Applied Econometrics. An Introduction

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Econometrics deals with the quantitative study of economic relations and requires combining statistics with economics. The emphasis can be more on the analysis and development of econometric methods or on their application. In the second case, we talk about applied econometrics.

Applied econometrics requires a basic knowledge of mathematics and statistics, such as elementary functional analysis (continuity, derivatives, optimization etc.), possibly matrix calculus, the notion of random variable, expected value and moments, cumulative distribution and density functions. These skills are further developed and combined with economic theory studied in courses such as economics, monetary economics or political economy to lead to the formulation of empirical models of economic reality.

A further fundamental component of applied econometrics is the practical implementation of the theoretical notions — empirical economic analyses using the appropriate econometric software.

The goal of this book is to facilitate both teaching of applied econometrics, particularly in undergraduate and Master courses, and learning by students and, more generally, by those concerned with a formal measurement of economic events. It is not an easy task because it requires combining statistics, economics, and computer science in the right proportions.

Statistics is needed for a correct formulation of the problem and interpretation of the results, but an excess of formalization may discourage students. For this reason, the statistical content of this book is rigorous but limited to what is strictly necessary for a proper application of the methods. All theoretical concepts are then illustrated empirically, with examples that use either simulated data, in order to have a more immediate and controlled feedback, or actual data on economic variables. The software used is EViews, usually available in academic computer rooms or otherwise at an affordable price.

Chapter 1 contains a brief introduction to the problems faced by econometrics and to different types of economic (or, more generally, social) data that can be analyzed with econometric techniques. Chapter 2 presents the linear regression model, which often provides a good representation of the relationships between economic variables, and the estimators of the parameters of the model and their properties. Chapter 3 focuses on techniques to test hypotheses about the parameters of the linear regression model. Chapter 4 assesses the effects of violations of the assumptions underlying the linear model and develops extended versions of the model that require less restrictive conditions of applicability. Chapter 5 examines the consequences of unmodelled changes in the model parameters and possible remedies. Chapter 6 explicitly considers the case of stochastic explanatory variables. Chapter 7 proposes an introduction to dynamic models. Chapter 8 discusses models for panel data, which have both a longitudinal and a temporal dimension. Chapter 9 deals with models for binary variables, such as those resulting from questionnaires or other types of qualitative analyses.

Each chapter begins with the necessary theoretical background, continues with the practical applications based on simulated and real data using EViews, and concludes with a summary of the main concepts developed in the chapter and with both theoretical and applied exercises as a way to test and improve learning. The solutions of the exercises are available on http://mybook.egeaonline.it.

The material contained in the book is the evolution of lecture notes prepared during several years of academic courses in Econometrics and Applied Econometrics, mostly taught at Bocconi University. These notes were based on several textbooks, including Greene (1991), Pindyck and Rubinfeld (1998), Hill, Griffiths and Judge (2001a, 2001b), Judge, Hill, Griffiths, Lutkepohl and Lee (1988) and Spanos (1986).

Although these texts remain a good reference for further study, with more recent publications such as Wooldridge (2003) and Stock and Watson (2003), the contents of this book are an original synthesis, designed explicitly for undergraduate and Master courses, enriched by further statistical insights, many practical examples, and an extensive number of exercises.

This book is a translated and slightly extended version of the second edition of the book *Introduzione all'Econometria Applicata*. I am grateful for comments from several students and colleagues, with special thanks to Novella Maugeri and Claudia Foroni, though I retain responsibility for any remaining errors.

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