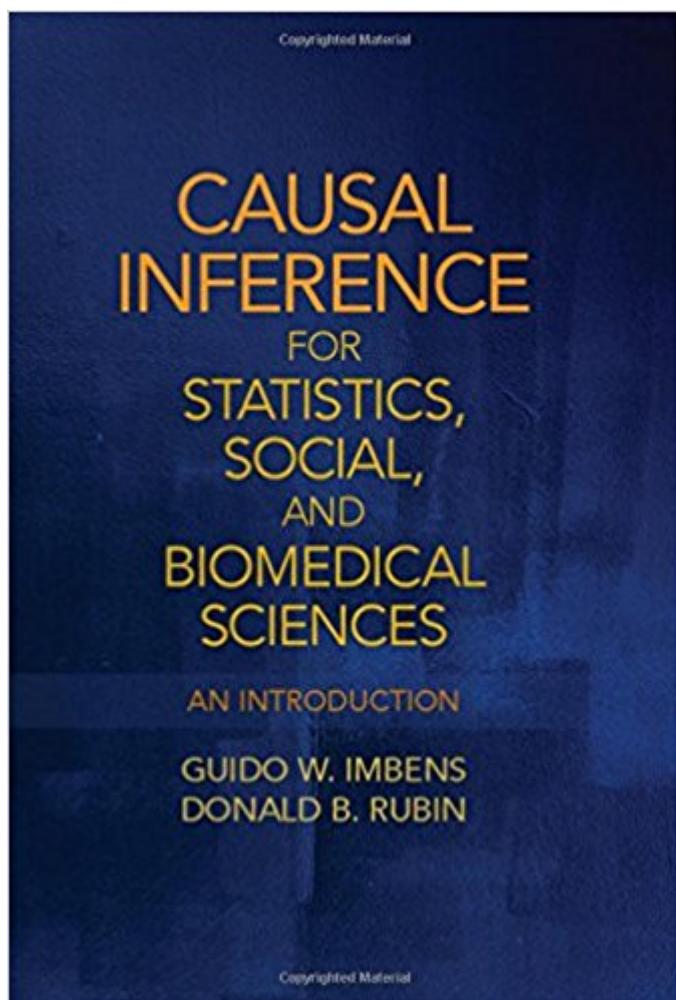


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Causal Inference For Statistics, Social, And Biomedical Sciences: An Introduction



Synopsis

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.

Book Information

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"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 fourty 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'Guido Imbens and Don Rubin present an insightful discussion of the potential outcomes framework for causal inference ... this book presents a unified framework to causal inference based on the potential outcomes framework, focusing on the classical analysis of experiments, unconfoundedness, and noncompliance. The book has become an instant classic in

the causal inference literature, broadly defined, and will certainly guide future research in this area. All researchers will benefit from carefully studying this book, no matter what their specific views are on the subject matter.' Matias D. Cattaneo, *Journal of the American Statistical Association*'Guido Imbens and Donald Rubin have written an authoritative textbook on causal inference that is expected to have a lasting impact on social and biomedical scientists as well as statisticians. Researchers have been waiting for the publication of this book, which is a welcome addition to the growing list of textbooks and monographs on causality ... the authors should be congratulated for the publication of this impressive volume. The book provides a unified introduction to the potential outcomes approach with the focus on the basic causal inference problems that arise in randomized experiments and observational studies.' Alicia A. Lloro, *Journal of the American Statistical Association*

Many applied research questions are fundamentally questions of causality: Is a new drug effective? Does a training program affect someone's chances of finding a job? What is the effect of a new regulation on economic activity? In this ground-breaking text, two world-renowned experts present statistical methods for studying such questions.

Some people are of the opinion that statistics should replace calculus in high school/college curricula because of the importance of analytics in the modern business world. I think a similar argument could be made about replacing some of the more esoteric parts of graduate statistics/econometrics with causal inference theory. If that opinion is correct, this would be an excellent reference text.Causal inference theory is important because the regression techniques now taught to young social scientists as methods of determining cause and effect assume endogeneity when the data often don't support such an assumption. They also impose a linear model on the data that can be similarly inappropriate. The non-parametric techniques discussed by Rubin and Imbens, while having their own assumptions, are applicable to a wider range of problems.Rubin and Imbens summarize the voluminous literature on propensity score and related causal inference techniques in a manner that is accessible to someone with a solid background in statistics (both frequentist and Bayesian). I read the book cover to cover and, despite already knowing something about Propensity Score techniques, learned a great deal.They begin with randomized experiments then explain how the mathematical models developed for such methods are also applicable to observational studies. They then discuss various methods of using the Propensity Score along with tests of the plausibility of such models and bias limits when some of the

assumptions in these models are relaxed. One complaint I have is that the different types of exact matching are barely discussed. Considering the growing importance of techniques like Coarsened Exact Matching, this seems like a significant oversight. In addition, the book contains no exercises making it difficult to use as a textbook without some supplementary material. All in all, though, this work is a must have for those engaged in Causal Inference either academically or in the business world. Even those not making active use of these techniques might find applications to their empirical work once they understand how to properly use Propensity Score analysis.

The only shortcoming is that font is small. If the margin is reduced to give more space to the context, that would be perfect!

Although this might be a good book to study causal inference since there are not many choices for now, it was tediously long in many topics. I wish it were written in a more concise way.

A great book. It has careful and easy (to follow) arguments that help to understand interesting situations.

Very good

Awesome possum. Easy to read primer from two innovators in this field. No brainer acquisition for Academics and practitioners alike. 4 thumbs up!

Recommended strongly by Prof. Strauss, really the best!

A great overview of the field.

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