

# Loss Models: From Data to Decisions, 2nd edition

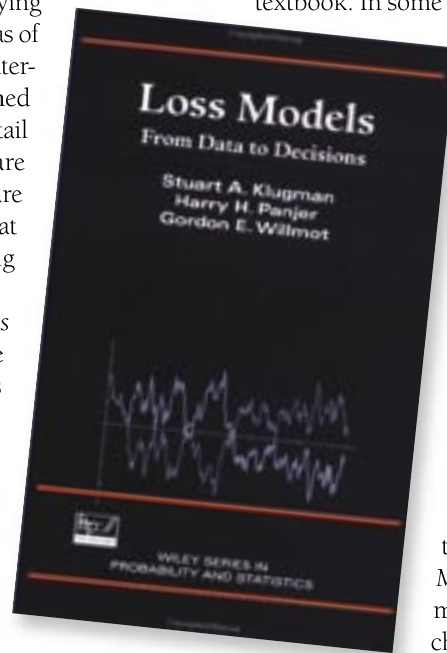
Stuart A. Klugman, Harry H. Panjer, and Gordon E. Willmot

John Wiley & Sons, Inc., Hoboken, NJ, 2004.

SINCE THE EARLIEST DAYS OF THE ACTUARIAL PROFESSION, actuaries have attempted to develop mathematical models that would represent, with reasonable accuracy, various kinds of loss processes. Such models are obviously useful for forecasting losses, which is at the heart of what actuaries do. Historically, life and pension actuaries have described these mathematical models as “survival” models and used them to represent those who continue to pay life insurance premiums or receive benefits from annuities or retirement plans. Because survival is merely the flip side of death (one kind of loss), survival models are often considered a subset of more general loss models.

Actuaries focusing on health insurance and casualty insurance are also interested in modeling (and forecasting) deaths, but these actuaries deal even more with other types of losses that have more widely varying frequencies and severities. These areas of practice, and the emerging area of enterprise risk management, are concerned with losses that have so-called long-tail distributions. Such distributions are characterized by large claims that are infrequent but sufficiently severe that they can't be ignored in rate-setting and reserving.

The second edition of *Loss Models* brings together in one volume the mathematics underlying loss models in all areas of actuarial practice. This material is very familiar to younger actuaries (and students) because substantially all of this 688-page book is required reading for the third and fourth examinations of both the Society of Actuaries and the Casualty Actuarial Society. (After the fourth examination, the two societies' courses of study diverge into specialized areas.) The second edition builds on the base of three previous books written by one or more of the authors: *Loss Distributions* (1984), by Hogg and Klugman, *Insurance Risk Models* (1992) by Panjer and Willmot, and the first edition of *Loss Models* (1998) by the same three authors.



All three authors are fellows of the Society of Actuaries who teach full time at academic institutions. Stuart Klugman is at Drake University in Des Moines, Iowa. Harry Panjer and Gordon Willmot teach at Waterloo University in Waterloo, Ontario. Panjer in particular should be familiar to most actuaries because he served as president of the Society of Actuaries during 2002-03.

The second edition of *Loss Models* is long and quite dense. It feels at times more like an encyclopedia than a textbook. In some areas, it reduces large amounts of material to just final results, without the derivations that contribute so much to understanding. In many of those cases, the derivations are left as exercises, and a very useful Solutions Manual can be obtained from the publisher. In other cases, the text refers to books by other authors. Any student attempting to learn this material from scratch would be well advised to have some of those other sources readily available! *Loss Models* contains many detailed and useful examples based on actual data.

In addition to a one-chapter introduction and six appendices, *Loss Models* has four main parts. “Actuarial models” is the longest part, with seven chapters. It starts with the basics of random variables and moment-generating functions before ranging through classification of families of models and ending with discrete- and continuous-time ruin models.

One of the most interesting chapters for this reader was the classification of families of models because it illuminated the relationships among various models that

I had, in many cases, learned independently of each other. For instance, an interesting picture on Page 72 shows the relationships among 13 members of the “transformed beta” family of distributions, which includes, among others, the Pareto, gamma, and Weibull distributions and their inverses, as well as the lognormal distribution. Many of these are special cases of the generalized transformed beta distribution; others are limiting cases, where parameters approach zero or infinity.

“Construction of Empirical Models” begins with a review of mathematical statistics before covering estimation based on complete and modified data. “Parametric Statistical Methods” explains how model parameters are determined and presents a selection of tests that are used to judge the appropriateness of various models, based on how well they represent the available data (and which often depend on the type of data avail-

**One of the most interesting chapters for this reader was the classification of families of models because it illuminated the relationships among various models that I had, in many cases, learned independently of each other.**

able). Some of those tests, such as the chi-square goodness-of-fit test, are familiar; others, such as the Kolmogorov-Smirnov and Anderson-Darling tests, may be less so. In any event, no one should build a loss model without testing its quality.

Finally, “Adjusted Estimates And Simulation” covers interpolation, smoothing, credibility, and simulation. The chapter on smoothing is particularly interesting because it updates the “graduation” techniques that are familiar to older actuaries. While those older methods focused on finite differences and used clever ways of performing complex calculations manually, the modern methods described in *Loss Models* focus on cubic splines, which are continuous functions with smooth juncture points. The measures of fit and smoothness are analogous but use derivatives instead of differences. Some examples in the book use mortality data from Miller’s classic *Elements of Graduation* (1949). Of course, computers do all the calculations today.

*Loss Models* is an excellent reference book for any actuary and is certain to become a classic in actuarial literature.

—Bruce D. Schobel

We  
want  
you to  
know

Aetna Career Opportunities



Open a  
new door  
every day.

Aetna is a leading provider of health care coverage and related benefits, and we are committed to giving people information so they can make more informed health care decisions. We are looking for smart, ambitious, enterprising people who can help us continue to build the new standard in the industry every day. People who work hard and hold themselves accountable. People who are ready to leverage the power of what they know to make a measurable difference. Now is the time to believe in the value of your work. Get ready. Come work with a team of proud, open-minded, diverse people who are driven to make a positive impact. Every day.

To learn more about our career opportunities, visit us at [www.aetna.com](http://www.aetna.com).

We want you to know™



Health  
Dental  
Pharmacy  
Disability  
Long-Term Care  
Life