

Foreword

This book has been translated from French by Robin Ryder, who is assistant professor in the CEREMADE (Centre De Recherche en Mathématiques de la Décision) at Université Paris Dauphine (France). We are very pleased that he has agreed to make this translation.

This book is based on notes from a series of lectures given for a few years at the Institut Universitaire de Technologie Grenoble 2 in the Department of Statistics and Business Intelligence (STID, *Statistique et informatique décisionnelle*). It has therefore been “digested” first, in a very imperfect form, by the students of this department, whom we thank here. Had they not shown so much interest, this book would probably never have existed. We also thank our colleague and friend Michel Lejeune, who managed to talk to us about writing a manuscript and submitting it to Springer. It is worth pointing out the role of chance, which made the paths of the three authors cross in the same place for a few years. The human and scientific experience of this encounter was very enriching, and each author provided complementary skills which made it possible to overcome the tremendous amount of work necessary for this book. Finally, we wish to warmly thank our colleague and friend Matthieu Dubois, who is a researcher in experimental psychology and addicted to R and to Macintosh and who was the first to read the French version of the book in its almost finalized version and gave us many ideas for improvement.

The contents of this book were chosen and organized in the best possible way for them to be not only **exhaustive** but also **easy to assimilate** by the reader. This book can be used as support material for lectures on R at any level from beginner to advanced. We have paid particular attention to the form of the book, which we think should aid understanding. It can also be used as a support for self-teaching. Note that most of this book can be useful to users of any operating system. However, a few chapters are mostly meant for users of Microsoft Windows. We have also felt it useful to give, occasionally, complements aimed at users of Linux or Macintosh.

All chapters follow the same structure. A chapter begins with a small insert listing the prerequisites necessary for the chapter and a short description of the contents. All theoretical notions are explained with numerous examples and include breaks so that the reader can put into practice on a computer the recently introduced notions. Each chapter ends with an assessment section: memorandum of most important terms, followed by a section of theoretical exercises (to be done on paper), which can be used as questions for a test. A practical sheet is also given at the end of each chapter. It can be used to check that the practical aspects of the chapter have been taken in. Note that all exercises and practicals only require the contents of the previous chapters.

The structure of the book is sequential. After a short introduction (see the first part), aimed at getting the reader interested, and a description of a few data sets which will be used throughout the book to illustrate how to use **R**, the second part of the book is dedicated to the fundamental concepts of **R**: data organization, import and export, various manipulations, documentation, plots, programming and maintenance. This part should help you “learn the ropes” of **R**.

The third part of the book is dedicated to using **R** in a few mathematical and statistical settings. You should read the second part before moving on to this part, although it can be understood by users who already have a few notions in **R**. It covers **R** instructions for some of the main statistics and mathematics courses up to third-year undergraduate (e.g., it covers the baccalaureate in statistics and actuarial sciences curriculum at Université de Montréal, as well as the French IUT curriculum in statistics and business intelligence): matrix operations, integration, optimization, descriptive statistics, simulations, confidence intervals and hypothesis testing, simple and multiple linear regression and analysis of variance.

Finally, note that each statistical chapter in the third part relies on one or several real data sets, kindly made available by ISPED (*Institut de santé publique, d'épidémiologie et de développement* in Bordeaux) and described at the beginning of the book. These make learning more concrete and more attractive. We take this opportunity to thank all the teaching staff from the Public Health School of ISPED. These data, as well as several functions developed specially for this book and which are described or used here, are available in an **R** package associated with this book, called **TheRSoftware**. We also thank Mohamed El Methni and Taghi Barumandzadeh for the material they gave us for the chapter on ANOVA and Hubert Raymondau for many comments he has made on our French version which allowed us to significantly improve several sections of this book.

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The R Software

Fundamentals of Programming and Statistical Analysis

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