清华经济学系列英文版教材

Econometric Analysis

Fourth Edition

计量经济分析

（第4版）

William H. Greene 著

清华大学出版社
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出 版 说 明

为了适应经济全球化的发展趋势，满足国内广大读者了解、学习和借鉴国外先进的管理经验和掌握经济理论的前沿动态，清华大学出版社与国外著名出版公司合作影印出版一系列英文版经济管理方面的图书。我们所选择的图书，基本上是已再版多次、在国外深受欢迎、并被广泛采用的优秀教材，绝大部分是该领域中较具权威性的经典之作。在选书的过程中，我们得到了很多专家、学者的支持、帮助和鼓励，在此表示谢意！清华经济学系列英文版教材由清华大学经济管理学院和北京大学经济学院杨炘、李明志、钟笑寒、姚志勇等老师审阅，在此一并致谢！

由于原作者所处国家的政治、经济和文化背景等与我国不同，对书中所持观点，敬请广大读者在阅读过程中注意加以分析和鉴别。

我们期望这套影印书的出版对我国经济科学的发展能有所帮助，对我国经济管理专业的教学能有所促进。

欢迎广大读者给我们提出宝贵的意见和建议；同时也欢迎有关的专业人士向我们推荐您所接触到的国外优秀图书。

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总 序

世纪之交，中国与世界的发展呈现最显著的两大趋势——以网络为代表的信息技术的突飞猛进，以及经济全球化的激烈挑战。无论是无远弗界的因特网，还是日益密切的政治、经济、文化等方面的国际合作，都标示着21世纪的中国是一个更加开放的中国，也面临着一个更加开放的世界。

教育，特别是管理教育总是扮演着学习与合作的先行者的角色。改革开放以来，尤其是20世纪90年代之后，为了探寻中国国情与国际上一切优秀的管理教育思想、方法和手段的完美结合，为了更好地培养高层次的“面向国际市场竞争、具备国际经营头脑”的管理者，我国的教育机构与美国、欧洲、澳洲以及亚洲一些国家和地区的大量的著名管理学院和顶尖跨国企业建立了长期密切的合作关系。以清华大学经济管理学院为例，2000年，学院顾问委员会成立，并于10月举行了第一次会议，2001年4月又举行了第二次会议。这个顾问委员会包括了世界上最大的一些跨国公司和中国几家顶尖企业的最高领导人，其阵容之大、层次之高，超过了世界上任何一所商学院。在这样高层次、多样化、重实效的管理教育国际合作中，教师和学生与国外的交流机会大幅度增加，越来越深刻地融入到全球性的教育、文化和思想观念的时代变革中，我们的管理教育工作者和经济管理学习者，更加真切地体验到这个世界正发生着深刻的变化，也更主动地探寻和把握着世界经济发展和跨国企业运作的脉搏。

我国管理教育的发展，闭关锁国、闭门造车是绝对不行的，必须同国际接轨，按照国际一流的水准来要求自己。正如朱镕基总理在清华大学经济管理学院成立十周年时所发的贺信中指出的那样：“建设有中国特色的社会主义，需要一大批掌握市场经济的一般规律，熟悉其运行规则，而又了解中国企业实情的经济管理人才。清华大学经济管理学院就要敢于借鉴、引进世界上一切优秀的经济管理学院的教学内容、方法和手段，结合中国的国情，办成世界第一流的经管学院。”作为达到世界一流的一个重要基础，朱镕基总理多次建议清华的MBA教育要加强英语教学。我体会，这不仅因为英语是当今世界交往中重要的语言工具，是连接中国与世界的重要桥梁和媒介，而且更是中国经济管理人才参与国际竞争，加强国际合作，实现中国企业的国际战略的基石。推动和实行英文教学并不是目的，真正的目的在于培养学生——这些未来的企业家——能够具备同国际竞争对手、合作伙伴沟通和对抗的能力。按照这一要求，清华大学经济管理学院正在不断推动英语教学的步伐，使得英语不仅是一门需要学习

的核心课程，而且渗透到各门专业课程的学习当中。

课堂讲授之外，课前课后的大量英文原版著作、案例的阅读对于提高学生的英文水平也是非常关键的。这不仅是积累相当的专业词汇的重要手段，而且是对学习者思维方式的有效训练。

我们知道，就阅读而言，学习和借鉴国外先进的管理经验和掌握经济理论动态，或是阅读翻译作品，或是阅读原著。前者属于间接阅读，后者属于直接阅读。直接阅读取决于读者的外文阅读能力，有较高外语水平的读者当然喜欢直接阅读原著，这样不仅可以避免因译者的疏忽或水平所限而造成的纰漏，同时也可以尽享原作者思想的真实表达。而对于那些有一定外语基础，但又不能完全独立阅读国外原著的读者来说，外文的阅读能力是需要加强培养和训练的，尤其是专业外语的阅读能力更是如此。如果一个人永远不接触专业外版图书，他在获得国外学术信息方面就永远会比别人差半年甚至一年的时间，他就会在无形中减弱自己的竞争能力。因此，我们认为，有一定外语基础的读者，都应该尝试一下阅读外文原版，只要努力并坚持，就一定能过了这道关，到那时就能体验到直接阅读的妙处了。

在掌握大量术语的同时，我们更看重读者在阅读英文原版著作时对于西方管理者或研究者的思维方式的学习和体会。我认为，原汁原味的世界级大师富有特色的表达方式背后，反映了思维习惯，反映了思想精髓，反映了文化特征，也反映了战略偏好。知己知彼，对于跨文化的管理思想、方法的学习，一定要熟悉这些思想、方法所孕育、成长的文化土壤，这样，有朝一日才能真正“具备国际战略头脑”。

以往，普通读者购买和阅读英文原版还有一个书价的障碍。一本外版书少则几十美元，多则上百美元，一般读者只能望书兴叹。随着全球经济合作步伐的加快，目前在出版行业有了一种新的合作出版的方式，即外文影印版，其价格几乎与国内同类图书持平。这样一来，读者可以不必再为书价发愁。清华大学出版社这些年在这方面一直以独特的优势领先于同行。早在1997年，清华大学出版社敢为人先，在国内最早推出一批优秀商学英文版教材，规模宏大，在企业界和管理教育界引起不小的轰动，更使国内莘莘学子受益良多。

为了配合清华大学经济管理学院推动英文授课的急需，也为了向全国更多的MBA试点院校和更多的经济管理学院的教师和学生提供学习上的支持，清华大学出版社再次隆重推出与世界著名出版集团合作的英文原版影印商学教科书，也使广大工商界人士、经济管理类学生享用到最新最好质优价廉的国际教材。

祝愿我国的管理教育事业在社会各界的大力支持和关心下不断发展、日进日新；祝愿我国的经济建设在不断涌现的大批高层次的面向国际市场竞争、具备国际经营头脑的管理者的勉力经营下早日中兴。

赵纯均 教授

清华大学经济管理学院院长

全国工商管理硕士教育指导委员会副主任

For

Lesley, Elizabeth, Allison, and Julianna

Preface

Econometric Analysis is intended for a one-year graduate course in econometrics for social scientists. The prerequisites for this course should include calculus, basic mathematical statistics, and an introduction to the paradigm of econometrics at the level of, say, Gujarati's *Basic Econometrics* (McGraw-Hill, 1995), Maddala's *Introduction to Econometrics* [Macmillan (now Prentice Hall), 1992]. Self-contained (for our purposes) summaries of the matrix algebra, statistical theory, and mathematical statistics used later in the book are given in Chapters 2 through 4. Chapter 5 contains a description of numerical methods that will be useful to practicing econometricians. The formal presentation of econometrics begins in Chapters 6 through 9 with discussion of the fundamental building block, the linear multiple regression model. Chapters 10 through 16 present familiar extensions of the single linear equation model, including nonlinear regression, panel data models, the generalized regression model, and systems of equations. We end in the last four chapters with discussions of current topics in applied econometrics, including GMM estimation methods, Lagrange multiplier tests, time-series analysis, and the analysis of qualitative and limited dependent variable models.

This book has two objectives. The first is to introduce students to *applied econometrics,* including basic techniques in regression analysis and some of the rich variety of models that are used when the linear model proves inadequate or inappropriate. The second is to present students with sufficient *theoretical background* that they will recognize new variants of the models learned about here as merely natural extensions that fit within a common body of principles. Thus, I have spent what might seem to be a large amount of effort explaining the mechanics of GMM estimation, nonlinear least squares, and maximum likelihood estimation, for example, of GARCH models. To meet the second objective, this book also contains a fair amount of theoretical material, such as that on maximum likelihood estimation and on asymptotic results for regression models. Modern software has made complicated modeling very easy to do, and an understanding of the underlying theory is important.

I had four purposes in undertaking this revision. Many readers have written to me with interesting ideas for my "next edition." It is impossible to use them all, of course. Because the four volumes of the *Handbook of Econometrics* already run to over 3000 pages, and Volumes I and II of the *Handbook of Applied Econometrics* will soon appear (both in 1998) it is also unnecessary. Nonetheless, I was eager to do this revision. I have extended some topics that were already present in the third edition and added several new ones, often through examples. For example, students of time-series econometrics will find several new discussions in Chapters 17 and 18. Second, I have taken the opportunity to continue fine-tuning the text as the experience and shared wisdon of my readers accumulates in my files. The literature in econometrics has continued to evolve, and my third objective is to grow with it. This purpose is inherently difficult to accomplish in a textbook. Most of the literature is written by professionals for other professionals, and this textbook is written for students who are in the early stages of their training. But I do hope to provide a bridge to that literature, both theoretical and applied. Fourth, with modern software and microcomputers, students can be given realistic data sets and challenging empirical analyses as a routine part of their econometrics training. To this end, a customized version of *LIMDEP* and a large number of data sets, some of which have been used in studies already in the literature are included in a CD at the back of the book.

This book is a broad survey of the field of econometrics. This field grows continually, and such an effort becomes increasingly difficult. (A partial list of journals devoted at least in part, if not completely, to econometrics includes the *Journal of Applied Econometrics*, *Journal of Econometrics*, *Econometric Theory*, *Econometric Reviews*, *Journal of Business and Economic Statistics*, *Empirical Economics*, and *Econometrica*.) Still, my view has always been that the serious student of the field must start somewhere, and one *can* successfully seek that objective in a single textbook. This text attempts to survey, at an entry level, enough of the fields in econometrics that a student can comfortably move from here to more advanced study in one or more specialized areas. At the same time, I have tried to present the material in sufficient generality that the reader is also able to appreciate the important common foundation of all these fields and to use the tools that they all employ.

One feature that distinguishes this work from its predecessors is its greater emphasis on nonlinear models. [Davidson and MacKinnon (1993) is a noteworthy, but more advanced, exception.] Computer software now in wide use has made estimation of nonlinear models as routine as estimation of linear ones, and the recent literature reflects that progression. My purpose is to bring the textbook treatment in line with current practice. The book concludes with four lengthy chapters on time-series analysis and limited dependent variable models. These nonlinear models are now the staples of the applied econometrics literature. This book also contains a fair amount of material that will extend beyond many first courses in econometrics, including, perhaps, the aforementioned chapters on limited dependent variables, the section in Chapter 20 on duration models, and some of the discussion of time series. Once again, I have included these in the hope of providing a bridge to the professional literature in these areas.

It is a pleasure to express my appreciation to those who have influenced this work. I am grateful to Arthur Goldberger and Arnold Zellner for their encouragement, guidance, and always interesting correspondence. Dennis Aigner, and Laurits Christensen were also influential in shaping my views on econometrics. Some collaborators to the earlier editions whose contributions remain in this one include Aline Quester, David Hensher, and Donald Waldman. The number of students and colleagues whose suggestions have helped to produce what you find here is far too large to allow me to thank them all individually. I would like to achnowledge the many reviewers of my work whose careful reading has vastly improved the book: Badi Baltagi, University of Houston: Neal Beck, University of California at San Diego; Diane Belleville, New York University; Anil Bera, University of Illinois; Leonard Carlson, Emory University; Frank Chaloupka, City University of New York; Chris Cornwell, University of Georgia; Craig Depken II, University of Texas at Arlington: Edward

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William H. Greene

ECONOMETRIC ANALYSIS

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