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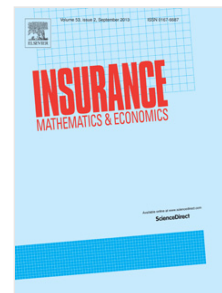
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A Risk Model with Renewal Shot-noise Cox Process*

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Abstract

In this paper we generalise the risk models beyond the ordinary framework of affine processes or Markov processes and study a risk process where the claim arrivals are driven by a Cox process with renewal shot-noise intensity. The upper bounds of the finite-horizon and infinite-horizon ruin probabilities are investigated and an efficient and exact Monte Carlo simulation algorithm for this new process is developed. A more efficient estimation method for the infinite-horizon ruin probability based on importance sampling via a suitable change of probability measure is also provided; illustrative numerical examples are also provided.

Keywords: Risk model; Ruin probability; Renewal shot-noise Cox process; Piecewise-deterministic Markov process; Martingale method; Monte Carlo simulation; Importance sampling; Change of probability measure; Rare-event simulation

JEL Classification: G22, C10, C60

Mathematics Subject Classification (2010): Primary: 91B30; Secondary: 60J75, 65C05

1 Introduction

In insurance modelling a *Poisson process* has a long history of being used as a classical model for the claim-arrival process. Extensive discussions from both applied and theoretical viewpoints can be found in early literature, Cramér (1930), Cox and Lewis (1966), Bühlmann (1970) and Çinlar (1974). A Poisson process is a simple counting process that

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