Preface

This book's title is the synthesis of two influential and outstanding entities. To quote David Hendry in the Nobel Memorial Prize lecture for Clive W. J. Granger, "[the] modeling of non-stationary macroeconomic time series [...] has now become the dominant paradigm in empirical macroeconomic research" (Hendry [2004]). Hence, a thorough command of integration and cointegration analysis is a must for the applied econometrician. On the other side is the open-source statistical programming environment `R`. Since the mid-1990s, it has grown steadily out of infancy and can now be considered mature, flexible, and powerful software with more than 600 contributed packages. However, it is fair to say that `R` has not yet received the attention among econometricians it deserves. This book tries to bridge this gap by showing how easily the methods and tools encountered in integration and cointegration analysis are implemented in `R`.

This book addresses senior undergraduate and graduate students and practitioners alike. Although the book's content is not a pure theoretical exposition of integration and cointegration analysis, it is particularly suited as an accompanying text in applied computer laboratory classes. Where possible, the data sets of the original articles have been used in the examples such that the reader can work through them step by step and thereby replicate the results. Exercises are included after each chapter. These exercises are written with the aim of fostering the reader's command of `R` and applying the previously presented tests and methods. It is assumed that the reader has already gained some experience with `R` by working through the relevant chapters in Dalgaard [2002] and Venables and Ripley [2002] as well as the manual "An Introduction to R."

This book is divided into three parts. In the first part, theoretical concepts of time series analysis, unit root processes, and cointegration are presented. Although the book's aim is not a thorough theoretical exposition of these methods, this first part serves as a unifying introduction to the notation used and as a brief refresher of the theoretical underpinnings of the practical examples in the later chapters. The focus of the second part is the testing of the unit root hypothesis. The common testing procedure of the augmented

Dickey-Fuller test for detecting the order of integration is considered first. In the later sections, other unit root tests encountered widely in applied econometrics, such as the Phillips-Perron, Elliott-Rothenberg-Stock, Kwiatkowski-Phillips-Schmidt-Shin, and Schmidt-Phillips tests, are presented, as well as the case of seasonal unit roots and processes that are contaminated by structural shifts. The topic of the third and last part is cointegration. As an introduction, the two-step method of Engle and Granger and the method proposed by Phillips and Ouliaris are discussed before finally Johansen's method is presented. The book ends with an exposition of vector error-correction models that are affected by a one-time structural shift.

At this point, I would like to express my gratitude to the R Core Team for making this software available to the public and to the numerous package authors who have enriched this software environment. The anonymous referees are owed a special thanks for the suggestions made. Of course, all remaining errors are mine. Last but not least, I would like to thank my editor, John Kimmel, for his continuous encouragement and support.

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