



# Causal Inference in Statistics, Social, and Biomedical Sciences: An Introduction

By Guido W. Imbens, Donald B. Rubin

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Most questions in social and biomedical sciences are causal in nature: what would happen to individuals, or to groups, if part of their environment were changed? In this groundbreaking text, two world-renowned experts present statistical methods for studying such questions. This book starts with the notion of potential outcomes, each corresponding to the outcome that would be realized if a subject were exposed to a particular treatment or regime. In this approach, causal effects are comparisons of such potential outcomes. The fundamental problem of causal inference is that we can only observe one of the potential outcomes for a particular subject. The authors discuss how randomized experiments allow us to assess causal effects and then turn to observational studies. They lay out the assumptions needed for causal inference and describe the leading analysis methods, including matching, propensity-score methods, and instrumental variables. Many detailed applications are included, with special focus on practical aspects for the empirical researcher.

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Most questions in social and biomedical sciences are causal in nature: what would happen to individuals, or to groups, if part of their environment were changed? In this groundbreaking text, two world-renowned experts present statistical methods for studying such questions. This book starts with the notion of potential outcomes, each corresponding to the outcome that would be realized if a subject were exposed to a particular treatment or regime. In this approach, causal effects are comparisons of such potential outcomes. The fundamental problem of causal inference is that we can only observe one of the potential outcomes for a particular subject. The authors discuss how randomized experiments allow us to assess causal effects and then turn to observational studies. They lay out the assumptions needed for causal inference and describe the leading analysis methods, including matching, propensity-score methods, and instrumental variables. Many detailed applications are included, with special focus on practical aspects for the empirical researcher.

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### Editorial Review

#### Review

"This book offers a definitive treatment of causality using the potential outcomes approach. Both theoreticians and applied researchers will find this an indispensable volume for guidance and reference."

Hal Varian, Chief Economist, Google, and Emeritus Professor, University of California, Berkeley

"By putting the potential outcome framework at the center of our understanding of causality, Imbens and Rubin have ushered in a fundamental transformation of empirical work in economics. This book, at once transparent and deep, will be both a fantastic introduction to fundamental principles and a practical resource for students and practitioners. It will be required readings for any class I teach."

Esther Duflo, Massachusetts Institute of Technology

"Causal Inference sets a high new standard for discussions of the theoretical and practical issues in the design of studies for assessing the effects of causes - from an array of methods for using covariates in real studies to dealing with many subtle aspects of non-compliance with assigned treatments. The book includes many examples using real data that arose from the authors' extensive research portfolios. These examples help to clarify and explain many important concepts and practical issues. It is a book that both methodologists and practitioners from many fields will find both illuminating and suggestive of further research. It is a professional tour de force, and a welcomed addition to the growing (and often confusing) literature on causation in artificial intelligence, philosophy, mathematics and statistics."

Paul W. Holland, Emeritus, Educational Testing Service

"A comprehensive and remarkably clear overview of randomized experiments and observational designs with as-good-as-random assignment that is sure to become the standard reference in the field."

David Card, Class of 1950 Professor of Economics, University of California, Berkeley

"This book will be the "Bible" for anyone interested in the statistical approach to causal inference associated with Donald Rubin and his colleagues, including Guido Imbens. Together, they have systematized the early insights of Fisher and Neyman and have then vastly developed and transformed them. In the process they have created a theory of practical experimentation whose internal consistency is mind-boggling, as is its sensitivity to assumptions and its elaboration of the key 'potential outcomes' framework. The authors' exposition of random assignment experiments has breadth and clarity of coverage, as do their chapters on observational studies that can be readily conceptualized within an experimental framework. Never have experimental principles been better warranted intellectually or better translated into statistical practice. The book is a "must read" for anyone claiming methodological competence in all sciences that rely on experimentation."

Thomas D. Cook, Joan and Sarepta Harrison Chair of Ethics and Justice, Northwestern University, Illinois

"In this wonderful and important book, Imbens and Rubin give a lucid account of the potential outcomes perspective on causality. This perspective sensibly treats all causal questions as questions about a hidden variable, indeed the ultimate hidden variable, "What would have happened if things were different?" They make this perspective mathematically precise, show when and to what degree it succeeds, and discuss how to apply it to both experimental and observational data. This book is a must-read for natural scientists, social scientists and all other practitioners who seek new hypotheses and new truths in their complex data."

David Blei, Columbia University

"This thorough and comprehensive book uses the "potential outcomes" approach to connect the breadth of theory of causal inference to the real-world analyses that are the foundation of evidence-based decision making in medicine, public policy and many other fields. Imbens and Rubin provide unprecedented guidance for designing research on causal relationships, and for interpreting the results of that research appropriately." Mark McClellan, Director of the Health Care Innovation and Value Initiative, Brookings Institution, Washington DC

"This book will revolutionize how applied statistics is taught in statistics and the social and biomedical sciences. The authors present a unified vision of causal inference that covers both experimental and observational data. They do a masterful job of communicating some of the deepest, and oldest, issues in statistics to readers with disparate backgrounds. They closely connect theoretical concepts with applied concerns, and they honestly and clearly discuss the identifying assumptions of the methods presented. Too many books on statistical methods present a menagerie of disconnected methods and pay little attention to the scientific plausibility of the assumptions that are made for mathematical convenience, instead of for verisimilitude. This book is different. It will be widely read, and it will change the way statistics is practiced."

Jasjeet S. Sekhon, Robson Professor of Political Science and Statistics, University of California, Berkeley

"Clarity of thinking about causality is of central importance in financial decision making. Imbens and Rubin provide a rigorous foundation allowing practitioners to learn from the pioneers in the field." Stephen Blyth, Managing Director, Head of Public Markets, Harvard Management Company

"A masterful account of the potential outcomes approach to causal inference from observational studies that Rubin has been developing since he pioneered it forty years ago."

Adrian Raftery, Blumstein-Jordan Professor of Statistics and Sociology, University of Washington

"Correctly drawing causal inferences is critical in many important applications. Congratulations to Professors Imbens and Rubin, who have drawn on their decades of research in this area, along with the work of several others, to produce this impressive book covering concepts, theory, methods and applications. I especially appreciate their clear exposition on conceptual issues, which are important to understand in the context of either a designed experiment or an observational study, and their use of real applications to motivate the methods described."

Nathaniel Schenker, Statistician

"The book is well-written with a very comprehensive coverage of many issues associated with causal inference. As can be seen from its table of contents, the book uses multiple perspectives to discuss these issues including theoretical underpinnings, experimental design, randomization techniques and examples using real-world data."

Carol Joyce Blumberg, International Statistical Review

#### About the Author

Guido W. Imbens is Professor of Economics at the Graduate School of Business, Stanford University. He has held tenured faculty positions at Harvard University, the University of California, Los Angeles, the University of California, Berkeley, and Stanford University. He is a fellow of the Econometric Society and the American Academy of Arts and Sciences. Imbens has published widely in economics and statistics journals, including *Econometrica*, *The American Economic Review*, the *Annals of Statistics*, the *Journal of the American Statistical Association*, *Biometrika*, and the *Journal of the Royal Statistical Society*.

Donald B. Rubin is John L. Loeb Professor of Statistics at Harvard University, where he has been professor

since 1983 and department chair for thirteen of those years. He has authored or coauthored nearly four hundred publications (including ten books), has four joint patents, and has made important contributions to statistical theory and methodology, particularly in causal inference, design and analysis of experiments and sample surveys, treatment of missing data, and Bayesian data analysis. Rubin has received the Samuel S. Wilks Medal from the American Statistical Association, the Parzen Prize for Statistical Innovation, the Fisher Lectureship, and the George W. Snedecor Award from the Committee of Presidents of Statistical Societies. He was named Statistician of the Year by the American Statistical Association, Boston and Chicago chapters. He is one of the most highly cited authors in mathematics and economics with nearly 150,000 citations to date.

## **Users Review**

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This book untitled Causal Inference in Statistics, Social, and Biomedical Sciences: An Introduction to be one of several books in which best seller in this year, that's because when you read this reserve you can get a lot of benefit onto it. You will easily to buy this specific book in the book retailer or you can order it by way of online. The publisher with this book sells the e-book too. It makes you more readily to read this book, as you can read this book in your Touch screen phone. So there is no reason for you to past this book from your list.

#### **Helen Kingsbury:**

Your reading sixth sense will not betray an individual, why because this Causal Inference in Statistics, Social, and Biomedical Sciences: An Introduction book written by well-known writer we are excited for well how to make book which can be understand by anyone who have read the book. Written inside good manner for you, dripping every ideas and composing skill only for eliminate your own hunger then you still hesitation Causal Inference in Statistics, Social, and Biomedical Sciences: An Introduction as good book but not only by the cover but also by the content. This is one reserve that can break don't judge book by its cover, so do you still needing a different sixth sense to pick this!? Oh come on your reading through sixth sense already said so why you have to listening to an additional sixth sense.

#### **Jennifer Galaviz:**

In this era globalization it is important to someone to find information. The information will make a professional understand the condition of the world. The healthiness of the world makes the information better to share. You can find a lot of sources to get information example: internet, newspaper, book, and soon. You can view that now, a lot of publisher in which print many kinds of book. The particular book that recommended for you is Causal Inference in Statistics, Social, and Biomedical Sciences: An Introduction this guide consist a lot of the information on the condition of this world now. This specific book was represented how does the world has grown up. The words styles that writer use for explain it is easy to understand. Typically the writer made some exploration when he makes this book. That is why this book acceptable all of you.

**Keith Lugo:**

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