Introductory Econometrics for Finance

This bestselling and thoroughly classroom-tested textbook is a complete resource for finance students. A comprehensive and illustrated discussion of the most common empirical approaches in finance prepares students for using econometrics in practice, while detailed case studies help them understand how the techniques are used in relevant financial contexts. Worked examples from the latest version of the popular statistical software EViews guide students to implement their own models and interpret results. Learning outcomes, key concepts and end-of-chapter review questions (with full solutions online) highlight the main chapter takeaways and allow students to self-assess their understanding. Building on the successful data- and problem-driven approach of previous editions, this third edition has been updated with new data, extensive examples and additional introductory material on mathematics, making the book more accessible to students encountering econometrics for the first time. A companion website, with numerous student and instructor resources, completes the learning package.

Chris Brooks is Professor of Finance and Director of Research at the ICMA Centre, Henley Business School, University of Reading, UK where he also obtained his PhD. He has diverse research interests and has published over a hundred articles in leading academic and practitioner journals, and six books. He is Associate Editor of several journals, including the Journal of Business Finance and Accounting, the International Journal of Forecasting and the British Accounting Review. He acts as consultant and advisor for various banks, corporations and professional bodies in the fields of finance, real estate, and econometrics.

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THIRD EDITION

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CAMBRIDGE
UNIVERSITY PRESS

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University Printing House, Cambridge CB2 8BS, United Kingdom

Cambridge University Press is part of the University of Cambridge.

It furthers the University's mission by disseminating knowledge in the pursuit of education, learning and research at the highest international levels of excellence.

www.cambridge.org
Information on this title: www.cambridge.org/9781107661455

First published 2002
Second edition 2008
Third edition published 2014
3rd printing 2015

Printed in the United Kingdom by Bell and Bain Ltd, Glasgow

A catalogue record for this publication is available from the British Library

Library of Congress Cataloguing in Publication data
Brooks, Chris
Introductory econometrics for finance / Chris Brooks, The ICMA Centre, Henley Business School, University of Reading. – Third edition.
pages cm
Includes bibliographical references and index.
ISBN 978-1-107-03466-2 (hardback) – ISBN 978-1-107-66145-5 (pbk)
1. Finance – Econometric models. 2. Econometrics. I. Title.
HG173.B76 2014
332.01′5195 – dc23 2013049908

ISBN 978-1-107-03466-2 Hardback
ISBN 978-1-107-66145-5 Paperback

Additional resources for this publication at www.cambridge.org/brooks3

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Preface to the third edition

Sales of the first two editions of this book surpassed expectations (at least those of the author). Almost all of those who have contacted the author seem to like the book, and while other textbooks have been published since in the broad area of financial econometrics, none are really at the introductory level. All of the motivations for the first edition, described below, seem just as important today. Given that the book seems to have gone down well with readers, I have left the style largely unaltered but changed the structure slightly and added new material.

The main motivations for writing the first edition of the book were:

- To write a book that focused on *using and applying* the techniques rather than deriving proofs and learning formulae.
- To write an accessible textbook that required no prior knowledge of econometrics, but which also covered more recently developed approaches usually only found in more advanced texts.
- To use examples and terminology from finance rather than economics since there are many introductory texts in econometrics aimed at students of economics but none for students of finance.
- To litter the book with case studies of the use of econometrics in practice taken from the academic finance literature.
- To include sample instructions, screen dumps and computer output from a popular econometrics package. This enabled readers to see how the techniques can be implemented in practice.
- To develop a companion web site containing answers to end of chapter questions, PowerPoint slides and other supporting materials.

What is new in the third edition

The third edition includes a number of important new features:

(1) Students of finance have enormously varying backgrounds, and in particular varying levels of training in elementary mathematics and statistics. In order to make the book more self-contained, the material that was previously buried in an appendix at the end of the book has now been considerably expanded and enhanced, and is now placed in a new chapter 2. As a result, all of the previous chapters 2 to 13 have been shunted forward by a chapter (so the

previous chapter 2 becomes chapter 3, 3 becomes 4, and so on). What was the concluding chapter in the second edition, chapter 14, has now been removed (with some of the content worked into other chapters) so that there are also fourteen chapters in the third edition.

(2) An extensive glossary has been added at the end of the book to succinctly explain all of the technical terms used in the text.

(3) As a result of the length of time it took to write the book, to produce the final product and the time that has elapsed since then, the data and examples used in the second edition are already several years old. The data, EViews instructions and screenshots have been fully updated. EViews version 8.0, the latest available at the time of writing, has been used throughout. The data continue to be drawn from the same freely available sources as in the previous edition.

(4) Two of the most important uses of statistical models by students in their courses tend to be the methodology developed in a series of papers by Fama and French, and the event study approach. Both of these are now described in detail with examples in chapter 14.

(5) New material has been added in the appropriate places in the book covering panel unit root and cointegration tests; measurement error in variables; unit root testing with structural breaks; and conditional correlation models.

Motivations for the first edition

This book had its genesis in two sets of lectures given annually by the author at the ICMA Centre (formerly ISMA Centre), Henley Business School, University of Reading and arose partly from several years of frustration at the lack of an appropriate textbook. In the past, finance was but a small sub-discipline drawn from economics and accounting, and therefore it was generally safe to assume that students of finance were well grounded in economic principles; econometrics would be taught using economic motivations and examples.

However, finance as a subject has taken on a life of its own in recent years. Drawn in by perceptions of exciting careers in the financial markets, the number of students of finance grew phenomenally all around the world. At the same time, the diversity of educational backgrounds of students taking finance courses has also expanded. It is not uncommon to find undergraduate students of finance even without advanced high-school qualifications in mathematics or economics. Conversely, many with PhDs in physics or engineering are also attracted to study finance at the Masters level. Unfortunately, authors of textbooks failed to keep pace with the change in the nature of students. In my opinion, the currently available textbooks fall short of the requirements of this market in three main regards, which this book seeks to address:

(1) Books fall into two distinct and non-overlapping categories: the introductory and the advanced. Introductory textbooks are at the appropriate level for students with limited backgrounds in mathematics or statistics, but their focus is too narrow. They often spend too long deriving the most basic results, and

treatment of important, interesting and relevant topics (such as simulations methods, VAR modelling, etc.) is covered in only the last few pages, if at all. The more advanced textbooks, meanwhile, usually require a quantum leap in the level of mathematical ability assumed of readers, so that such books cannot be used on courses lasting only one or two semesters, or where students have differing backgrounds. In this book, I have tried to sweep a broad brush over a large number of different econometric techniques that are relevant to the analysis of financial and other data.

(2) Many of the currently available textbooks with broad coverage are too theoretical in nature and students can often, after reading such a book, still have no idea of how to tackle real-world problems themselves, even if they have mastered the techniques in theory. To this end, in this book, I have tried to present examples of the use of the techniques in finance, together with annotated computer instructions and sample outputs for an econometrics package (EViews). This should assist students who wish to learn how to estimate models for themselves – for example, if they are required to complete a project or dissertation. Some examples have been developed especially for this book, while many others are drawn from the academic finance literature. In my opinion, this is an essential but rare feature of a textbook that should help to show students how econometrics is really applied. It is also hoped that this approach will encourage some students to delve deeper into the literature, and will give useful pointers and stimulate ideas for research projects. It should, however, be stated at the outset that the purpose of including examples from the academic finance print is not to provide a comprehensive overview of the literature or to discuss all of the relevant work in those areas, but rather to illustrate the techniques. Therefore, the literature reviews may be considered deliberately deficient, with interested readers directed to the suggested readings and the references therein.

(3) With few exceptions, almost all textbooks that are aimed at the introductory level draw their motivations and examples from economics, which may be of limited interest to students of finance or business. To see this, try motivating regression relationships using an example such as the effect of changes in income on consumption and watch your audience, who are primarily interested in business and finance applications, slip away and lose interest in the first ten minutes of your course.

Who should read this book?

The intended audience is undergraduates or Masters/MBA students who require a broad knowledge of modern econometric techniques commonly employed in the finance literature. It is hoped that the book will also be useful for researchers (both academics and practitioners), who require an introduction to the statistical tools commonly employed in the area of finance. The book can be used for courses covering financial time-series analysis or financial econometrics in undergraduate or postgraduate programmes in finance, financial economics, securities and investments.

Although the applications and motivations for model-building given in the book are drawn from finance, the empirical testing of theories in many other disciplines, such as management studies, business studies, real estate, economics and so on, may usefully employ econometric analysis. For this group, the book may also prove useful.

Finally, while the present text is designed mainly for students at the undergraduate or Masters level, it could also provide introductory reading in financial modelling for finance doctoral programmes where students have backgrounds which do not include courses in modern econometric techniques.

Pre-requisites for good understanding of this material

In order to make the book as accessible as possible, no prior knowledge of statistics, econometrics or algebra is required, although those with a prior exposure to calculus, algebra (including matrices) and basic statistics will be able to progress more quickly. The emphasis throughout the book is on a valid application of the techniques to real data and problems in finance.

In the finance and investment area, it is assumed that the reader has knowledge of the fundamentals of corporate finance, financial markets and investment. Therefore, subjects such as portfolio theory, the capital asset pricing model (CAPM) and arbitrage pricing theory (APT), the efficient markets hypothesis, the pricing of derivative securities and the term structure of interest rates, which are frequently referred to throughout the book, are not explained from first principles in this text. There are very many good books available in corporate finance, in investments and in futures and options, including those by Brealey and Myers (2013), Bodie, Kane and Marcus (2011) and Hull (2011) respectively.

Acknowledgements

I am grateful to Gita Persand, Olan Henry, James Chong and Apostolos Katsaris, who assisted with various parts of the software applications for the first edition. I am also grateful to Hilary Feltham for assistance with chapter 2 and to Simone Varotto for useful discussions and advice concerning the EViews example used in chapter 11.

I would also like to thank Simon Burke, James Chong and Con Keating for detailed and constructive comments on various drafts of the first edition, Simon Burke for suggestions on parts of the second edition and Jo Cox, Eunyoung Mallet, Ogonna Nneji, Ioannis Oikonomou and Chardan Wese Simen for comments on part of the third edition. The first and second editions additionally benefited from the comments, suggestions and questions of Peter Burridge, Kyongwook Choi, Rishi Chopra, Araceli Ortega Diaz, Xiaoming Ding, Thomas Eilertsen, Waleid Eldien, Andrea Gheno, Christopher Gilbert, Kimon Gomozias, Cherif Guermat, Abid Hameed, Ibrahim Jamali, Arty Khemlani, Margaret Lynch, David McCaffrey, Tehri Jokipii, Emese Lazar, Zhao Liuyan, Dimitri Lvov, Bill McCabe, Junshi Ma, David Merchan, Victor Murinde, Mikael Petitjean, Marcelo Perlin, Thai Pham, Jean-Sebastien Pourchet, Marcel Prokopczuk, Guilherme Silva, Jerry Sin, Andre-Tudor Stancu, Silvia Stanescu, Yiguo Sun, Li Qui, Panagiotis Varlagas, Jakub Vojtek, Henk von Eije, Jue Wang and Meng-Feng Yen.

A number of people sent useful e-mails pointing out typos or inaccuracies in the first edition. To this end, I am grateful to Merlyn Foo, Jan de Gooijer and his colleagues, Mikael Petitjean, Fred Sterbenz and Birgit Strikholm.

Useful comments and software support from Quantitative Micro Software (QMS) (now IHS Global) are gratefully acknowledged. Any remaining errors are mine alone.

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