BOOK REVIEW

M.J. GOOVAERTS, R. KAAS, A.E. VAN HEERWAARDEN, T. BAUWELINCKX (1990): *Effective Actuarial Methods*. Elsevier Science Publishers BV, Amsterdam, 316 pages, US$ 92.25/DFL. 180.00.

The 'Effective actuarial methods' comprise three separate essays on *Ordering of Risks* (Part 1), *Credibility Theory* (Part 2) and *IBNR Techniques* (Part 3). Via these topics the authors present material from actuarial science which is interesting, both from a mathematical and an applications point of view. The latter is highlighted by analyses based on real portfolio data using the software packages SLIC (stop-loss reinsurance), CRAC (credibility) and LORE (IBNR modelling).

In PART 1 a review of various orderings of risks, together with a discussion of the related algebraic properties, are given. Having these tools available, it is relatively easy to tackle specific problems in the collective risk model. These mainly are estimation and ordering of adjustment coefficients and ruin probabilities, but also results on optimal reinsurance are obtained. In many cases do these 'order' results allow for easier numerical calculations. After a rather trivial excursion into the realm of survival distributions, this first part closes with a discussion on incomplete information, i.e. situations where only moment conditions and/or shape information (like unimodality) of the relevant random variables are/is assumed. Think for instance of the construction of stop-loss premiums with n moments known.

PART 2 on Credibility Theory starts with a very readable introduction on 'what is credibility all about' before giving an overview of the various models and their analysis. The models included are those by BÜHLMANN, BÜHLMANN-STRAUB, the hierarchical one and regression type models. The material is presented in a well-documented, self-contained way which gives the reader a thorough insight into the basic theory. Proofs are given explicitly. Some interesting extensions of the 'classical theory' are given in Chapter VI. These comprise credibility formulae of the updating type together with results on covariance structures leading to such formulae. Furthermore, in a section on credibility for loaded premiums, it is shown how credibility estimators can be based on weighted loss functions; examples are Esscher and variance premiums. After some brief comments on multidimensional credibility, the authors spend some more time on semi-linear credibility where linear functions of *transformed* variables are considered as estimators. An interesting chapter on insurance applications of credibility theory, based on the CRAC-software package for two level, semi-linear hierarchical credibility ends this section of the book.

The final PART 3 contains an introduction of IBNR-techniques. These involve mechanical smoothing (where no underlying model is assumed), statistical methods (mostly of (auto)regression type) and credibility based methods (including Kalman filtering). Via the loss reserving software package LORE, the versatility of the methods presented is demonstrated on real data coming from:

— recuperation in credit insurance;
— loss-reserving for liability insurance for notaries;
— loss-reserving in automobile liability insurance, and
— 'activity coefficients' in a pension fund of physicians.

The overall material is well-balanced between the three parts with exercises adding to the course-book status. It is clear that having the software would add to the understanding of some of the material presented though this is by no means a necessity. One of the main attractions with respect to teaching lies in the fact that based on this one book, actuarial students will gain considerable insight into some of the specific techniques which are by now well-established as core material within modern actuarial science. I am convinced that many actuarial students, and indeed many researchers in the field, will find this text a very useful one to have on one's bookshelf.

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