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Professor Piet de Jong
Head of Department, Actuarial Studies, Macquarie University

Modeling dependence between loss triangles using copulas

This article discusses the modeling of dependence between loss triangles. Dependence is critical to setting overall risk margins. High positive dependence implies little diversification benefit and vice versa. Dependence is modeled using copulas associating calendar years in different loss triangles. Methods take on a simple form in the case of Gaussian copulas in which case association is captured through a correlation matrix of order equal to the number of triangles.

The impact of the correlations is moderated by quantities called specificities. Specificities are numbers between 0 and 1 which measure the amount of within calendar year variation attributable to factors specific to a given loss triangle. The obverse of specificity is communality which measures the variation within a calendar year that is common to all triangles. Estimation procedures are given as well as the joint forecasting of future liabilities and the calculation of over- all risk margins, diversification benefits and benefits attributable to each loss triangle. Methods are illustrated on practical data.