Numerical finite horizon ruin probabilities in the classical risk model witi stochastic return on investments

Lubasi Simataa

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University of Dar es Salaam, College of Natural and Applied Science, 2011

This study deals with numerically computing finite horizon ruin probabilities in an insurance portfolio with the money market in mind. The risk process in this study has its origin in the classical risk process (a constant income stream from which is subtracted a claim process that is assumed to be a compound Poisson process). This classical risk process is then compounded by an independent return on investments process of the Blink and Schuler type. The uncertainty in both processes is modelled by a standard Brownian motion. A model is formulated theoretically with all the parameters (like volatility constant, rate of premium income, return from the investments and uncertainty) assumed to be unknown but from a certain set. In this study we derive partial differential equations as our model.

Numerical schemes to approximate the solutions have been developed since exact solutions are hard to find. In this study, we preferred to use an implicit finite difference scheme to numerically solve the equations for finite time ruin probabilities in the absence of jumps and in the presence of jumps because the scheme is unconditionally stable. The model has been validated using common parameters in literature. The software that has been used for numerical schemes and simulations is matlab 7.0.1. The effect of jumps on the probability of ruin and time to ruin has been investigated In this study we have considered light tailed exponentially distributed jumps and heavy tailed Pareto distributed jumps.

The results confine intuitive thinking that when the surplus process is compounded by an independent stochastic return on investments the resulting surplus process has a minimum finite horizon ruin probabilities. Obviously this means that the ruin probability is reduced in the presence of positive interest. Furthermore, our results Show that the presence of jumps and a number of jumps happening in a short period increase this probability.