

Non-Poissonian claims' arrivals and calculation of the probability of ruin[★]

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Abstract

Collective risk model with a special emphasize on non-Poissonian claims' arrival processes is considered. Exact and approximate techniques for the calculation of the probabilities of ruin are examined. Simulation going back to the importance sampling is applied to two particular cases of non-Poissonian claims arrival processes to illustrate strong dependence of the probabilities of ruin on the interclaims distribution. © 1998 Elsevier Science B.V. All rights reserved

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1. Introduction

Consider the collective risk model introduced by F. Lundberg, interpreted by H. Cramér and developed by E. Sparre Andersen. Apart from purely mathematical breakthrough, Andersen's contribution allowed us to assume contagion between claims,¹ i.e., to deal with non-Poissonian claims' arrivals.

Since Andersen's model has been introduced, a number of authors claimed that "no practical examples of a renewal risk process other than Poissonian have been produced" (see, e.g., Seal, 1974, p. 121). This assertion reflects the well-known fact pointed out first by Khintchine and proved by Grigelionis (1966) under some mild technical assumptions, that the sum of a large number of independent point processes is approximately Poissonian, if the individual summands do not affect the composition.

Nevertheless, renewal non-Poissonian risk models do not look like a mere analytical over-complication. Indeed, e.g., modern mass media and telecommunication networks could introduce substantial and sometimes unpredictable dependence into behaviour of insured persons which eventually could make an assumption on the Poissonian origin of claims' arrival suspicious.

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¹ Andersen wrote: "the type of contagion, which may be considered, is characterized by the property that a claim is more likely (or, if that should be wanted, less likely) to occur shortly after another claim, and that the probability of occurrence of claims depends on the time elapsed since the last claim and only on this quantity" (Andersen, 1957, p. 219).