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Extremes in risk management – a nonparametric approach to the estimation of the quantiles of compound distributions

Prof Helgard Raubenheimer (North-West University)

DATE: Monday, 18 November 2024 | 16h00–17h00 SAST

VENUES:
- Neelsie Cinema, Stellenbosch University
- Online

--- A recording of the talk will be published on the NITheCS YouTube channel afterwards ---

ABSTRACT

Estimation of operational risk reserves is still widely done using the loss distribution approach. The accuracy of the estimation depends heavily on the accuracy with which the extreme quantiles of the aggregate loss distributions are estimated. Various approaches have been proposed to estimate the extreme quantiles of this compound distribution, including estimators based on the single-loss and perturbative approximations that rely on estimating an even more extreme quantile of the underlying severity distribution. However, estimation of these extreme quantiles may be inaccurate due to incorrect parametric distributional assumptions. To circumvent this problem, we propose estimating nonparametrically a less extreme or lower quantile of the severity distribution, hopefully with better accuracy, and then multiplying this lower quantile by a certain factor to obtain an estimate of the required extreme quantile of the compound distribution. The factor or multiplier is derived by using extreme value theory and the single loss and perturbative approximations. The estimators are evaluated by means of a simulation study which suggest that the second-order multiplier estimator based on the second-order perturbative approximation, is a good choice for practical applications.

BIOGRAPHY

Helgard Raubenheimer is a professor at North-West University (NWU), where he started as a lecturer in 2003 at the Centre for Business Mathematics and Informatics (CBMI). From 2016 he was the Head of the SAS Lab at CBMI, and since 2022 he has been the Director of CBMI. He received a PhD in Risk Analysis from NWU in 2010.

Helgard has built up expertise as an educator, researcher, and consultant throughout his career at CBMI. He has completed multiple successful industry-directed research projects and presented professional training in the financial services industry locally and globally. His primary research interest is in quantitative risk management. He co-authored numerous peer-reviewed papers, which have received national and international acclaim from the South African Statistical Association (SASA), the Actuarial Society of South Africa (ASSA) and Risk.net.

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