# Ruin Probabilities with Excess of Loss Reinsurance and Reinstatements

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**Abstract**

The present paper studies the probability of ruin of an insurer, if excess of loss reinsurance with reinstatements is applied. In the setting of the classical Cramer-Lundberg risk model, piecewise deterministic Markov processes (PDMP) are used to describe the surplus process in this more general situation. It is shown that the finite-time ruin probability is both the solution of a partial integro-differential equation and the fixed point of a contractive integral operator. We exploit the latter representation to develop and implement a recursive algorithm for numerical approximation of the ruin probability that involves high-dimensional integration. Furthermore we study the behavior of the finite-time ruin probability under various levels of initial capital and security loadings and compare the efficiency of the numerical algorithm with the computational alternative of stochastic simulation of the risk process.

**Keywords:** reinsurance, PDMP, integral operator, finite-time ruin probability, high-dimensional integration

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