

commercially (moreover, such severe transition rules would strongly modify the claims pattern, since an enormous hunger for bonus would develop).

The calculation of the equilibrium distribution of the proposed Dutch bonus-malus system, using Markov chain theory, shows that this premium crash should not have too drastic consequences if—hopefully—economic conditions (like average claim frequency, composition of the portfolio, . . .) do not change too much: around one third of the policy-holders should ultimately find themselves in the best class.

Some considerations about the transition from the old bonus-malus system to the new one conclude this extremely interesting book.

J. LEMAIRE

J. Lemaire (1982). *L'assurance automobile: modèles mathématiques et statistiques*. 178 pages, FB 690. Bruxelles: Fernand Nathan, Editions Labor

This book on third-party automobile insurance is divided in four parts. The first part, which is non-mathematical, gives a description of the automobile insurance system in Belgium. This is also performed by means of tables with real empirical data. Furthermore, the situation in other countries is used for comparison purposes. Clearly, this first part forms a colourful introduction for the remainder of the book.

The second part addresses itself to the a priori classification of risks. It makes use of some elementary mathematics and statistics. An important topic which is discussed here is the question whether to study the number or the amount of the claims. The dependence of the average claim size on the number of claims is clearly presented and illustrated with real data. The choice and selection of explanatory dummy variables to classify the risks is discussed. This results in a linear scoring rule. This result is more or less based on the traditional assumptions of the standard linear model. The appropriateness of these assumptions for analyzing risk statistics is correctly criticised. The possibility of using generalized linear models, which pay more attention to the stochastic specification of the model, is not mentioned, however.

The third part makes more heavy use of mathematics and statistics. This part is on bonus-malus systems: the a posteriori classification of risks.

First some models for claim frequency data are presented and compared with real data. After that, a construction of an optimal bonus-malus system is given. The choice of an *optimal* system needs the specification of a loss function, as used in statistical decision theory. Various loss functions are presented and the implied behaviour of the optimal bonus-malus systems is given. Clearly, if the "optimal" bonus-malus system does not behave the way we like, something must be wrong with the specification of the loss function.

A very interesting chapter is on the possibility to take into account the severity of the claims: bonus-malus systems only utilize the number of claims, not their

severity. A simple model is derived which “translates” severity by recognizing claims to be material claims or bodily-injury claims. This results in a simple rule to value a bodily-injury claim as a multiple of material claims.

The efficiency of bonus-malus systems is also discussed. Perhaps a reference to Borgan, Hoem and Norberg (SAJ, 1981) would have been in order.

A very important topic is on the behaviour of the policyholder. A decision problem which the policyholder has to face—to claim or not to claim—is formulated and applied to the situation in Belgium.

The final part focusses on the adequate calculation of the provision for incurred losses, reported or not yet reported. The importance of the adequate calculation of this provision, especially in third-party automobile insurance, is clearly emphasized. A presentation of the chain-ladder method, the separation method and a least squares method is given. The author correctly recognizes that all these methods are deterministic in the sense that they do not consider a stochastic process, which generates the data. All methods, including two variations of the chain ladder method, are applied to the same empirical data set and compared with each other.

The appeal and virtue of this book is in its use of empirical data as well as mathematics and statistics which remains on an elementary level. High-brow procedures are avoided, emphasis is on exposition and presentation. This gives this book a problem solving oriented flavour.

I think that this book is a worthy addition of the literature on modelling in automobile insurance.

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