

## BOOK-REVIEW

**Market-Valuation Methods in Life and Pension Insurance by Thomas Moller and Mogens Steffensen, (Cambridge University Press, Cambridge, 2007, pp.xiv + 279. Price not mentioned)**

The development of financial mathematics and its convergence with insurance mathematics during the last few decades have important consequences, particularly for practising actuaries. Artificial conservative assumptions on mortality rate and interest rates formed the basis for valuation of liabilities of insurance companies to policy-holders in the classical approach. The changes that have come about in international accounting standards and solvency standards have added a new dimension to the problem. Furthermore, theoretical advances in Finance relating to methods of risk valuation in a free market economy called for adoption of new approach to the problems involved. As mentioned by the authors in the preface to the volume "...practising actuaries need an exposition of financial methods and their applications to life insurance....Methods and applications are discussed [in the book] in terms of the Danish approach to market valuation" (p.x)

The volume is divided into seven chapters. The brief first chapter focuses on discussing life insurance practice with particular reference to with-profit policies. The authors draw a useful distinction between defined benefits and what they call "defined contributions with partly defined benefits." The latter type which is the most important category of policies is sub-divided into private, firm-based or labour-based policies. In later discussions in the volume, the authors primarily confine their attention to the second category of policies by providing interpretations and examples mainly related to such policies though those ideas might also be applicable to the first category of policies, viz., defined benefit policies. The chapter also deals with topics such as technical reserves, dividends, bonus and unit-linked insurance.

Chapter 2 is devoted to demonstrating the retrospective accumulation of the technical reserve and then formalizing an approach to prospective market valuation. The liabilities of an insurance company are represented as conditional expected values. While discussing the market valuation approach, the authors introduce the idea of a payment process (payments being the components of the total payments in an insurance contract) and draw a vital partition of future payments in guaranteed payments and non-guaranteed payments. The chapter also outlines the intervention option the insurance policyholder holds, such as surrender option and free policy options.

Introducing a few important concepts from interest rate theory and financial mathematics, the authors show in Chapter 3 how market values of life insurance liabilities can be computed. The case of stochastic interest rate is discussed which involves consideration of hedging. This discussion provides new insights into the issue of determination of the market value for guaranteed payments of a life insurance contract. The chapter also shows the estimation of forward rates and introduces arbitrage pricing theory in models which contain trading possibilities at fixed discrete time points.

Assuming a deterministic interest rate and possibility of investing in one risky investment (say, shares), the market valuation method is generalized in chapter 4. Both discrete and continuous stock market theory are considered. The chapter is basically addressed to developing methods for the valuation of the bonus obligations under investment in shares. In this context, the binomial stock price model and the well known and popular Black-Scholes model are discussed. The author specifically demonstrate how the latter model is valuable in the valuation of with-profit life insurance contracts.

It is well-known that a life insurance contract combines or integrates actuarial and financial risk and the policy benefits are linked to returns on the financial

markets. In a unit-linked insurance contract, which is the subject matter of chapter 5, the benefits are invariably linked to returns on assets and the portfolio choice is made by policyholders. Specifically, the insurance contract completely spells out how the benefits accrue and how the account of the policy-owner develops in any financial scenario. There is in this chapter a useful discussion of various approaches to incomplete market valuation. It also considers topics such as mean-variance hedging, utility optimization and risk minimization investment approaches.

One of the methods by which insurance companies manage risk is by entering into derivative markets. Their financial risk management involves using interest rate derivatives such as swaps, swaptions and related products. The last chapter in the book explains the various interest rate derivatives, different pricing methods that have been developed over time and indicates possible application of such instruments in managing risk by an insurance company “facing insurance liabilities that cannot be hedged via bonds in the market due to the very long time horizon associated with the liabilities”. As insurance liabilities extend upto 30,40 or even 60 years into the future, and as financial markets do not offer bonds of such long duration, insurance companies can adopt an investment strategy combining investment in bonds and long term interest rate derivatives to mitigate the risk associated with the company’s liabilities.

There is no doubt that the book is extremely useful for practising actuaries, finance professionals and others interested in the areas. The presentation is marked by clarity. The four appendices included at the end enhance the value of the volume.

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