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A generalization of Panjer's recursion and numerically stable risk aggregation. (English)

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Finance Stoch. 14, No. 1, 81-128 (2010).

The authors are concerned with a classical topic in insurance: the aggregation of risks on a portfolio basis, which gained an increasing importance in the context of credit risk, and the advanced measurement approach for operational risk. Modeling losses on a portfolio basis usually leads to the problem of calculating the distribution of a compound sum of a random number of independent identically distributed individual credit, operational or insurance losses, which are assumed to be independent of the number of summands. Often it is needed to calculate some extreme quantiles (e.g. by Basel II requirements), and in this case the Monte Carlo approach is useless, because it leads to a substantial stochastic error. Recursive schemes such as Panjer's recursion offer a much better method to calculate the loss distribution, avoiding this stochastic error. However, applying the classical Panjer recursion may lead to numerical instabilities in some important cases. The authors present a generalization of Panjer's recursion, which leads to numerically stable algorithms. Albeit slower than the Panjer's recursion by a constant factor, these algorithms can reduce the numerical error substantially, which is confirmed by numerical examples provided by the authors. De Pril's recursion can be generalized in the same way. The authors also give an analogue of their method for the collective risk model with a severity distribution having mixed support.

Reviewer: [Georgij M. Shevchenko \(Kyiv\)](#)

MSC:

91B30 Risk theory, insurance (MSC2010)
91G40 Credit risk
91G60 Numerical methods (including Monte Carlo methods)

Cited in **5** Documents

Keywords:

portfolio credit risk; [CreditRisk⁺](#); operational risk; collective risk model; extended negative binomial distribution; extended logarithmic distribution; compound distribution; extended Panjer recursion; numerical stability; De Pril's recursion

Software:

[CreditRisk⁺](#)

Full Text: [DOI](#)

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