

Mathematics Department
Brooklyn College, City University of New York
Math 3802 (Introduction to Risk Theory) Syllabus
4 hours, 4 credits

Utility Theory in Insurance

Classes of utility functions
The expected utility model

Individual Risk Model

Mixed distributions and risks
Convolutions and Transforms of cumulative distribution functions
Approximations: Central Limit Theorem, Translated gamma and Normal power

Collective Risk Models

Compound distributions
Convolution formula for a compound cumulative distribution function
Distributions for the number of claims
Properties of compound Poisson distributions
Panjer's recursion
Compound distributions and the Fast Fourier Transform
Approximations for compound distributions
Comparison between individual and collective risk model

Loss Distributions

Review: techniques to generate pseudo-random samples and maximum likelihood estimates
Poisson and Negative Binomial claim number distribution
Gamma, Inverse Gaussian, Exponential, Lognormal and Pareto claim severity distributions

Ruin Theory

The classical ruin process
Lundberg's inequality
Ruin probability and capital at ruin
Explicit expressions for ruin probabilities: the case of exponential distributions
Approximation of ruin probabilities

Premium Principles and Risk Measures

Examples of premium principles and their properties
Characterizations of premium principles
Premium reduction by coinsurance
Value-at-Risk and related risk measures

Reinsurance

Stop-loss reinsurance
Proportional reinsurance