

MAT 6280: Advanced risk theory

The fall semester 2001

Professor: Vsevolod Malinovskii

(office # 6153, malinovs@dms.umontreal.ca)

Course description

The subject of this course is finite time ruin probability. The course could be considered an extension of the obligatory course on risk theory (MAT 3251) which makes a considerable part of the Society of Actuaries exam no. 3. Its major parts are:

- The Andersen's collective risk model with a special emphasis on the Poisson/Exponential, or a "classical", particular case.
- Random walks and ruin. Associated random walks in the ruin problem. Ladder random variables.
- Distribution of the ladder random variables. Wald identities and the Spitzer's sums. Calculation of the cummulants of the ladder random variables. The cummulants in the Poisson/Exponential model.
- Exact formulas for the probabilities of ruin within finite and infinite time.
- Approximation (as the initial capital grows) of the finite time ruin probability in the general Andersen's model. Corrected formulas. Accuracy of the approximations.
- Approximation (as the initial capital grows) of the risk reserve conditioned by ruin.
- More advanced theory: probabilities of ruin when the safety loading tends to zero.

Emphasis will be put, on one hand, on the applicability of the formulas to problems occurring in the practical work of an actuary and, on the other hand, on the mathematical foundations of the formulas.

Texts

1. Daykin, C.D., Pentikäinen, T., and Pesonen, M., *Practical Risk Theory for Actuaries*, Chapman and Hall, London, etc., 1996.
2. Panjer, H.H., Willmot, G.E., *Insurance Risk Models*, Society of Actuaries, Schaumburg, Ill., 1992.

Articles

1. Malinovskii, V.K., Corrected normal approximation for the probability of ruin within finite time, *Scandinavian Actuarial Journal*, (1994), 161 – 174.
2. Malinovskii, V.K., Probabilities of ruin when safety loading is tending to zero, *Advances in Applied Probability* **32** (2000), no. 3, 885 – 923.

Evaluation

First exam: 50%
Second exam: 50%