

Modeling and Asymptotic Analysis of Insurance Company Performance

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1 Introduction

It is well known that in order to study any real-life process or system one needs a mathematical model. Description of the new models which became important in modern actuarial sciences during the last twenty years one can find in the paper by Bulinskaya [1]. We mention only the strong interaction of insurance and finance and employment of sophisticated mathematical tools for investigation of complex stochastic systems. This paper deals with modeling of insurance company performance and its analysis continuing the research started in [2] - [7]. Thus, we are going to deal with models involving reinsurance, dividends payment and investment.

2 Formulation of the problem

One of our aims is to evaluate the functioning of an insurance company and study the sensitivity of optimal decisions to small fluctuations of parameters and perturbation of underlying distributions. The methods useful for this purpose one can find in the books by Saltelli et al. [11] and Rachev et al. [10], respectively. It is possible to perform this investigation in the framework of reliability and cost approaches. In other words, one can choose either the ruin probability as objective function or costs incurred by implementation of the optimal control. The solvency problems (see, e.g., [12]) demanded consideration of the so-called Parisian ruin and Omega models (for definitions see, e.g., [8] or [9] and references therein, as well as, [1]). We are interested in calculation and asymptotic analysis of these characteristics. Moreover, we introduce a new indicator of insurance company performance, namely, the first time η_l^X when the interval of the surplus staying above zero (before the Parisian ruin) becomes greater than l . For the Cramér-Lundberg model the explicit form of the Laplace transform of η_l^X is calculated as a function of the model's parameters. This enables us to carry out the sensitivity analysis of the new characteristic and establish the model stability.

Another problem treated in our presentation is the choice of dividends payment strategy in dual Sparre Andersen models which can arise in life-insurance or investigation of investment company performance.

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