

# Preface

In property and casualty insurance the provisions for payment obligations from losses that have occurred but have not yet been settled usually constitute the largest item on the liabilities side of an insurer's balance sheet. For this reason, the determination and evaluation of these technical provisions, which are also called *loss reserves*, is of considerable economic importance for every property and casualty insurer. Therefore, the application of actuarial methods of loss reserving is indispensable.

This *Handbook on Loss Reserving* presents the basic aspects of actuarial loss reserving. Besides the traditional methods it also includes a description of more recent ones and a discussion of certain problems occurring in actuarial practice, like inflation, scarce data, large claims, slow loss development, the use of market statistics, the need for simulation techniques, and last but not least, the task of calculating best estimates and ranges of future losses.

The actuarial methods of loss reserving form a substantial part of this book. These methods are presented in separate articles which are to a large extent self-contained. In the articles on traditional methods, the description of the method is accompanied by two numerical examples; these examples are the same for all methods and illustrate their sensitivity with respect to a small change in the data. While the traditional methods are univariate in the sense that they aim at prediction for a single portfolio of risks, the new multivariate methods, developed about ten years ago, aim at simultaneous prediction for several portfolios and take dependencies between these portfolios into account. Such methods are presented as well.

Almost all of the traditional methods are related to the *Bornhuetter–Ferguson principle*, which consists of an analytical part and a synthetical part. The analytical part provides a unified form of the predictors of most traditional methods such that the differences between these methods can be explained by the use of different estimators of parameters related to accident years or development years, and hence also by the use of different kinds of information, and the synthetical part consists of the construction of new methods by using new combinations of such estimators.

The methods of loss reserving and their properties can only be understood on the basis of stochastic models, which describe the generation of the run-off data and express the assumptions on the development (run-off) behaviour. For this reason, the articles on methods also discuss stochastic models that justify the respective method. By contrast, some other articles emphasize a stochastic model and then use the model together with a classical principle of mathematical statistics to construct a method of loss reserving.

There are basically two types of stochastic models that can be used to justify a method of loss reserving:

- *Development patterns* formalize the idea that, up to random fluctuations, the development of losses is identical for all different accident years, and they involve only assumptions on the expectations of the incremental or cumulative losses.
- *Linear models* and *credibility models* involve assumptions not only on the expectations but also on the variances and covariances of the incremental or cumulative losses. They thus enable the determination of the expected squared prediction error and its estimation.

While the traditional univariate methods result from heuristic considerations and were justified by a stochastic model later, the new multivariate methods result from generalizations of such models.

This book addresses actuarial students and academics as well as practicing actuaries. It is not intended as a complete presentation of all aspects of loss reserving, but rather as an invitation to gain an overview of the most important actuarial methods, to understand their underlying stochastic models and to get an idea of how to solve certain problems which may occur in practice. To proceed further and to become acquainted with other models and methods of loss reserving which are outside the scope of this book, the advanced reader may consult the survey articles by England & Verrall (2002) and by Schmidt (2012) and the monographs by Taylor (1986, 2000), and by Wüthrich & Merz (2008). We also refer to *A Bibliography on Loss Reserving*

<http://www.math.tu-dresden.de/sto/schmidt/dsvm/reserve.pdf>

which will be completed from time to time.

This *Handbook on Loss Reserving* is a free translation of the second edition of the *Handbuch zur Schadenreservierung*, published in 2012 as an update and extension of its first edition which appeared in 2004. A few articles of the German editions have been excluded since they are either outdated or specific to the German market.

The articles of this book are arranged in alphabetical order. They allow for a quick access to the different subjects, and the following guide *How to Read This Book* contains several hints on connections between certain articles and on possible starting points for reading this book.

The editors are most grateful to the authors who contributed to this book and whose expertise enabled a concise and consistent presentation of diverse theoretical and practical aspects of loss reserving, to Helga Mettke and Christiane Weber for their very delicious work in producing the graphics of this book, and to Christiane Weber for thoughtful proofreading.

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