



SOCIETY OF ACTUARIES

Article from:

# The Actuary

September 1989 – Volume 23, No. 8

## Book review

# A fresh look at actuarial mathematics

by William B. Frye

*Actuarial Mathematics, Proceedings of Symposia in Applied Mathematics, Volume 35*, edited by Harry H. Panjer. Published by the American Mathematical Society, 1986. 127 pages.

This book reviews the thirty-fifth in a series, which began in 1947, of short survey courses designed to acquaint mathematicians with various topics in applied mathematics. The course on actuarial mathematics was conducted in Laramie, Wyoming, in August 1985. The proceedings of that meeting, as presented in this volume, include a preface by Harry Panjer, an introduction by James Hickman and seven papers.

The first paper, "Updating Life Contingencies" by James Hickman, describes the mathematics involved in calculating premiums and reserves. The loss variable is an integral part of the exposition, and its variance is used as a measure of risk.

The next paper, "Models in Risk Theory" by Harry Panjer, focuses on the various probability distributions available for modeling claim frequency. Compound distributions and mixed models are also examined. Stop-loss reinsurance is given as an application of the distribution of total claims.

"Loss Distributions," a paper by Stuart Klugman, considers the advantages of fitting claim distributions to a parametric model. Several methods of fitting are considered, and the advantages of one, the maximum likelihood method, are discussed.

Another paper, "Overview of Credibility Theory" by P. M. Kahn, explores various methods of determining the credibility factor,  $Z$ , in the basic equation: New estimate of claims =  $Z$  (actual claims) +  $(1 - Z)$  (old estimate of claims).

Kahn studies various distributions of claim frequencies and uses a Bayesian approach to the problem, as well as the least-squares theory. He also provides a brief overview of recent developments in credibility theory.

The fifth paper, "A Survey of Graduation Theory" by Elias Shiu, introduces the concept of graduation of data and reviews three of the better-known graduation methods – Whittaker-Henderson, moving weighted average, and smooth-junction interpolation. The presentation emphasizes the use of linear algebra.

John Beekman's paper on "Actuarial Assumptions and Models for Social Security Projections" discusses factors used in making estimates for the Old-Age, Survivors, and Disability Insurance System (OASDI). In addition, Beekman examines the short-, medium- and long-range projections needed in managing the OASDI program. Among factors that must be projected are population distributions by age, sex and marital status, and effective taxable payroll. These estimates require demographic and economic assumptions. Several formulas used by the Social Security Administration are presented and discussed.

The final paper, "On the Performance of Pension Plans" by Cecil Nesbitt, discusses the benefit formulas used in the TIAA and CREF pension plans and the plans' performance with respect to the actual benefits paid out to various groups of retirees. Several tables are included in the paper. In addition, Nesbitt reviews the problem of loss of real value of vested benefits before they are received.

While actuaries were not the book's intended audience, the actuary who wants a fresh look at some basic topics of actuarial mathematics may find the book of interest. Also, an extensive bibliography at the end of each paper provides a rich source for a closer look at new developments in some familiar areas. This book accomplishes its purpose of acquainting mathematicians with actuarial mathematics and is recommended to any mathematician interested in beginning or continuing to build a knowledge of actuarial science.

William B. Frye is Assistant Professor in the Department of Mathematics, Ball State University.

## Becoming an actuary in The Netherlands

by Ron van Oijen

The following information about actuarial education in The Netherlands is offered in response to the article, "Competition, communication, and cooperation" in *The Actuary* of March 1989.

There are two ways to become an actuary in The Netherlands. Both require study at the University of Amsterdam. The following is a short description of the two courses of study:

1) When you have finished your study at the V.W.O. (a comprehensive, pre-university school) and completed required courses at that school, including mathematics, you can enroll at the University of Amsterdam in the study-direction of actuarial science. The course of study usually takes four years (see accompanying sample study program).

During your course of study you can specialize in pensions, life insurance or casualty. If you successfully complete all the courses at the university, including the required exams, you receive a degree in actuarial science, and you also become a member of the Dutch Actuarial Society.

2) The other route to membership in the Dutch Actuarial Society involves combining study and work, as an "outside-university student." These students take the same required courses as the regular students but do not complete other courses required for a university degree. If they pass all the exams, they become members of the Society too. They do not get a degree from the university, as they have not taken all the courses. The students in this group are generally older than the students in the first group.

The numbers of regular and outside students enrolled at the university are about equal. "Graduates" of both types are respected members of the Actuarial Society.

The relationship between faculty members of the university and members and administrators of the Dutch Society is good. In addition, there are members of the Dutch

### *The Netherlands cont'd*

Society who also are professors at the university.

One of the complaints of the enrolled regular university students is that they don't have work experience and that there always is a gap between a science and a real job. But this drawback appears to be outweighed by the advantages of the current system.

The proposal by Ardian Gill, described in the article referred to previously, is very similar to the way actuarial students are educated in The Netherlands. You earn a degree and become a member of the Society, because it accepts the examinations of the university. Moreover, you can become a member of the Society only if you take exams at the university.

Ron van Oijen is a student at San Francisco State University, on exchange from the University of Amsterdam. He also is working part-time at The Wyatt Company.

### Study program

The "propedeutisch" program (i.e., first degree)

Trimester 1:

- calculus A
- linear algebra
- probability and statistics 1
- programming (Pascal)
- bookkeeping
- orientation

Trimester 2:

- calculus B
- linear algebra
- probability and statistics 1
- company economics 1 (to compare with accounting and finance)
- macro economics
- orientation

Trimester 3:

- calculus B
- linear algebra
- probability and statistics 1
- micro economics
- orientation
- company economics 2

"Master's" degree

Trimester 4:

- computer concepts
- calculus C
- linear algebra
- probability and statistics 2
- actuarial mathematics 1

Trimester 5:

- probability and statistics 2
- actuarial mathematics 1
- actuarial mathematics 2
- casualty insurance
- econometrics 1

Trimester 6:

- numerical methods
- practical programming

- actuarial mathematics 2
  - actuarial mathematics 3
  - practical econometrics
- Trimester 7:
- life insurance
  - pension A1
  - operations research
  - company economics 3
- Trimester 8:
- stochastic processes
  - casualty insurance A1
  - pensions A2
  - practical operations research
- Trimester 9:
- casualty insurance A2
  - life insurance A2
  - research assignment
- Trimesters 10, 11, and 12 comprise some elective courses. If you want, you can specialize in pensions, casualty insurance, or life insurance. In trimester 12 you get practical training within a company.

### Former actuarial instructor dies

A chain of four persons has informed us that Ernest J. Oglesby, a retired professor of mathematics at the University of Virginia, died recently at age 97. Once a week for nearly 30 years, Professor Oglesby commuted from Charlottesville, Virginia, to Newark, New Jersey. There he gave classes to Prudential actuarial students and others preparing for such exams as the one-time Parts 3 and 4. Harold Dow, the third person in the above-mentioned chain, recalls that Professor Oglesby occasionally stayed overnight with one or another Prudential family and generally brought along house gifts of butter and cream from his farm. Besides teaching and farming, Professor Oglesby's activities included chairing the Albemarle County School board for over a decade. His many former students will be happy to know that he outlived the span of not only the American Experience Table but also (by one year less) the Northampton table.

## Winners selected for most obscure actuarial tables

The SOA Research Department recently conducted a contest to determine the most obscure actuarial tables. The effort was intended to augment an index of mortality and morbidity tables being prepared by the research staff. Readers of *The Actuary* submitted a number of tables of which three have been chosen as the most obscure.

First prize was awarded to Robert D. Hohertz for his submission on "Total Abstinence Life Insurance." Interestingly, the table is part of a tract soliciting applications for nondrinkers and contains assumed deaths based on the New England Mutual Life Insurance Company pricing mortality during the mid-1840s. The solicitation was prepared by Elizur Wright.

Two runners-up also were selected. Jerome M. Stein submitted *A New Method for Valuing Annuities Upon Lives* by Richard Hayes. Printed in 1746, the book has an inscription that indicates a purchase date of April 1756 as well as handwritten calculations of annuity values in the flyleaves.

The final winner was the "Herget Mortality Table" prepared by R. Thomas Herget. The table studies 554 male descendants of an ancestor dating back to 1585. Herget says he developed the table to enhance his chances of passing the old Part Five. This table shows a great deal of originality as well as obscurity.

*The Index of Mortality and Morbidity Tables* will be completed shortly. The *Index* will be limited to actuarial tables dating back to 1925 and will contain:

- Formal title of the table
- Popular name for the table
- Author or committee
- Years of experience studied
- Reference

The major sources of information were the *Reports, Transactions, and Record*. In addition, the *Proceedings of the Conference of Actuaries in Public Practice* and *Journal of the American Academy of Actuaries* were examined. The *Index* will be updated as more tables are developed and expanded as more sources are reviewed.