An overview of the recommendations regarding Catastrophe Risk and Solvency II

Designing and implementing a regulatory framework in the complex field of CAT Risk that lies outside "the traditional actuarial domain" is a lengthy and difficult process that requires a variability of expert advisers and constant modifications and updates. Transparency is essential regarding both the regulatory framework and the calculation of standard formulas and currently needs to be strengthened.

Independent expert opinion is required and this can be achieved with the establishment of an independent multidisciplinary group of experts, covering different CAT risk topics that will propose reforms in current regulations and revise the standard formula. The majority of its members should not be associated with the insurance industry or vendors so as to avoid conflicts of interest. A revision targeted for 2018 could be an achievable goal and should be coordinated by EIOPA.

Regulators need support and training from expert advisers in understanding and validating scientific aspects of the complex catastrophe modelling process. In some cases, national supervisory authorities could offer a source of expertise. Following the above, the role of EIOPA as a coordinator could be fundamental for: a) building capacity to assist regulators by setting up/organizing training seminars, b) creating a pool of specialists from existing national regulators, c) facilitate knowledge transfer and/or mobility of specialists from one country regulator to another according to the needs. The latter will support EIOPA's role in strengthening oversight of cross-border groups and promoting coordinated European Union supervisory response.

Currently insurance in Europe does not efficiently support the agricultural sector and no specific regulations have been traced within Solvency II. The latter is verified by the low penetration of 20-25% of crop insurance in Europe. Special regulations are needed for the CAT Risk of the agricultural sector and the food industry so as to address agricultural needs and peculiarities. A detail study among Europe is needed, setting priorities and importing best practices from the US and Australia, so as to increase penetration in Europe. Some coordination with the Common Agricultural Policy (CAP) that defines the European policy and distributes a major part of the European Commission Budget would be essential and beneficial.

Support the development of open access CAT models. These models can be transparent, informing also the public in line with the proposals of the European Parliament.

Feedback Statement on Catastrophe Risk and Solvency II

This is a short report following the talk "*Catastrophe models and Solvency II: Transparency, evaluation, credibility*" on the IRSG meeting held on 28th of October 2015. This report summarizes the context, outcomes and proposals and is directly linked to the talk presentation as well as its 62 citations/references. It was distributed and discussed during the IRSG meeting held on 16th of February 2016. The talk and the feedback report have been presented and authored by Assist. Prof. Dr. Ioannis Papanikolaou academic member of the IRSG, Head of the Subgroup of Strategic Areas of the IRSG and Topic Owner of Cat Risk.

The context

Economic losses from natural hazards continue to escalate from the 1950ies since from 2000 up to 2012, direct losses from disasters are in the range of $2.5 trillion. Hence, in 2013 the UN reports that losses are out of control, urging public and private sector to reduce risk. In accordance insured losses follow a similar trend, exceeding 50$ billions per year (Munich Re 2013). Overall vulnerability constantly increases (e.g. globally, US$71 trillion of assets would be exposed to one in 250 year earthquakes), whereas some countries are significantly exposed, considering that their 1 to 250 year loss scenarios, exceed 4 or even 10% of their GDP.

Catastrophe Risk

Catastrophes represent significant financial hazards to an insurer, including the risk of insolvency, an immediate reduction in earnings and statutory surplus, the possibility of forced asset liquidation to meet cash needs, and the risk of a ratings downgrade. Catastrophe insurance has some characteristics and peculiarities that differentiates it significantly from the regular insurance, making it more challenging to deal with and more prone to failure. In particular: i) individual claims are correlated and insurers have to pay more clients at once, producing a liquidity strain, ii) in the catastrophe insurance market losses are usually characterized by high peaks that relate to LF-HS (low-frequency high severity risks) and iii) the precise prediction of loss probabilities of these low-frequency, high severity risks is a difficult task and require a different approach compared to the other HF-LF "high-frequency, low-severity risks" in the industry (e.g. car accidents).

Importance of CAT Models

Two landmark events in the 90ies (1992 Hurricane Andrew and 1994 Northridge earthquake California) that were unexpectedly destructive, emphasized the importance of CAT risk modeling. Since then, CAT models have been advanced and now widely used, forming a tool of major importance since:

i) The quality of the CAT model might determine the survival of the insurer, when a catastrophe occurs, by defining the pricing of risk,
ii) Justify the Solvency Capital Requirements by running an internal CAT model,

iii) NatCat risk is a rating factor on corporate credit quality (e.g. S&P uses exposure and treatment of Natcat risk in downgrading 60 companies since 2005 and this trend is expected to increase the following years),
iv) Assist decision making in risk diversification,
v) Suggest whether a transfer of risk (e.g. reinsurance) is required,
vi) Set the policy conditions (e.g. deductibles),
vii) Guide portfolio optimization (by determining the size and distribution of potential losses),
viii) Controls the pricing of catastrophe bond market that is an emerging market,
ix) Has a significant role in organizing the contingency plans immediately after the catastrophe.

Structure and evaluation of CAT Models

CAT models have four main components: the hazard module (location, frequency and severity of events), the exposure module, vulnerability/risk module (damage function/curves) and the financial module (loss). The final output is the Exceedance Probability (EP) curve that communicates the probability of any given financial loss being exceeded. CAT models are simplifications of complex natural processes and are highly dependent on data input. Therefore for their evaluation, it is crucial to evaluate the data input; the assumptions used and obtain a good understanding of the implied uncertainties.

Completeness of data input and high spatial resolution are of major importance for assessing the risk. However, completeness of data input for low frequency high severity events (e.g. earthquakes) is a major challenge and can not be dealt with the use of the historical record because it is too short. If the data window is too narrow to catch a rare event, then missing an extreme loss will result in a much lower estimate of the average annual loss. On the other hand, if this narrow window happened to have recorded the extreme event, then the annual loss will be overestimated. Recent scientific advances, can in several cases, eliminate the incompleteness problem by extending the history back in time and should be incorporated to modern CAT models.

Solvency II and Catastrophe Risk

The SCR is calibrated using the Value at Risk (VaR) of the basic own funds of an insurance or reinsurance undertaking, subject to a confidence level of 99.5 % over a one-year period. This calibration objective is applied to each individual risk module and sub-module. The Standard Formula provides tables showing the gross loss damage ratio (Qcountry) for 1-in-200 year catastrophe events, by peril, within each CRESTA zone separated by country. The capital requirement for each CRESTA zone and each peril gross of reinsurance is Qcountry times the aggregated value of geographically weighted total insured value by peril for each country, where the weights are the zone relativity factors for each country provided by the Standard Formula.

Several gaps and weaknesses have been identified in the current regulation of Catastrophe risk. In particular:

1) Lack of transparency regarding the calculation of the standard formula since there is no report that supports existing values. Therefore, a question emerges on how current values from Annexes have been extracted and who has validated them. Moreover, country risk factors have been modified from 2010 to 2012, but again there is no justification for these changes;
2) There could be a conflict of interest if some or all of the Q country factors have been proposed by CAT Risk companies, the insurance industry and/or vendors;
3) Credibility issue (e.g. some of the country factors are scientifically unjustifiable, either too high or too low, whereas some risks or processes are ignored) ;
4) Aggregate country level exposure data are inadequate to properly reflect the high spatial and temporal variability in natural catastrophe risk;
5) The peril correlation matrix has several inconsistencies and gaps. For example, it implies that subsidence and earthquakes could not be interrelated and are independent to each other. However, subsidence is one of the main earthquake environmental effects. In addition, subsidence phenomena can be triggered by weak or distant earthquakes. In addition, subsidence is regarded as a peril only in France. However, there are several other countries that suffer from subsidence phenomena;
6) Terminology issues can cause problems. For example, heave is the upward movement of the ground beneath the buildings due to soil expansion of clay minerals or tree roots and can also cause damages. Heave is not reported in the regulations, but is it covered within the subsidence phenomena or not?
7) No specific regulations have been traced regarding the agricultural sector that requires a different approach.

Standard Formula and Internal models

In Solvency II, insurance companies have two choices for CAT Risk. Either use a standard formula or run an internal model. Smaller companies that do not have the capacity/ability to run an internal model use the standard formula that usually requires higher capital requirements. On the other hand, an internal model requires the use of specialized staff. As a result, bigger companies tend to perform an internal model. During ORSA through a Risk Profile they demonstrate that their model produces different results than the Standard Formula, so that they can justify the use of internal model. In most cases it is partial internal model since a major part goes outsourcing to vendors, but Solvency II requires that the company staff is well aware of its model, data input and each module.

Different CAT models in the same area and portfolio can provide significantly different results. In such a case, a conflict of interest can be created by favoring the model that leads towards the lowest capital requirements. Such a model could be more attractive to insurers. As a result, a good evaluation of the model is required. Therefore, what is the ability of the supervisory authorities to monitor the compliance to the Solvency II requirements and can regulators understand and evaluate CAT models and their applications?

Outcome

CAT Risk models lie outside “the traditional actuarial domain” and are more difficult to comprehend and evaluate both by insurers and regulators.

Their construction relies heavily on the expertise of certain scientific disciplines (geology, meteorology, civil engineering), beyond statistics and actuarial analysis.

CAT Risk models require a special treatment from insurers and regulators some of which have to be specialists, so as to monitor their compliance with Solvency II obligations and offer an adequate evaluation/supervision of the internal models. Currently the ability of the regulators to sufficiently supervise and evaluate internal cat models is questioned.

The commonest constraint for building a reliable model is the lack of accurate and complete historical information about catastrophic events. Recent scientific advances can partly cope with such constraints, eliminating this incompleteness.

Proposals and the Role of EIOPA

Independent expert opinion is required and this can be achieved with the establishment of an independent multidisciplinary group of experts, covering different CAT risk topics that will propose reforms in current regulations and revise the standard formula. The majority of its members should not be associated with the insurance industry or vendors so as to avoid conflicts of interest. A revision targeted for 2018 could be an achievable goal and should be coordinated by EIOPA.

Regulators need support and training from expert advisers, in understanding and validating scientific aspects of the modelling process. In some cases, national supervisory authorities could offer a source of expertise. Following the above, the role of EIOPA as a coordinator could indeed be fundamental for: a) building capacity to assist regulators by setting up/organizing training seminars, b) creating a pool of specialists from existing national regulators, c) facilitate knowledge transfer and/or mobility of specialists from one country regulator to another according to the needs. The latter will support EIOPA’s role in strengthening oversight of cross-border groups and promoting coordinated European Union supervisory response.

Support the development of open access CAT models. These models can be transparent, informing also the public in line with the proposals of the European Parliament.

Currently insurance in Europe does not efficiently support the agricultural sector and no specific regulations have been traced within Solvency II. The latter is verified by the relative low penetration of 20-25% of crop insurance in Europe that is approximately half compared to the US. Special regulations are needed for the CAT Risk of the agricultural sector so as to address agricultural needs and peculiarities. A detail study among Europe is needed, setting priorities and importing best practices from the US and Australia, so as to increase penetration in Europe. Some coordination with the Common Agricultural Policy (CAP) that defines the European policy and distributes a major part of the European Commission Budget would be essential and beneficial.

Ending remark

Designing and implementing a regulatory framework in the complex field of CAT Risk is a lengthy and difficult process that requires a variability of expert advisers. In addition, since scientific input and advances in catastrophe risk are rapidly evolving, regulators and insurers need to realise that modifications and updates will be a common process, implying that they need to incorporate these to their future plans.

Assist. Prof. Dr. Ioannis Papanikolaou

Head of the Subgroup of Strategic Areas of the IRSG

Topic Owner of Cat Risk