

Production And Efficiency Analysis With R

This book covers the area of unpaced, unbalanced production lines. You will find an up-to-date discussion of how designing these lines can be made more efficient by taking advantage of inherent imbalance -- for example operators who work at different speeds-- a concept which has traditionally been seen as an obstacle to efficient production. A series of experiments are presented to illustrate the issues involved in improving performance through production line imbalance. This area is of interest to postgraduate and executive level students interested in the area of production, and to managers of manual or semi-automated production lines who are interested in innovative approaches to line design. In this book you will find some surprisingly easy ways to improve performance with low or zero costs. Emphasis is placed on reducing the amount of time production lines lie idle, and on reducing work in process. This is a timely contribution to the field when managers are casting around for new ways to cut waste and reduce their use of natural resources.

This text is designed as a primer for anyone seeking an introduction to efficiency and productivity analysis by offering a unified text presentation of four different methods. It also provides detailed advice on computer programs which can be used to calculate the various measures.

This book provides practitioners with a step-by-step guide on how to conduct efficiency analysis using the stochastic frontier approach.

This book extends the dynamic and stochastic analysis of economic efficiency by using the recent techniques of data envelopment analysis. New results and applications of these techniques in numerous areas of economics, finance and management are provided, including treatment of private sector industries, portfolio models in finance, quality control techniques in managerial performance, the role of market competition, policy applications in investment models in finance, risk aversion and efficiency, and technology and innovation. The most up-to-date tools of efficiency analysis developed here will be valuable for students and researchers in operations research, applied management science and applied microeconomics. Contents: New Efficiency

Theory Economics of Efficiency Measurement Efficiency Dynamics Stochastic Efficiency

Analysis Industrial Applications Economic Theory and DEA Readership: Students and

researchers in applied mathematics, economics, finance, operations research,

management and applied statistics. Keywords: Efficiency Measurement; Productivity

Growth; Demand Fluctuations and Price Uncertainty; Nonparametric Theory; Data

Envelopment Analysis Reviews: "... this book contains a lot of useful material and has the potential to be an effective resource for researchers in DEA ..."

Interfaces Providing a systematic and comprehensive treatment of recent developments in efficiency analysis, this book makes available an intuitive yet rigorous presentation of advanced nonparametric and robust methods, with applications for the analysis of economies of scale and scope, trade-offs in production and service activities, and explanations of efficiency differentials.

This book provides a detailed introduction to the theoretical and methodological foundations of production efficiency analysis using benchmarking. Two of the more popular methods of efficiency evaluation are Stochastic Frontier Analysis (SFA) and Data Envelopment Analysis (DEA), both of which are based on the concept of a

production possibility set and its frontier. Depending on the assumed objectives of the decision-making unit, a Production, Cost, or Profit Frontier is constructed from observed data on input and output quantities and prices. While SFA uses different maximum likelihood estimation techniques to estimate a parametric frontier, DEA relies on mathematical programming to create a nonparametric frontier. Yet another alternative is the Convex Nonparametric Frontier, which is based on the assumed convexity of the production possibility set and creates a piecewise linear frontier consisting of a number of tangent hyper planes. Three of the papers in this volume provide a detailed and relatively easy to follow exposition of the underlying theory from neoclassical production economics and offer step-by-step instructions on the appropriate model to apply in different contexts and how to implement them. Of particular appeal are the instructions on (i) how to write the codes for different SFA models on STATA, (ii) how to write a VBA Macro for repetitive solution of the DEA problem for each production unit on Excel Solver, and (iii) how to write the codes for the Nonparametric Convex Frontier estimation. The three other papers in the volume are primarily theoretical and will be of interest to PhD students and researchers hoping to make methodological and conceptual contributions to the field of nonparametric efficiency analysis.

This book draws together contributions from forest economists in the Research Triangle of North Carolina, with co-authors from institutions around the world. It represents our common belief that rigorous empirical analysis in an economic framework can inform forest policy. We intend the book as a guide to the empirical methods that we have found most useful for addressing both traditional and modern areas of concern in forest policy, including timber production and markets, multiple use forestry, and valuation of non-market benefits. The book editors and most chapter authors are affiliated with three institutions in the Research Triangle: the Southern Research Station of the USDA Forest Service (K. Abt, Butry, Holmes, Mercer, Moulton, Prestemon, Wear), the Department of Forestry at North Carolina State University (R. Abt, Ahn, Cabbage, Sills), and the Environmental and Natural Resource Economics Program of Research Triangle Institute (Murray, Pattanayak). Two other Triangle institutions are also represented among the book authors: Duke University (Kramer) and the Forestland Group (Zinkhan). In addition to our primary affiliations, many of us are adjunct faculty and/or graduates of Triangle universities. Many of our co-authors also graduated from or were previously affiliated with Triangle institutions. Thus, the selection of topics, methods, and case studies reflects the work of this particular network of economists, and to some degree, our location in the southeastern United States. However, our work and the chapters encompass other regions of the United States and the world, including Latin America and Asia.

Efficiency Analysis details the important econometric area of efficiency estimation, both past approaches as well as new methodology. There are two main camps in efficiency analysis: that which estimates maximal output and attributes all departures from this as inefficiency, known as Data Envelopment Analysis (DEA), and that which allows for both unobserved variation in output due to shocks and measurement error as well as inefficiency, known as Stochastic Frontier Analysis (SFA). This volume focuses exclusively on SFA. The econometric study of efficiency analysis typically begins by constructing a convoluted error term that is composed on noise, shocks, measurement error, and a one-sided shock called inefficiency. Early in the development of these methods, attention focused on the proposal of distributional assumptions which yielded a likelihood function whereby the parameters of the distributional components of the convoluted error could be recovered. The field evolved to the study of individual specific efficiency scores and the extension of these methods to panel data. Recently, attention has focused on relaxing the stringent distributional assumptions that are commonly imposed, relaxing the functional form assumptions commonly placed on the underlying technology, or

some combination of both. All told exciting and seminal breakthroughs have occurred in this literature, and reviews of these methods are needed to effectively detail the state of the art. The generality of SFA is such that the study of efficiency has gone beyond simple application of frontier methods to study firms and appears across a diverse set of applied milieus. This review should appeal to those outside of the efficiency literature seeking to learn about new methods which might assist them in uncovering phenomena in their applied area of interest. International Applications of Productivity and Efficiency Analysis features a complete range of techniques utilized in frontier analysis, including extensions of existing techniques and the development of new techniques. Another feature is that most of the contributions use panel data in a variety of approaches. Finally, the range of empirical applications is at least as great as the range of techniques, and many of the applications are of considerable policy relevance. This book offers a wide selection of contributions presented at the LV Conference of Italian society of agricultural economics (SIDEA) Studies. Agricultural economists and sociologists reflect on the change processes that are affecting the agri-food systems and take a small step towards an improved understanding of the complexity of green metamorphosis, and the interplay between agriculture, food and ecology.00The key message is that a green metamorphosis has been taking place, increasingly involving more and more aspects and dimensions: from environment to consumers' preferences, from social value to human health, from profitability to governance issues. Furthermore, this book tries to shed a light on the complexity of the new agricultural paradigm, which involves technology as well as traditions, trying to understand the ongoing metamorphosis taking into account that 'nothing is created, nothing is destroyed, everything is transformed?'. This volume intends to guide the new generations of agricultural economists, who have the hard task of leading the green metamorphosis across the four main axes of sustainability: economic, socio-cultural, environmental, and political.0.

Measuring productive efficiency for nonprofit organizations has posed a great challenge to applied researchers today. The problem has many facets and diverse implications for a number of disciplines such as economics, applied statistics, management science and information theory. This monograph discusses four major areas, which emphasize the applied economic and econometric aspects of the production frontier analysis: A. Stochastic frontier theory, B. Data envelopment analysis, C. Clustering and estimation theory, D. Economic and managerial applications Besides containing an up-to-date survey of the most recent developments in the field, the monograph presents several new results and theorems from my own research. These include but are not limited to the following: (1) interface with parametric theory, (2) minimax and robust concepts of production frontier, (3) game-theoretic extension of the Farrell and Johansen models, (4) optimal clustering techniques for data envelopment analysis and (5) the dynamic and stochastic generalizations of the efficiency frontier at the micro and macro levels. In my research work in this field I have received great support and inspiration from Professor Abraham Charnes of the University of Texas at Austin, who has basically founded the technique of data envelopment analysis, developed it and is still expanding it. My interactions with him have been most fruitful and productive. I am deeply grateful to him. Finally, I must record my deep appreciation to my wife and two children for their loving and enduring support. But for their support this work would not have been completed. This textbook introduces essential topics and techniques in production and efficiency analysis and shows how to apply these methods using the statistical software R. Numerous small simulations lead to a deeper understanding of random processes assumed in the models and of the behavior of estimation techniques. Step-by-step programming provides an understanding of advanced approaches such as stochastic frontier analysis and stochastic data envelopment analysis. The text is intended for master students interested in empirical production and efficiency analysis. Readers are assumed to have a general background in

production economics and econometrics, typically taught in introductory microeconomics and econometrics courses.

This book provides an introduction to incorporating preference information in Data Envelopment Analysis (DEA) with a special emphasis in Value Efficiency Analysis. In addition to theoretical considerations, numerous illustrative examples are included. Hence, the book can be used as a teaching text as well. Only a modest mathematical background is needed to understand the main principles. The only prerequisites are a) familiarity with linear algebra, especially matrix calculus; b) knowledge of the simplex method; and c) familiarity with the use of computer software. The book is organized as follows. Chapter 1 provides motivation and introduces the basic concepts. Chapter 2 provides the basic ideas and models of Data Envelopment Analysis. The efficient frontier and production possibility set concepts play an important role in all considerations. That's why these concepts are considered more closely in Chapter 3. Since the approaches introduced in this study are inspired by Multiple Objective Linear Programming, the basic concepts of this field are reviewed in Chapter 4. Chapter 5 also compares and contrasts Data Envelopment Analysis and Multiple Objective Linear Programming, providing some cornerstones for approaches presented later in the book. Chapter 6 discusses the traditional approaches to take into account preference information in DEA. In Chapter 7, Value Efficiency is introduced, and Chapter 8 discusses practical aspects. Some extensions are presented in Chapter 9, and in Chapter 10 Value Efficiency is extended to cover the case when a production possibility set is not convex. Three implemented applications are reviewed in Chapter 11. Provides a comprehensive approach to productivity and efficiency analysis using economic and econometric theory.

Production and Efficiency Analysis with R Springer

When Harold Fried, et al. published *The Measurement of Productive Efficiency: Techniques and Applications* with OUP in 1993, the book received a great deal of professional interest for its accessible treatment of the rapidly growing field of efficiency and productivity analysis. The first several chapters, providing the background, motivation, and theoretical foundations for this topic, were the most widely recognized. In this tight, direct update, these same editors have compiled over ten years of the most recent research in this changing field, and expanded on those seminal chapters. The book will guide readers from the basic models to the latest, cutting-edge extensions, and will be reinforced by references to classic and current theoretical and applied research. It is intended for professors and graduate students in a variety of fields, ranging from economics to agricultural economics, business administration, management science, and public administration. It should also appeal to public servants and policy makers engaged in business performance analysis or regulation. In companies that produce goods and services, productivity and efficiency improvements are a constant challenge. This book reviews the differences between productivity and efficiency. It proposes a new method and makes available a computational tool for implementation that contributes to facilitating the use of Data Envelopment Analysis (DEA). The book presents a discussion about productivity and efficiency, illustrating the potentials of use and conceptual differences. It covers the concepts and techniques for analysis of productivity and efficiency, analyzing critical benefits and limitations, explains in detail how to use DEA for analysis, provides

innovative methods for using DEA, offers a free online computer tool with a direction guide, shows real empirical applications, and covers other techniques that can be used to complement the analysis performed. The book is for professionals, managers, consultants, students working and taking courses in productive systems of goods and services. Ancillary materials include a free online computer tool to operationalize the concepts and methods proposed in the book, a guide on how to use the method and the software developed for the DEA application. Solutions manual, instructor's manual, PowerPoint slides, and figure slides also will be available upon qualified adoption. In this book the authors explore the state of the art on efficiency measurement in health systems and international experts offer insights into the pitfalls and potential associated with various measurement techniques. The authors show that: - The core idea of efficiency is easy to understand in principle - maximizing valued outputs relative to inputs, but is often difficult to make operational in real-life situations - There have been numerous advances in data collection and availability, as well as innovative methodological approaches that give valuable insights into how efficiently health care is delivered - Our simple analytical framework can facilitate the development and interpretation of efficiency indicators.

A Practitioner's Guide to Stochastic Frontier Analysis Using Stata provides practitioners in academia and industry with a step-by-step guide on how to conduct efficiency analysis using the stochastic frontier approach. The authors explain in detail how to estimate production, cost, and profit efficiency and introduce the basic theory of each model in an accessible way, using empirical examples that demonstrate the interpretation and application of models. This book also provides computer code, allowing users to apply the models in their own work, and incorporates the most recent stochastic frontier models developed in academic literature. Such recent developments include models of heteroscedasticity and exogenous determinants of inefficiency, scaling models, panel models with time-varying inefficiency, growth models, and panel models that separate firm effects and persistent and transient inefficiency. Immensely helpful to applied researchers, this book bridges the chasm between theory and practice, expanding the range of applications in which production frontier analysis may be implemented.

Modern textbook presentations of production economics typically treat producers as successful optimizers. Conventional econometric practice has generally followed this paradigm, and least squares based regression techniques have been used to estimate production, cost, profit and other functions. In such a framework deviations from maximum output, from minimum cost and cost minimizing input demands, and from maximum profit and profit maximizing output supplies and input demands, are attributed exclusively to random statistical noise. However casual empiricism and the business press both make persuasive cases for the argument that, although producers may indeed attempt to optimize, they do not always succeed. This book develops econometric techniques for the estimation of production, cost and profit frontiers, and for the estimation of the technical and economic efficiency with which producers approach these frontiers.

Since these frontiers envelop rather than intersect the data, and since the authors continue to maintain the traditional econometric belief in the presence of external forces contributing to random statistical noise, the work is titled Stochastic Frontier Analysis.

The aim of this volume is to provide a general overview of the econometrics of panel data, both from a theoretical and from an applied viewpoint. Since the pioneering papers by Edwin Kuh (1959), Yair Mundlak (1961), Irving Hoch (1962), and Pietro Balestra and Marc Nerlove (1966), the pooling of cross sections and time series data has become an increasingly popular way of quantifying economic relationships. Each series provides information lacking in the other, so a combination of both leads to more accurate and reliable results than would be achievable by one type of series alone. Over the last 30 years much work has been done: investigation of the properties of the applied estimators and test statistics, analysis of dynamic models and the effects of eventual measurement errors, etc. These are just some of the problems addressed by this work. In addition, some specific difficulties associated with the use of panel data, such as attrition, heterogeneity, selectivity bias, pseudo panels etc., have also been explored. The first objective of this book, which takes up Parts I and II, is to give as complete and up-to-date a presentation of these theoretical developments as possible. Part I is concerned with classical linear models and their extensions; Part II deals with nonlinear models and related issues: logit and probit models, latent variable models, duration and count data models, incomplete panels and selectivity bias, point processes, and simulation techniques.

This book surveys the state-of-the-art in efficiency and productivity analysis, examining advances in the analytical foundations and empirical applications. The analytical techniques developed in this book for efficiency provide alternative ways of defining optimum outcome sets, typically as a (technical) production frontier or as an (economic) cost, revenue or profit frontier, and alternative ways of measuring efficiency relative to an appropriate frontier. Simultaneously, the analytical techniques developed for efficiency analysis extend directly to productivity analysis, thereby providing alternative methods for estimating productivity levels, and productivity change through time or productivity variation across producers. This book includes chapters using data envelopment analysis (DEA) or stochastic frontier analysis (SFA) as quantitative techniques capable of measuring efficiency and productivity. Across the book's 15 chapters, it broadly extends into popular application areas including agriculture, banking and finance, and municipal performance, and relatively new application areas including corporate social responsibility, the value of intangible assets, land consolidation, and the measurement of economic well-being. The chapters also cover topics such as permutation tests for production frontier shifts, new indices of total factor productivity, and also randomized controlled trials and production frontiers. This book provides a coherent description of the main concepts and statistical

methods used to analyse economic performance. The focus is on measures of performance that are of practical relevance to policy makers. Most, if not all, of these measures can be viewed as measures of productivity and/or efficiency. Linking fields as diverse as index number theory, data envelopment analysis and stochastic frontier analysis, the book explains how to compute measures of input and output quantity change that are consistent with measurement theory. It then discusses ways in which meaningful measures of productivity change can be decomposed into measures of technical progress, environmental change, and different types of efficiency change. The book is aimed at graduate students, researchers, statisticians, accountants and economists working in universities, regulatory authorities, government departments and private firms. The book contains many numerical examples. Computer codes and datasets are available on a companion website.

This proceedings volume examines the state-of-the art of productivity and efficiency analysis and adds to the existing research by bringing together a selection of the best papers from the 8th North American Productivity Workshop (NAPW). It also aims to analyze world-wide perspectives on challenges that local economies and institutions may face when changes in productivity are observed. The volume comprises of seventeen papers that deal with productivity measurement, productivity growth, dynamics of productivity change, measures of labor productivity, measures of technical efficiency in different sectors, frontier analysis, measures of performance, industry instability and spillover effects. These papers are relevant to academia, but also to public and private sectors in terms of the challenges firms, financial institutions, governments and individuals may face when dealing with economic and education related activities that lead to increase or decrease of productivity. The North American Productivity Workshop brings together academic scholars and practitioners in the field of productivity and efficiency analysis from all over the world. It is a four day conference exploring topics related to productivity, production theory and efficiency measurement in economics, management science, operations research, public administration, and related fields. The papers in this volume also address general topics as health, energy, finance, agriculture, utilities, and economic development, among others. The editors are comprised of the 2014 local organizers, program committee members, and celebrated guest conference speakers.

This book provides energy efficiency quantitative analysis and optimal methods for discrete manufacturing systems from the perspective of global optimization. In order to analyze and optimize energy efficiency for discrete manufacturing systems, it uses real-time access to energy consumption information and models of the energy consumption, and constructs an energy efficiency quantitative index system. Based on the rough set and analytic hierarchy process, it also proposes a principal component quantitative analysis and a combined energy efficiency quantitative analysis. In turn, the book addresses the design and development of quantitative analysis systems. To save energy consumption on the basis of energy efficiency analysis, it presents several optimal control strategies, including one for single-machine

equipment, an integrated approach based on RWA-MOPSO, and one for production energy efficiency based on a teaching and learning optimal algorithm. Given its scope, the book offers a valuable guide for students, teachers, engineers and researchers in the field of discrete manufacturing systems.

This book provides an understanding of the subject and will prove an invaluable aid to both new and experienced experimenters in many different branches of chemistry.

This volume systematically details both the basic principles and new developments in Data Envelopment Analysis (DEA), offering a solid understanding of the methodology, its uses, and its potential. New material in this edition includes coverage of recent developments that have greatly extended the power and scope of DEA and have lead to new directions for research and DEA uses. Each chapter accompanies its developments with simple numerical examples and discussions of actual applications. The first nine chapters cover the basic principles of DEA, while the final seven chapters provide a more advanced treatment.

Softcover version of the second edition Hardcover. Incorporates a new author, Dr. Chris O'Donnell, who brings considerable expertise to the project in the area of performance measurement. Numerous topics are being added and more applications using real data, as well as exercises at the end of the chapters. Data sets, computer codes and software will be available for download from the web to accompany the volume.

A key resource and framework for assessing the performance of competing entities, including forecasting models Advances in DEA Theory and Applications provides a much-needed framework for assessing the performance of competing entities with special emphasis on forecasting models. It helps readers to determine the most appropriate methodology in order to make the most accurate decisions for implementation. Written by a noted expert in the field, this text provides a review of the latest advances in DEA theory and applications to the field of forecasting. Designed for use by anyone involved in research in the field of forecasting or in another application area where forecasting drives decision making, this text can be applied to a wide range of contexts, including education, health care, banking, armed forces, auditing, market research, retail outlets, organizational effectiveness, transportation, public housing, and manufacturing. This vital resource: Explores the latest developments in DEA frameworks for the performance evaluation of entities such as public or private organizational branches or departments, economic sectors, technologies, and stocks Presents a novel area of application for DEA; namely, the performance evaluation of forecasting models Promotes the use of DEA to assess the performance of forecasting models in a wide area of applications Provides rich, detailed examples and case studies Advances in DEA Theory and Applications includes information on a balanced benchmarking tool that is designed to help organizations examine their assumptions about their productivity and performance.

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