

Additional valuable features of *Databook* are a general demographic and labor force statistical appendix, a glossary, and a listing of major U.S. government statistical agencies including addresses and telephone numbers.

The Foreword says that in an effort to keep us current, EBRI hopes to update *Databook* every 18 months. Since few major studies and government indicators change on such a rapid basis, we wonder if each new edition will be largely the same as the previous one, with just a few changes and updates—enough to justify a new acquisition. Instead, perhaps *every other* edition can focus on new or different kinds of data.

Apart from such revision schedule considerations, the one major improvement that future editions of *Databook* should consider is the inclusion of more individual-level, micro data. After all, the first of three-chapter organization for each of the main sections is titled "Participants and Beneficiaries," clearly an individual-level concern. With very few exceptions, all *Databook* tables are macro, societal-level in focus, leaving the individual-level questions unanswered. For example, while it's interesting to know how many billions of dollars are spent out-of-pocket on health care, it's also important to know about the distribution of individuals. Did 50 percent of all families pay nothing or pay a lot, or is it 80 percent? Are older people and families different from younger people or other groups?

There are a number of ongoing government studies and publication series aimed at the individual level (e.g., the Survey of Income and Program Participation, and the National Medical Expenditure Survey and its follow-ups). A few tables from such studies in the next *Databook* will make this valuable resource even more valuable for the analysts, researchers, faculty, and graduate students who seek information about past, current, and future patterns in employee benefits.

Bayesian Statistics in Actuarial Science with Emphasis on Credibility, by Stuart A. Klugman (Norwell, Mass.: Kluwer Academic Publishers, 1992).

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Stuart Klugman, the author of *Bayesian Statistics in Actuarial Science with Emphasis on Credibility*, wants to demonstrate the advantages of the Bayesian approach to actuarial problems. The advantages are that the Bayesian method is independent of the model for the data and that interval estimates are as easy to obtain as point estimates. These advantages allow the actuary to analyze more complex problems and to produce evidence concerning the quality of the estimates. Although actuaries have known that Bayesian analysis is appropriate for a number of problems in actuarial science, a lack of algorithms and computing power have prevented its application. This monograph spends a great deal of time on the computational issues of Bayesian analysis. Algorithms are presented in the text, computer programs (written in the Gauss programming language, similar to SAS Matrix language) for the algorithms are in the

appendix, and 44 pages of data sets (to which the algorithms are applied in the text) are in the appendix.

The general problem of model-based prediction is used throughout the monograph. Collecting data on past behavior, building a model that describes the random process that yielded the data, and making a prediction based on the model are discussed. The Bayesian paradigm is reviewed. The presentation overviews the selection of the prior distribution, the selection of the model, and the evaluation of the mathematical expressions to make the selections. The Bayesian paradigm is an ideal mechanism to combine the random process variability of the data and the variability due to the model being estimated from the data. The computational aspects of Bayesian analysis are maximization and integration. Adaptive Gaussian, Gauss-Hermite, Monte Carlo, and Tierney-Kadane integration are presented and evaluated as techniques to compute integrals of various dimensions. Another source of variability to the forecasting problem, parameter uncertainty, is added to the problem. The Kalman filter is presented as a technique to incorporate time-varying parameters in Bayesian analysis. Both a life and a casualty example are examined as applications of the technique. A method for graduating mortality tables is introduced.

The credibility problem is analyzed in the last half of the monograph. A number of complicating issues in credibility and the manner in which they have been handled in the past are reviewed. None of the credibility methods being used at this time qualify as true Bayesian analysis. The general hierarchical Bayesian approach that is flexible enough to include regression, time series, and analysis of variance models is presented. Normality, linearity, and the variance being independent of the mean are simplifying assumptions made to make the analysis more tractable. The resulting hierarchical normal linear model is presented. With this model, severity, pure premiums, and loss ratios can be handled. One-way and two-way analysis-of-variance models are used for loss and loss ratio models for groups and territories. Stochastically changing parameters are handled through the use of the Kalman filter. Graduation of the mortality table is revisited. Using the techniques described, analysis of the four data sets is done. Data set 1 was generated with known parameters to assess how the techniques perform while data sets 2 through 4 are actual workers' compensation data. Modifications to the hierarchical normal linear model are made for lognormal and poisson distributions of data.

The book has an excellent and current bibliography. The appendices clearly present algorithms useful for the mathematical calculations involved with these applications of Bayesian analysis. The reader benefits in each chapter from the application of the techniques to the included data. A reader of this monograph needs a good knowledge of mathematical statistics to follow the statistical arguments and the numerous mathematical symbols.

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