3rd International Conference on Applied Mathematics & Approximation Theory May 28-31, 2015 – Ankara – Turkey

AMAT 2015

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Oktay Duman (*Turkey*)

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ABSTRACTS BOOK

Venue: TOBB University of Economics and Technology
Söğütözü Street No: 43, 06560 Ankara - Turkey

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Solution of Equation for Ruin Probability of Company for Some Risk Model by Monte Carlo Methods

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Abstract

In classical risk model with Poisson damages stream that enter an insurance company with intensity's λ and accumulation speed of payments c and with damages distribution $D(u)$ under condition $\frac{\lambda b}{c} < 1$, the equation is given as

$$R(x) = \frac{\lambda}{c}\int_0^x D(x-u)R(u)du + \frac{\lambda}{c}F(x),$$

where $F(x) = \int_x^\infty D(t)dt$, $b = \int_0^\infty tdD(t)$, $R(x)$ stands for probability of ruin as a function of the initial capital $x \geq 0$. It is known that the function $R(x)$ is monotone decreasing to 0 as $x \to \infty$. Proven fact that for continuous function $F(x)$, $x \geq 0$, the integral equation for probability of ruin has continuous unique solution in $\mathbf{C}$ function class on interval $[0, \infty)$. This integral equation is not easy solved by "classical" methods when $D(x)$ is Pareto distribution, $D(x) \equiv P(x) = 0$, $0 \leq u \leq \frac{\alpha-1}{\alpha}$; $P(u) = 1 - \left(\frac{\alpha-1}{\alpha u}\right)^\alpha$, $u > \frac{\alpha-1}{\alpha}$ with parameter $\alpha = 3$, with accuracy at most 0.03, $\lambda = 0.7$, $c = 1$, for $x > 500$.

We solve this integral equation with any given accuracy for given parameters and for $x > 500$ by Monte Carlo methods. The calculating experiment was realized for parameters $\lambda = 0.8$, $c = 1$,

$$F(x) = \begin{cases} 1, & \text{for } x \leq k, \\ \left(\frac{k}{x}\right)^\alpha, & \text{for } x > k \end{cases}$$

and also for Pareto distribution with parameters $\alpha = 2, 3, 5, 7$ and $k > 0$, $k = \frac{\alpha-1}{\alpha}$. Results of numerical experiments are completely satisfactory.

Keywords: Probability, ruin, model, integral equation, Pareto dostribution, Monte Carlo methods.