STAT 4703, Actuarial Models II

The course is open to anyone who has successfully completed STAT 3701.

Calendar description:

In STAT 3701, we covered the types of models that can be used for loss models in actuarial work. In this course we look into the problem of choosing which model to use, and how to estimate the parameters in that model.

Course description:

Models for loss severity: parametric models, effect of policy modifications, tail behaviour. Models for loss frequency: (a, b, 0), (a, b, 1), mixed Poisson models; compound Poisson models, Aggregate claims models: moments and moment generating function: recursion. Classical ruin theory.

It is intended that this course should cover a portion of the syllabus for that part of the professional actuarial examination concerned with the Construction and Evaluation of Actuarial Models. Currently, this corresponds to most of the material listed above from Chapters 12-16, 20, and 21 that is on the syllabus for the Society of Actuaries Exam C. This course syllabus should be updated as needed, with this objective in mind.

Quality of an estimator: unbiasedness, asymptotic unbiasedness, consistency, means squared error, uniform minimum variance. Confidence interval. Tests of hypotheses. Estimation for complete data. Estimation for grouped data. Estimation for modified data: Kaplan-Meier estimator, variances and confidence intervals of the empirical estimator, kernel density estimator. Parameter estimation. Variance of the estimators and confidence intervals. Model selection: graphical procedures, goodness-of-fit test, likelihood ratio test. Interpolation and smoothing. Covers part of the syllabus for Exam C of the Society of Actuaries and Exam 4 of the Casualty Actuarial Society. Quantitative.

Evaluation:

6–8 assignments (15%), midterm (30%), closed-book final exam (55%)

Textbook

Loss Models: From Data to Decisions, 4th Edition, 2012, S.A.Klugman, H.H. Panjer and G.E. Willmot; Publisher: Wiley

Topics

This course covers the fundamentals of actuarial loss models. The topics covered correspond to chapters 10–16 and 20 of the required text and the study notes from SOA for Exam C. They include the following:

1. Estimation for complete data: empirical distributions for complete, individual data and grouped data.

2. Estimation for modified data: point estimation, Mean, variance, and interval estimation, kernel density models, approximations for large data sets.

3. Frequentist estimation: method of moments and percentile matching, maximum likelihood estimation, variance and interval estimation, Bayesian estimation, estimation for discrete distribution.

4. Frequentist estimation for discrete distributions

5. Model selection: representations of the data and model, hypothesis tests, two types of selection criteria, extreme value models, copula models, models with covariates.

6. Simulation