

# A recursive algorithm for the computation of some mixed compound distributions

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## Abstract

Let  $(\Omega, \Sigma, P)$  be a probability space and let  $S$  be the aggregate claims amount induced by the claim size process  $X := \{X_n\}_{n \in \mathbb{N}}$  and the claim number  $N$ .

In actuarial practice, the usual assumptions of  $P$ -independence among the random variables of  $X$  and the  $P$ -mutual independence between  $X$  and  $N$  are often violated. In particular, the mutual independence assumption seems to be unrealistic, especially when considering inhomogeneous portfolios. This motivated us to call  $P_S$  a **mixed compound distribution** if  $X$  is  $P$ -conditionally i.i.d. and  $P$ -conditionally mutually independent of  $N$  given  $\Theta$ , where  $\Theta$  is a  $d$ -dimensional random vector on  $\Omega$  representing an inhomogeneous portfolio under consideration.

In this framework, we consider the mixed counterpart of the original Panjer class of claim number distributions and the corresponding compound distributions. We characterize the mixed Panjer class of claim number distributions in terms of a regular conditional probability of  $P$  over  $P_\Theta$  consistent with  $\Theta$ , and relying on this characterization we obtain a simple recursion for the computation of  $P_S$  when the claim size distribution is concentrated on  $\mathbb{N}_0$ .

**Keywords:** Mixed compound distributions; Panjer recursion; regular conditional probabilities.

**Acknowledgements:** This work has been partly supported by the University of Piraeus Research Center.

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