

## Preface

This book deals with testing hypotheses in non-parametric models. A statistical model is non-parametric if it cannot be written in terms of finite-dimensional parameters. This book is a continuation of our book “Non-parametric Tests for Complete Data” [BAG 10], and it gives generalizations to the case of censored data. The basic notions of hypotheses testing covered in [BAG 10] and many other books are not covered here.

Tests from censored data are mostly considered in books on survival analysis and reliability, such as the monographs by Kalbfleisch and Prentice [KAL 89], Fleming and Harrington [FLE 91], Andersen *et al.* [AND 93], Lawless [LAW 02], Bagdonavičius and Nikulin [BAG 02], Meeker and Escobar [MEE 98], Klein and Moeschberger [KLE 03], Kleinbaum and Klein [KLE 05], and Martinussen and Scheike [MAR 06].

In the first chapter, the idea of censored and truncated data is explained. In Chapter 2, modified chi-squared goodness-of-fit tests for censored and truncated data are given. The application of modified chi-squared tests to censored data is not well described in the statistical literature, so we have described such test statistics for the most-used families of probability distributions. Chi-squared tests for parametric

accelerated failure time regression models, which are widely applied in reliability, accelerated life testing and survival analysis, are given in Chapter 5. These tests may be used not only for censored data but also for complete data. Goodness-of-fit tests for semi-parametric proportional hazards or Cox models are given in Chapter 5.

Homogeneity tests for independent censored samples are given in Chapter 3. We describe classical logrank tests, the original tests directed against alternatives with possible crossings of cumulative distribution functions. Homogeneity tests for dependent censored samples are only touched on very slightly in classical books on survival analysis. In Chapter 4, we give generalizations of logrank tests to the case of dependent samples, and also tests which are powerful against crossing marginal distribution functions alternatives.

Any given test is described in the following way: 1) a hypothesis is formulated; 2) the idea of test construction is given; 3) a statistic on which a test is based is given; 4) the asymptotic distribution of the test statistic is found; 5) a test is formulated; 6) practical examples of application of the tests are given; and 7) at the end of each chapter exercises with answers are given.

The basic facts on probability, stochastic processes and survival analysis used in the book are given in appendices.

Anyone who applies non-parametric methods of mathematical statistics, or who wants to know the ideas behind and mathematical substantiations of the tests, can use this book. If the application of non-parametric tests in reliability and survival analysis is of interest then this book could be the basis of a one-semester course for graduate students.

Knowledge of probability and parametric statistics is needed to follow the mathematical developments. The basic facts on probability and parametric statistics used in the book are also given in appendices.

The book contains five chapters and three appendices. In each chapter, the numbering of theorems, formulas and comments include the chapter number.

This book was written using lecture notes for graduate students in Vilnius and Bordeaux universities.

We thank colleagues and students at Vilnius and Bordeaux universities for their comments on the content of this book, especially Rūta Levulienė for writing the computer programs needed for the application of tests and the solutions of all exercises.

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