approach to insurance pricing. As the authors point out, "it would be foolhardy to reject a tarnished dime in order to keep a tarnished nickel".

Those with an interest in understanding the technical details and applying financial pricing in the real world will have to supplement this monograph with more advanced material. A good 'reading list' would be this monograph followed by DOHERTY and GARVEN (1986), CUMMINS and HARRINGTON (1987), and CUMMINS (1988). This set of readings is very close to encompassing the state-of-the-art in the financial modelling of property-liability insurance.

J. DAVID CUMMINS

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N. L. BOWERS, H. V. GERBER, J. C. HICKMAN, D. A. JONES, C. J. NESBITT (1986). *Actuarial Mathematics.* The Society of Actuaries 624 pages, USA $ 65.-, Overseas $ 97.50; (please send orders to: Society of Actuaries, P.O. Box 95668, Chicago, IL 60694).

In his opening lecture to "Actuarial Challenges of Reinsurance", held during the 1988 IAA congress in Helsinki, Jean Lemaire stated that he is "fully convinced of the importance of good survey books [in actuarial mathematics]. The publication of a major textbook inevitably acts as a catalyst for further actuarial research, and scores of related papers appear in subsequent years in our scientific journals." *Actuarial Mathematics* is one of these major textbooks. It has been directed by the Education and Examination Committee of the Society of Actuaries, and it is published by the Society of Actuaries, Itasca.

Notice, first, that the title of this new textbook is not *Life Contingencies*. This is because the subject is not simply life contingencies, but is what is hoped will be identified as the modern mathematical foundation of acturial science.

Among the book's key features is the probability approach. The discussions build on the developement of the mathematics of probability and the entry of risk into decision theory.

Another key feature is the integration of life contingency concepts with risk theory. [To German readers, this concept is well known from Hans U. Gerber's *Lebensversicherungsmathematik*, published in the new Springer series, Vol. 1, 1986.]

These and other expanded theoretical foundations carry actuarial practice to the forefront of defining 'security' in the financial security industry. This is an

increasingly important social and economic challenge brough about by lower profit margins and intensified pressure for public disclosure and government reporting.

And, as all branches of the financial security industry are facing this challenge, the techniques developed in *Actuarial Mathematics* are "as invaluable to health and casualty actuaries as they are to actuaries in the life and employees benefits areas." (cover text)

Containing a wealth of charts, tables, examples and exercises (with solutions!) clarifying the theory, it is readable and well suited for self study. The mathematical prerequisities do not go beyond typical undergraduate courses in calculus and probability theory.

Nineteen chapters articulate the book:

1. The Economics of Insurance,
2. Individual Risk Models for a Short Term,
3. Survival Distributions and Life Tables,
4. Life Insurance,
5. Life Annuities,
6. Net Premiums,
7. Net Premium Reserves,
8. Multiple Life Functions,
9. Multiple Decrement Models,
10. Valuation Theory for Pension Plans,
11. Collective Risk Models for a Single Period,
12. Collective Risk Models Over an Extended Period,
13. Application of Risk Theory,
14. Insurance Models Including Expenses,
15. Non-forfeiture Benefits and Dividends,
16. Special Annuities and Insurances,
17. Advanced Multiple Life Theory,
18. Population Theory, and
19. Theory of Pension Funding.

The appendix contains a statistical table, contingency tables with basic functions as well as communication functions, a complete list of symbols, general rules for symbols of actuarial functions, mathematical formulae and probability distributions, and an extensive bibliography.

So the 624 pages book offers a comprehensive survey on classical as well as modern actuarial mathematics. It is not intended to be exhaustive, one of its limitations is the discussion of estimation problems. For basic actuarial models, the parameters have to be estimated from observations, e.g. when life tables are constructed, or when claim frequencies are unknown and have to be estimated from available information.

Obviously, a textbook written by five distinguished actuaries living in distance cities of US and Europe will not be completely homogeneous in notation and style

(see, e.g. Chapter 19 which does not fit very well with the earlier chapters). Nevertheless, the book is certainly of major interest not only as a textbook for actuarial courses but also for expert actuaries. Among others it contributes to the solution of the following three problems mentioned in the cover text:

"What gross premium for a life insurance policy is required so that the probability that the insurance company will experience a loss as a result of random mortality fluctuations is under 5%?

What is the expected pay out of a retirement plan over the next 30 years, and what is the 90% probability interval for the pay out?

What is the increased financial risk to an insurance company from mandated unisex pricing?"

CHRISTIAN HIPP

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