Modelling Operational Risk Using Extreme Value Theory and Skew t-Copulas via Bayesian Inference

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Abstract : Operational risk losses are heavy tailed and are likely to be asymmetric and extremely dependent among business lines/event types. We propose a new methodology to assess, in a multivariate way, the asymmetry and extreme dependence between severity distributions, and to calculate the capital for Operational Risk. This methodology simultaneously uses (i) several parametric distributions and an alternative mix distribution (the Lognormal for the body of losses and the Generalized Pareto Distribution for the tail) via extreme value theory using SAS®, (ii) the multivariate skew t-copula applied for the first time for operational losses and (iii) Bayesian theory to estimate new n-dimensional skew t-copula models via Markov chain Monte Carlo (MCMC) simulation. This paper analyses a newly operational loss data set, SAS Global Operational Risk Data [SAS OpRisk], to model operational risk at international financial institutions. All the severity models are constructed in SAS® 9.2. We implement the procedure PROC SEVERITY and PROC NLMIXED. This paper focuses in describing this implementation.

Keywords : operational risk, loss distribution approach, extreme value theory, copulas
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