Rapidly assessing the probability of exceptionally high natural hazard losses

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One of the objectives in catastrophe modeling is to assess the probability distribution of losses for a specified period, such as a year. From the point of view of an insurance company, the whole of the loss distribution is interesting, and valuable in determining insurance premiums. But the shape of the righthand tail is critical, because it impinges on the solvency of the company. A simple measure of the risk of insolvency is the probability that the annual loss will exceed the company's current operating capital. Imposing an upper limit on this probability is one of the objectives of the EU Solvency II directive.

If a probabilistic model is supplied for the loss process, then this tail probability can be computed, either directly, or by simulation. This can be a lengthy calculation for complex losses. Given the inevitably subjective nature of quantifying loss distributions, computational resources might be better used in a sensitivity analysis. This requires either a quick approximation to the tail probability or an upper bound on the probability, ideally a tight one. We present several different bounds, all of which can be computed nearly instantly from a very general event loss table. We provide a numerical illustration, and discuss the conditions under which the bound is tight. Although we consider the perspective of insurance and reinsurance companies, exactly the same issues concern the risk manager, who is typically very sensitive to large losses.