

Preface

Econometrics is among the most valuable tools in an economist's toolkit. As any experienced craftsman knows, for a tool to be truly useful, one must have both the desire and the know-how to make use of it. One of our former professors liked to drive home this important point by saying that "the true power of a given test is the power of the test times the probability that someone actually uses it." This lesson stayed with us throughout our years studying econometrics, as we (not so fondly) recall the many times that we would anxiously sit down to apply a newly learned tool, stare at a blank computer screen, and think to ourselves "OK, what do we do now? Where do we get the data for which this econometric tool is appropriate? Once we have that data, how do we actually execute the commands required to perform the estimation?" Unfortunately, student feedback suggests that many of our first-time econometrics students find themselves in similar predicaments. Consequently, as each semester progresses, our office hours and e-mail inboxes become inundated with students seeking help with more practical questions, such as: Where do we get appropriate data? How do we understand which econometric tool to use in which situation? What information should we include in the write-up of our project?

Our goal with this text is to bridge the gap between theoretical and practical knowledge of introductory econometrics, thereby providing readers with not only the desire but also the practical know-how to correctly utilize the econometric tools introduced. In doing so, we hope to increase the true power of the introductory econometrics course.

In our view, one of the reasons that large numbers of first-time econometrics students are left feeling lost when moving from theory to practice is that existing texts generally proceed by (1) introducing data sets that are either made up or are taken from peer-reviewed journal articles without explaining to readers how they might locate such data on their own and (2) assuming that readers either already know or will be able to quickly learn how to ask their chosen statistical package to perform the necessary calculations for them. In doing so, the texts fail to provide students with the practical tools required to make maximum use of the econometric tools presented. This is unfortunate because for most individuals, particularly those who plan to directly enter the labor market rather than pursuing graduate degrees in economics, the true excitement associated with gaining econometric knowledge lies in the practical application of the acquired tools rather than the understanding of the econometric theories underlying the development of those tools.

This text bridges the gap between the theoretical and the practical knowledge of introductory econometrics in a number of ways. The text begins with a detailed discussion of how to identify a sufficiently interesting question and how to assemble a data set appropriate for empirically examining the answer. From that point forward, we continue to develop these important practical skills by only analyzing data sets that are publicly available and by detailing the steps taken to assemble each individual data set in either the given chapter or in Appendix A. When introducing new econometric tools, we strive to clearly explain the intuition underlying each individual tool, both verbally and visually whenever possible, before introducing the technical details required to actually implement the tool. Because correctly interpreting the resulting estimates is every bit as important as understanding how to implement a given econometric tool, we pay particular attention to developing correct interpretation skills. Likewise, because a tool lacks value unless it can actually be used, every time we introduce a new econometric tool, we provide the commands required to perform the analysis in a statistical package. Finally, because an empirical research project cannot be judged successful unless each of the individual steps is effectively communicated to the reader, we conclude the text with a detailed discussion of the how-to's associated with effectively communicating the quality of one's work, culminating in a capstone example of how to conduct and effectively write up an empirical research project.

The Use of Software

While many software packages are potentially available to readers, we focus on Microsoft Excel and Stata. We do so because Microsoft Excel (1) is relatively easy to use; (2) is available on almost

every computer to which a student will have access, including those of their future employers; and (3) helps solidify the intuition underlying the econometric tools being introduced through the manner by which many calculations are performed. While true, because Microsoft Excel is limited in its ability to perform more advanced econometric analysis, in the concluding chapters of the text, we rely on calculations performed in Stata because it is not only the most user-friendly more advanced statistical package but because it also offers a reasonably priced version that is available to students. To steepen the learning curve associated with learning to work with what is likely a new statistical package, we provide a comprehensive description of Stata commands in Appendix B that includes the commands necessary to perform all of the calculations introduced in the text.

Organization of the Book

To maximize the practical value of the material covered, the text is organized as follows.

Chapter 1 introduces the general themes of the text by reviewing the five steps to conducting an empirical research project, providing a general overview of econometrics, discussing the relationship between populations and samples, and introducing the importance of sampling distributions.

Chapter 2 begins the development of practical tools by providing a detailed discussion of data collection and management techniques, including potential sources of appropriate data, the how-to's of transferring data into Excel, the effective management of data once they are collected, and the Excel commands most commonly used in the data collection and management process.

Chapter 3 reviews summary statistics used to develop a general sense of the data collected in the previous chapter, including measures of central tendency, measures of dispersion, histograms, scatter diagrams, covariance, and correlation coefficients.

Chapters 4 through 8 provide a detailed introduction to one of the most important tools in an econometrician's toolkit—linear regression analysis. Chapter 4 starts by introducing simple linear regression analysis, the how-to's of ordinary least squares (OLS) estimation, the correct interpretation of the estimated OLS coefficients, the different potential measures of the goodness-of-fit of the OLS estimates, and the appropriate way to read regression output in Excel. Chapter 5 introduces the six assumptions required for OLS to be the best linear unbiased estimator (BLUE), the correct approach to performing hypothesis tests for the significance of individual coefficients and the overall significance of the estimated sample regression function, and the correct approach to constructing confidence intervals around predicted values. Chapter 6 extends linear regression analysis to the case of multiple independent variables by discussing the multiple linear regression assumptions required for OLS to provide estimates that are BLUE, the correct interpretation of the estimated OLS coefficients, and the correct method for performing hypothesis tests of the individual significance of the estimated slope coefficients, and the overall significance of the estimates sample regression function. Chapter 7 introduces methods for incorporating qualitative independent variables and other nonlinearities, including interaction terms, quadratic terms, and log terms into multiple linear regression analysis. Finally, Chapter 8 discusses issues related to the assumption that the model being estimated is “correctly specified,” including the potential importance of omitted independent variables; included irrelevant independent variables; missing values for independent variables; outliers associated with given independent variables; and the RESET, Davidson-MacKinnon, and “eye” tests for determining the correct model specification.

The next seven chapters of the text introduce more advanced econometric tools. Chapter 9 discusses the implications associated with heteroskedastic data, the correct approach to testing for heteroskedasticity, and the correct approach to correcting for its presence. Chapters 10 and 11 introduce the issues presented by time-series data, with Chapter 10 introducing tools for estimating time-series models, including static and distributed lag models, approaches to dealing with time-trends and seasonality, and approaches to testing for structural breaks, and Chapter 11 discussing the implications associated with autocorrelation, the correct approach to testing for autocorrelation, and the correct approach to correcting for its presence.

Chapters 12 through 15 provide introductions to more advanced econometric tools. Chapter 12 introduces tools for dealing with dependent variables that only take on two possible outcomes—linear probability, logit, and probit models—or that take on multiple discrete outcomes—multinomial logit, multinomial probit, and ordered probit models. Chapter 13

introduces tools for dealing with panel data, including pooled cross-section, fixed effects, and random effects models. Chapter 14 introduces instrumental-variable approaches to dealing with the empirical issues presented by simultaneous equations, endogenous independent variables, and measurement error in independent variables. Chapter 15 provides an overview of more recently developed econometric tools, including quantile regression, Poisson and negative binomial models, and difference-in-differences models.

Chapter 16 provides a detailed demonstration of how the newly acquired skills can be put to practical use by choosing a specific application, working through the individual steps required to conduct a successful empirical research project related to the chosen topic, and providing a specific example of the write-up that might accompany such a project.

Key Features

To aid the development of the intuition, technical, and practical skills required to successfully conduct an empirical research project, every chapter in the text begins with the same three features.

Chapter Objectives: These features introduce the objectives of each chapter.

A Student's Perspective: Rather than simply listing a number of topics that we believe students might be interested in addressing, we begin each chapter with a topic that a former student actually chose to address in his or her empirical research project.

Big Picture Overview: This feature provides a roadmap to the tools introduced in each chapter. A primary focus of this feature is visual depiction of the goals of the chapter demonstrating how the material covered in the chapter expands on the material covered in previous chapters.

To review the importance of the tools introduced, we conclude every chapter with three corresponding features.

Additions to Our Empirical Research Toolkit: Each chapter concludes with a review of the econometric tools introduced in the chapter.

Our New Empirical Tools in Practice: Using What We Have Learned in This Chapter: This feature ties back to the topic introduced in "A Student's Perspective" to demonstrate the practical value of the tools introduced in the chapter by describing how actual students utilized the tools in their empirical research projects.

Looking Ahead to (the Next) Chapter: This feature provides an introduction to the material presented in the next chapter, with particular focus on how the new material builds on the reader's existing knowledge base.

In addition to these common beginning and ending features, we introduce a number of learning aids within the body of each chapter.

Empirical Research Tool Boxes: These boxes provide a quick reference to the econometric tools introduced. They include the goal, implementation, and correct interpretation of the tool as well as a discussion of why the tool works.

Excel Example Boxes: These boxes demonstrate the correct implementation of given econometric tools in Excel by implementing the commands for a specific empirical example and by discussing the correct interpretation of the results.

Excel Regression Output Boxes: These boxes contain the regression output for the example being discussed in the chapter.

Supplements

To make this textbook user-friendly for both the instructor and the student, we provide PowerPoint slides, a test bank, and other supplementary material. The PowerPoint slides follow the information presented in each of the chapters, and the test bank includes multiple-choice, short-answer, and longer-answer questions. All of the supplements for students and instructors are available at www.mhhe.com/hilmer1e.

For Instructors:

- PowerPoint presentations outline the chapters for easy class preparation.
- The Digital Image Library provides electronic images of the figures and tables in the book.
- The Test Bank contains multiple-choice, short-answer, and essay questions.

For Students:

- Excel files with all of the data sets discussed in the text help students learn the material by allowing them to replicate all of the work on their own.
- Files with the commands required to perform all of the analysis in the text in other statistical packages, such as SAS, are provided.

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