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Practical Econometrics

an introduction to

State Space Time Series Analysis

Jacques J.F. Commandeur
and Siem Jan Koopman

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Practical Econometrics

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Preface

This book provides an introductory treatment of state space methods applied to unobserved-component time series models which are also known as structural time series models. The book started as a collection of personal notes made by JJFC about what he discovered and understood while studying state space methods for the first time. When colleagues and friends also found these notes useful and helpful, the idea came up to make them publicly available. SJK started to cooperate with JJFC on this book project as part of the highly enjoyable joint projects for the SWOV Institute for Road Safety Research in Leidschendam, the Netherlands.

Harvey (1989) and Durbin and Koopman (2001) treat the topic of state space methods at an advanced level suitable for postgraduate and advanced graduate courses in time series analysis. Elementary time series books, on the other hand, provide only very limited space to the class of unobserved-component models. Most of the attention is given to the Box–Jenkins approach to time series analysis.

The intended audience for this book is practitioners and researchers working in areas other than statistics, but who use time series on a daily basis in areas such as the social sciences, quantitative history, biology and medicine. This book offers a step-by-step approach to the analysis of the salient features in time series such as the trend, seasonal and irregular components. Practical problems such as forecasting and missing values are treated in some detail. The book may also serve as an accompanying textbook for a basic time series course in econometrics and statistics, typically at an undergraduate level.

JJFC would like to acknowledge and thank the management and the colleagues of the SWOV Institute for Road Safety Research for their mental and financial contribution to this publication. The book is an important component of the SWOV Research Programme 2003–2006.

Among all SWOV colleagues, JJFC is especially indebted to Frits Bijleveld, whose never abating and infectious enthusiasm for state space

methods was instrumental in stimulating JJFC to write this book. He was always willing to answer any questions JJFC had, and is a genius in exploiting the enormous flexibility that state space methods have to offer.

The authors are grateful to a referee for his positive remarks on an earlier draft of the book. His many constructive comments have improved the book considerably. Any mistakes and omissions remain the sole responsibility of the authors.

JJFC also wishes to thank members (some of them, former members) of the International Co-operation on Time Series Analysis (ICTSA): Peter Christens, Ruth Bergel, Joanna Zukowska, Filip Van den Bossche, Geert Wets, Stefan Hoeglinger, Ward Vanlaar, Phillip Gould, Max Cameron, and Stewart Newstead, for their inspiring contributions to our in-depth discussions on time series analysis, and for their encouraging response to earlier drafts of the book.

SJK would like to thank his colleagues at the Department of Econometrics, Vrije Universiteit Amsterdam, for giving him the opportunity to work on this book.

The book was written in LaTeX using the MiKTeX system (http://www.miktex.org). We thank Frits Bijleveld for his assistance in setting up the LaTeX system. The Ox and SsfPack code for carrying out the analyses discussed in the book, as well as the data files, can be downloaded from http://staff.feweb.vu.nl/koopman and from http://www.ssfpack.com.