Nested extreme risks and model uncertainty

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One of the stakes of the current regulation for financial institutions (banks, insurance) is the calculation of solvency ratio, related to a level of Value-At-Risk on future exposures. In simplifying, the assessment to be carried out takes the form of

$$SCR = \mathbb{E}\Big(\varphi\big(\mathbb{E}(Y \mid X)\big) \mid X \in A\Big)$$

where X stands for the economic variable in the future, $\varphi(\mathbb{E}(Y|X))$ is a measure of exposition to risks, and A is an extreme event ($\mathbb{P}(X \in A) \ll 1$). The above quantity is then transformed into a Solvency Capital Requirement.

Currently, SCR is often computed using nested Monte-Carlo methods, which can be quite computationally demanding. In [FGM17] the inner expectation is efficiently computed by regression methods where the design is generated by a MCMC scheme which is well suited to the rare set.

In this project, our objective is to account for the uncertainties in the modeling of economic variables X and Y, this is intrinsic to the applications under consideration. In particular the model parameters may be considered as random and we rather focus on the computation of the distribution of SCR. The aim of this project is to design new numerical methods for assessing the distribution of SCR with respect to the uncertainty on the underlying model.

References

[ADGL15] A. Agarwal, S. De Marco, E. Gobet, and G. Liu. Rare event simulation related to financial risks: efficient estimation and sensitivity analysis. *HAL preprint, hal-01219616*, 2015.

[FGM17] G. Fort, E. Gobet, and E. Moulines. MCMC design-based non-parametric regression for rare-event. Application to nested risk computations. *To appear in Monte Carlo Methods and Applications*, 2017.

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