reinsurance any longer' and created Reinsurance Derivatives at the Chicago Board of Trade (CBoT); which – whilst being a theoretically convincing concept – did not generate sufficient trading volume. The idea was to create derivative instruments based

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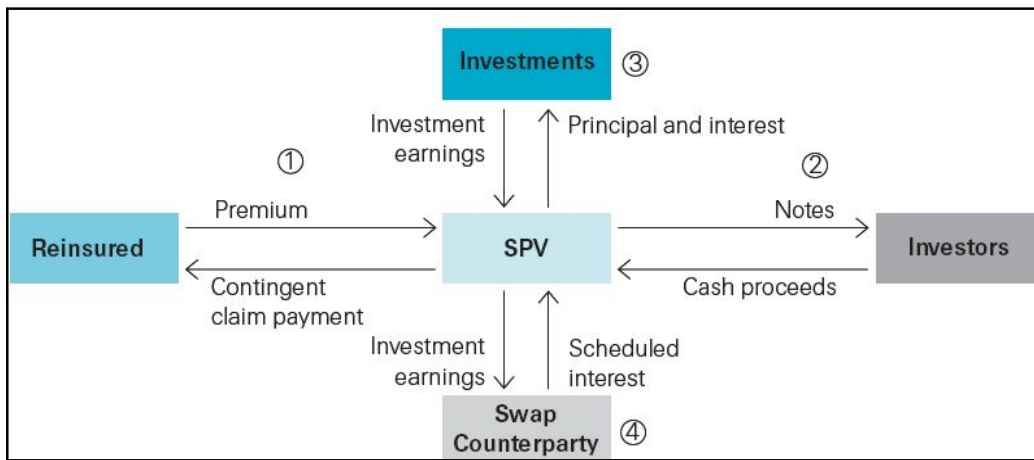
<sup>2</sup> Insurance Information Institute; <http://www.iii.org/media/facts/statsbyissue/catastrophes/>

<sup>3</sup> P&C market: Property & Casualty insurance market, in contrast to the Life insurance market

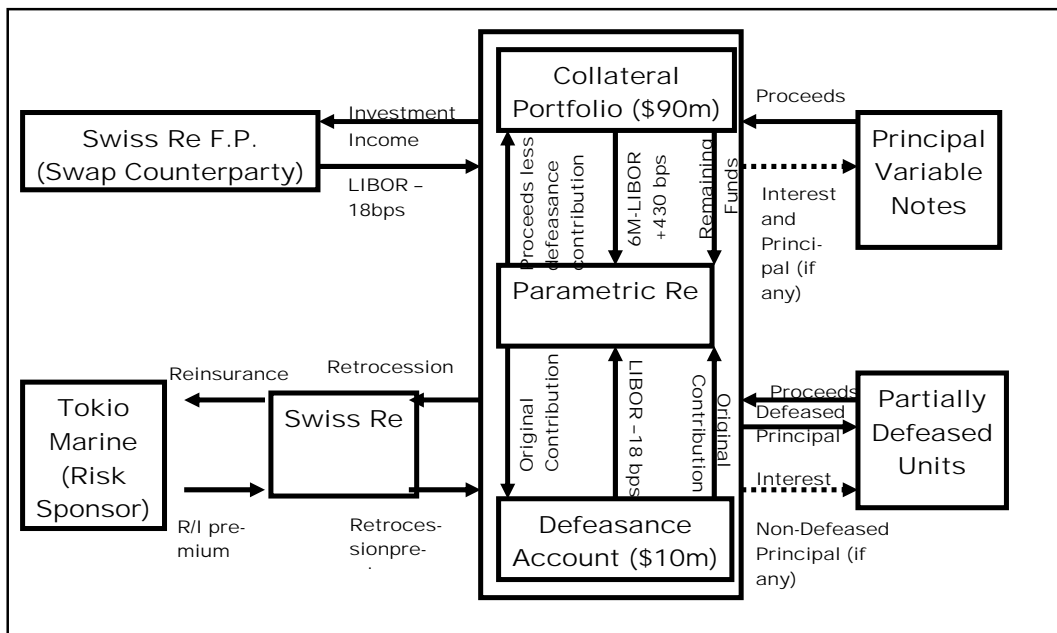
on insurance market loss ratios (US-nationwide and individual regions) for Nat Cat property business.

After this unsuccessful attempt to gain the capital market as capacity provider for transferring insurance risks into, the next approach in the middle / end of 1990's was Risk Securitization, as one example of which the Cat Bond concept will be explained in the following. Graph 1 displays the basic concept of a Cat Bond transaction, whilst Graph 2 shows an example for a P&C Cat-Bond: the Parametric Re transaction effected by Tokio Marine & Fire, Swiss Re and Goldman Sachs.

Parties of the capital market just like Hedge Funds or Pension Funds are expected to effect investments into bonds issued by (re-) insurance companies with an annual interest and the return the invested-principal for the investor at maturity of the bond, provided no triggering event reduces the payback of principal. In case of a defined



Graph 1; concept of Cat Bond; Source: Swiss Re Capital Markets



Graph 2; Parametric Re Transaction

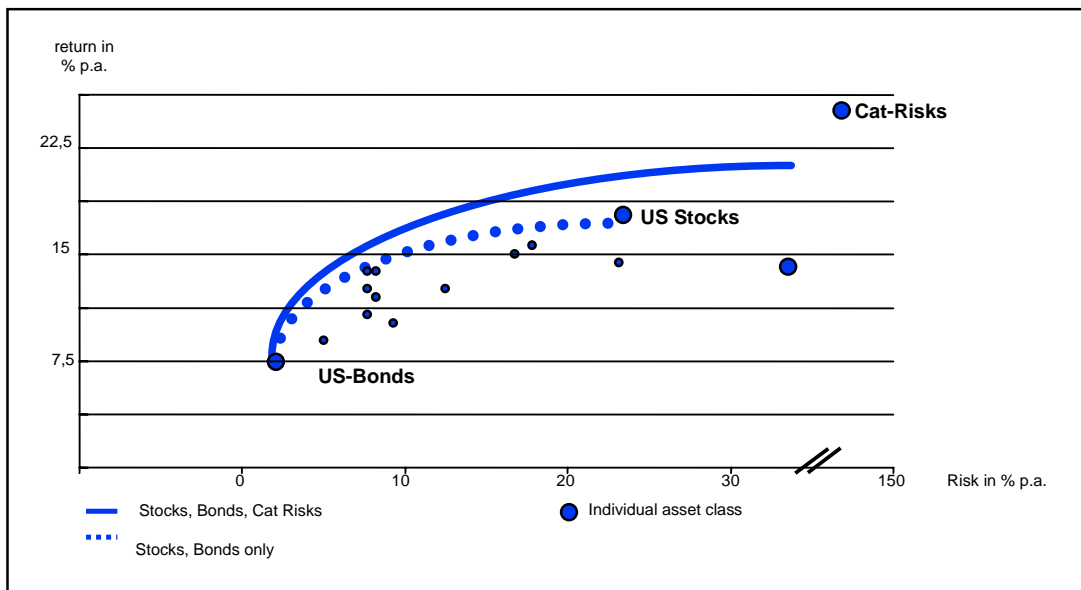
triggering event the repayment of principal by the reinsured (or named risk owner) is reduced and this relief of payback obligation economically equals a payment from a reinsurance company in the case of an insured loss.

Motivation for the insurance industry to welcome this sort of concept was:

- The much greater capacity potentially available in the capital market for transferring insurance-related risks, compared to the capacity provided by the insurance industry.
  - Another motivation was the drastically shortened value production chain for managing insurance-related risk by ways of (re-) insurance. By cutting short the value production chain and hence taking out a substantial number of profit absorbing entities, the price for the risk transfer should have been reduced.
  - A further effect of using the Cat Bond concept is the marked improvement in security of this coverage: Whilst under a reinsurance contract the cedant has to rely on the fulfilment of the reinsurer's promise at the time of the collection of the reinsurance receivables, the Cat Bond investor pays the principal up-front.

On the other hand, the capital market was expected to have a marked interest in investments into the Cat Bond area:

- Investors are trying to escape the seeming dilemma that all asset classes available for investment (e.g. stocks, raw material just like oil, real estate, etc.) share economic interdependencies. So it is difficult to achieve a substantial degree of diversification in the investment portfolio as is advisable according to the Portfolio Selection Theory of Harry Markowitz. Cat Bonds, however, support the diversification of the investment portfolio, as they do not correlate with the economic framework. E.g. a collapse of the Dow Jones Stock Index will not generate a natural catastrophe just like earthquake or storm (although the link in the other direction might not be fully non-correlating).



Graph 3; Risk Reward Ratio

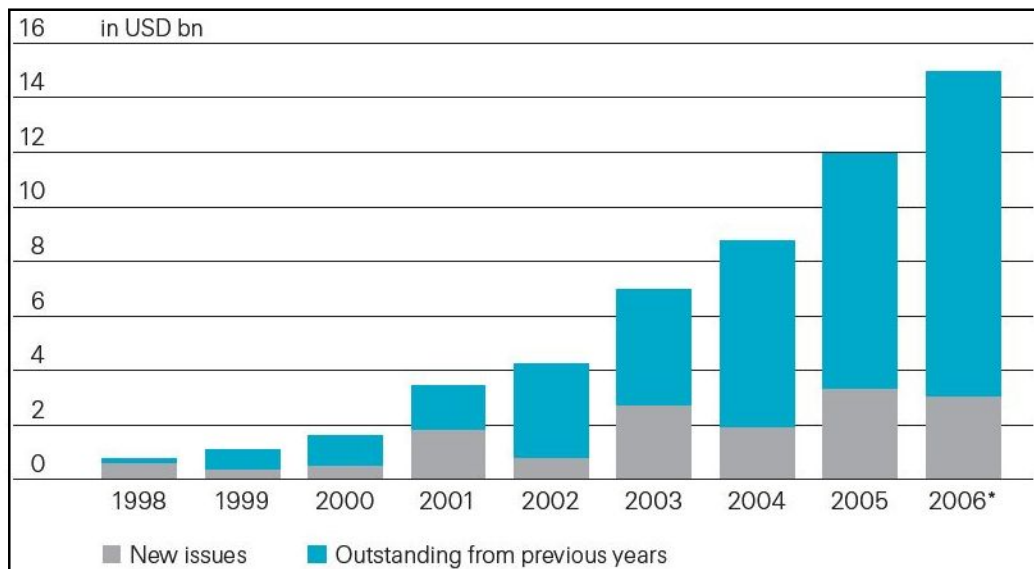
Using this “non-correlating asset class” should enable investors to increase the degree of diversification in their investment portfolio and to benefit from the according advantages.

Graph 3 illustrates the diversifying effect of Cat Risks added to the investment portfolio via Cat Bonds by pushing the Risk Reward Ratio or Efficient Frontier Curve further out

A substantial number of Cat Bond transactions has been effected over the last approx. 9 years, effecting a substantial capacity for risk transfer. Graph 4 illustrates the currently available capacity as at August 2006 for Life Cat Bonds and P&C Cat Bonds together, whilst Graph 5 shows the separated capacity provided by P&C Cat Bonds alone.

Cat Bond's are rarely used by corporates (e. g. classical buyers of insurance policies), more often bought by insurance companies of substantial size and, in particular, used by reinsurance companies. The motivation of the latter differs:

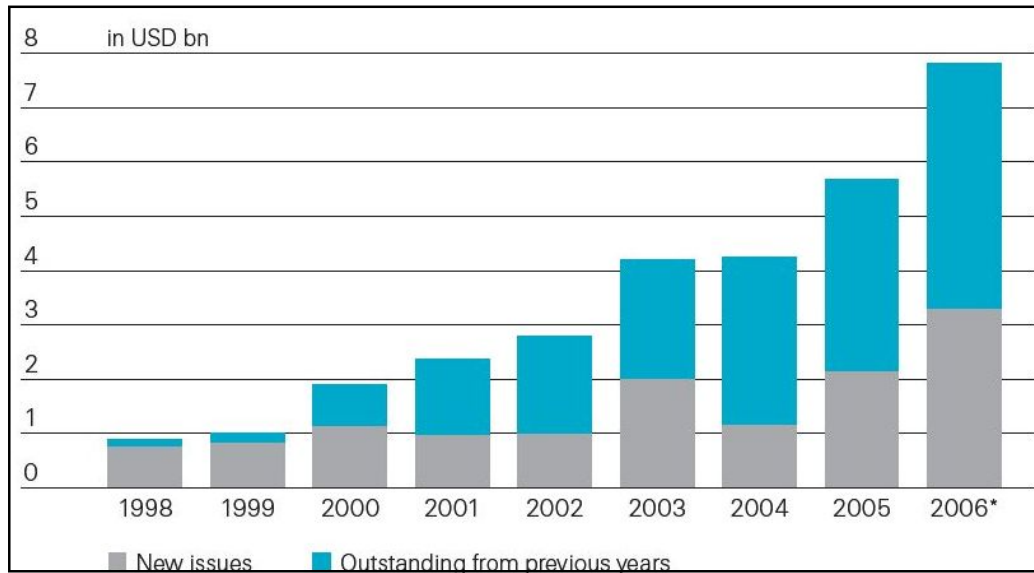
- Swiss Re uses risk securitization or replaces retrocession as well as to use these transactions as a profit centre on its own,
- Hanover Re utilizes this instrument in private placements to enhance their tight capital basis, in particular after the steep increase in prices for retrocession capacity, which Hanover Re had extensively used for several years (compare the retrocession grade of Hanover Re (20%) and e.g. that of General Re (3%)<sup>4</sup>).
- Munich Re have used a Cat Bond (named Carillon) in early 2006 specifically to counterbalance the heavy increase in retrocession prices in order to effect their risk management by attractive prices.



Graph 4; Issued Cat Bonds 1998 – 2006, both Life and P&C; Source Swiss Re Capital Markets

<sup>4</sup> Analysis of Annual Reports 2005 of Hannover Re and General Re, respectively.

Hurricane Katrina exposed Cat Bonds with an overall volume of US\$ 5.3bn<sup>5</sup>; the only Cat Bond hit by Katrina, however, amounted to US\$ 190m<sup>6</sup>. It needs to be stressed that those figures relate to the publicly issued Cat Bond's, so the volume of Cat Bond exposed by Katrina might be higher due to private placement. The 'Hit / Exposed-Ratio' of 3.6 % implies that Katrina – whilst being enormous in its economic consequences – was only a small loss relative to the attachment level of Cat Bonds.



Graph 5; Issued Cat Bonds 1998 – 2006, P&C only; Source Swiss Re Capital Markets

Nevertheless, there are some limitations or at least question marks to the potential of Cat Bonds to fully replace traditional reinsurance in its role of the leading risk transfer instrument:

- Almost all contracts of traditional reinsurance operate on a 'compensation trigger' basis, ie. the risk owner gets reimbursed for its actual loss under a loss event.

This means for the provider of risk transfer capacity (the reinsurer in case of traditional reinsurance and the capital market investors in case of a Cat Bond transaction) that the parameters of the triggering event (just like a hurricane) need to be understood as well as what such an event means to the specific portfolio of risks of the individual risk owner in question.

Many 'innocent' investors from the capital market are just afraid of the latter aspect; they do not want to encounter the need to understand the risk owner's business in detail, but they want to deal only with the first aspect (ie. understanding the return periods of a hurricane with certain parameters just like windspeed, etc.). Also, they are afraid that the risk owner could manipulate the actual loss cost incurred under a given loss event. Just plainly by

<sup>5</sup> Wall Street Journal (October 8, 2005, p C1 / C4)

<sup>6</sup> Wall Street Journal (October 8, 2005, p C1 / C4); State Farm Insurance Company (part of Zurich Group) Cat Bond issued this Cat Bond.

‘cooking the books’ or by assuming more risk before the event strikes and/or generously adjusting claims after the event (as the best opportunity for improving an insurance company’s reputation is by a ‘hazzle-free’ loss adjusting practice; ie. just paying the check).

This means, however, that most Cat Bonds are based on a ‘parametric trigger’ which creates a so called basis risk to the issuing risk owner. Ie. the financial relief received under the Cat Bond in case of a loss event might be differing from the actual loss incurred by the risk owner in his portfolio. To illustrate this point by means of an example: whilst a parametric trigger under a Cat Bond would grant a fixed amount of compensation payment in case of an event with fixed parameters (eg. an earthquake in the Southern Kanto area in Japan with a amplitude of 7.4 on the JMA scale would trigger a financial relief of US\$ 40m), the same event could have very different loss impact to two different insurance companies (eg. whilst the Millea Group has quite an exposure in the city area of Tokyo due to their private and industrial client segment, the cooperative insurer Zenkyoren focussing on farmers has a wide-spread exposure in the rural areas).

Basis risk is therefore a substantial issue for insurance companies in their risk management considerations: traditional reinsurance avoids basis risk due to the usage of compensation trigger, whilst a Cat Bond on a parametric basis leaves the ‘risk owner’ with basis risk.

There is hardly any Cat Bond to be found with a pure compensation trigger; even in those cases, where the financial relief in the event of a loss to the risk owner is based on the individual portfolio in question (rather than based on a parametric trigger), additional trigger conditions like market loss trigger or model-portfolio trigger are usually implemented. The first means that the loss experience not just of the individual risk owner is evaluated but also the loss experience of the whole insurance industry in the specific market; the latter means that the financial relief is not just based on the specific portfolio of the individual risk owner, but in addition the effect of the loss event in question is applied to a model portfolio<sup>7</sup>.

- Another substantial shortfall so far in the risk securitization concept is the capital market’s apparent unwillingness to accept long tail risks, ie. risks with long periods for loss settlements just like liability business. Amongst the three-digit-number of Cat Bonds there have been only two transactions that are covering liability risks<sup>8</sup>. And both transactions have been structured in a way that loss settlement period would be artificially shortened so that the potential adverse consequences of long tail business needs to be retained by the risk owner issuing the Cat Bond.
- Also it needs to be mentioned that structuring and executing a Cat Bond transaction has not yet become cheaper than buying a reinsurance contract with comparable risk transfer capacity. On the one hand, this is due to substantial structuring work and related cost (eg. a specific ‘Special Purpose Vehicle’ (SPV) needs to be set up), on the other hand, the ‘innocent’ investors

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<sup>7</sup> Peter Gerhardt, CEO of Paris Re in Insurance Day of 4 January, 2007: ‘Paris Re sets up Bermuda retro-arm’.

<sup>8</sup> OCIL / Avalon Re (liability from energy business) and AXA / FCC SPARC (motor business).

apparently insist on sort of 'extra profit margin' to be willing to embark into unchartered waters.

- Finally it remains to be seen – despite the assertions of those 'risk owners' that heavily rely on Cat Bonds as a means for the risk management – in how far investors are willing to invest in future Cat Bonds once a large loss event might have hit a few Cat Bonds materially. The stress test to this sort of risk management tool is still due to come.

### **Conclusion and outlook**

In a nutshell, Cat Bonds based on their advantages described above are a valid tool to transfer insurance related risks efficiently into the capital market and at the same time are an attractive investment opportunity for investors who would like to add the non-correlating asset class of (mainly) Natural Catastrophe Exposure to their investment portfolio. Also, for risk transfer of Natural Catastrophe exposure, sheer capacity in a commoditized form is needed and sufficient.

At the same time, traditional reinsurance can be structured in a tailor-made way to the needs of individual risk owners, eg. by avoiding basis risk by using compensation trigger, and will also have his valid ground. The best way for practicing risk management will be the prudent combination of those two tools, plus those developments still to come.