

## BOOK REVIEWS

STEPHEN P. D'ARCY and NEIL A. DOHERTY (1988). *The Financial Theory of Pricing Property-Liability Insurance Contracts*. Philadelphia, PA: S. S. Huebner Foundation, University of Pennsylvania. 99 pp. \$19.95.

A major development in pricing property-liability insurance contracts is the use of financial pricing models. These models were first introduced in a regulatory setting as a method for recognizing investment income in ratemaking. However, their potential applicability is far broader, spanning ratemaking, underwriting, reinsurance, and other financial decisions faced by insurers.

Financial pricing models draw upon theoretical and empirical developments in the field of financial economics. The insurance company is viewed as a corporation with the objective of maximizing firm value. The firm obtains funds by issuing equity (the net worth of the firm) and debt (insurance policies) and invests the funds primarily in financial assets. The price of insurance is the price of the firm's debt claims. The debt/insurance analogy is crucial and allows insurance policies to be priced according to equilibrium models, i.e. models that represent the effects of supply and demand in a competitive market.

As D'Arcy and Doherty point out, the primary differences between financial pricing models and conventional actuarial models are the following: (1) Insurers are assumed to be risk-neutral value maximizers. Firms do not have utility functions. (2) Prices are determined by supply and demand in more or less 'efficient' markets, i.e. markets in which prices rationally reflect all available information. (3) The time value of money is explicitly recognized. Thus, profit loadings typically reflect a risk component and an interest or cost-of-debt-capital component. The former is usually positive and the latter is negative. In most cases, this leads to a negative expected actuarial profit. The rationale is that insurers are rewarded for risk bearing but have to pay policyholders for the use of their funds between the premium payment and loss payment dates.

An important feature of these models is that insurance prices must be consistent with a defensible theory of market economics. Thus, many actuarial models would be viewed as mathematically correct but economically incorrect.

This monograph provides an excellent basic introduction to the financial pricing of insurance. It describes and critiques the various models that have been proposed in including: (1) the capital asset pricing model (CAPM), (2) the arbitrage pricing model (APM), (3) the options pricing approach, and (4) discounted cash flow models. An important contribution of the book is to point out the advantages and disadvantages of each of these models. The disadvantages should be clearly understood by anyone using the models in insurance transactions. However, it would be unfortunate if actuaries and other insurance practitioners were to use the disadvantages as an excuse for ignoring the market equilibrium

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.

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#### REFERENCES

- CUMMINS, J. D. (1988). "Risk-Based Premiums for Insurance Guaranty Funds." *Journal of Finance* 43 (June).
- CUMMINS J. D. and HARRINGTON, S. E. eds. (1987). *Fair Rate of Return in Property-Liability Insurance*. Norwell, MA: Kluwer Academic Publishers.
- DOHERTY N. A. and GARVEN J. R. (1986). "Price Regulation In Property-Liability Insurance: A Contingent Claims Approach. *Journal of Finance* 41 (December).

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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 actuarial science.

Among the book's key features is the probability approach. The discussions build on the development 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