

Data Envelopment Analysis Methods And Maxdea Software

Using Data Envelopment Analysis methods, this study measures the technical efficiency of the 50 largest Korean cities to provide information on the relative performance of each city, sources of inefficiency in urban production, and possible returns to scale of additional investment for each city. It also seeks to determine the factors that account for productivity differentials, and by using the Data Envelopment Analysis methodology, hopes to close the gap between theory and empirical estimates in urban-regional studies, and contribute to improvements in urban-regional policy making.

This volume discusses the latest techniques and their economic applications for modern industries like computer, pharmaceutical, banking and other manufacturing. Both econometric and mathematical programming techniques are analyzed so as to develop a synthetic approach.

Introduction to Data Envelopment Analysis and Its Uses: With DEA-Solver Software and References has been carefully designed by the authors to provide a systematic introduction to DEA and its uses as a multifaceted tool for evaluating problems in a variety of contexts. The authors have been involved in DEA's development from the beginning. William Cooper (with Abraham Charnes and Edwardo Rhodes) is a founder of DEA. Lawrence Seiford and Kaoru Tone have been actively involved as researchers and practitioners from its earliest beginnings. All have been deeply involved in uses of DEA in practical applications as well as in the development of its basic theory and methodologies. The result is a textbook grounded in authority, experience and substance.

In a relatively short period of time, data envelopment analysis (DEA) has grown into a powerful analytical tool for measuring and evaluating performance. DEA is computational at its core and this book is one of several Springer aim to publish on the subject. This work deals with the micro aspects of handling and modeling data issues in DEA problems. It is a handbook treatment dealing with specific data problems, including imprecise data and undesirable outputs.

A Foundation Text with Integrated Software

A Guide for Practitioners and Analysts Working in Operations Research Using DEA

Data Envelopment Analysis: Theory, Methodology, and Applications

Data Envelopment Analysis with Spreadsheets

Data Envelopment Analysis (DEA) as an Approach to Exploring Technical Efficiency in Higher Education

A Technique for Measuring the Efficiency of Government Service Delivery

Empirical Pareto-Efficient Production Function means to assess the impact of advertising in U.S. Army Recruiting are developed utilizing Data Envelopment Analysis (DEA). Results show that service specific advertising is more effective in producing high quality army contracts. These results corroborate earlier findings by the authors based on DEA that address the joint vs. service specific

advertising issue. DEA analyses need to be performed with various other service outputs and inputs to complete these developments. However, the already developed DEA applications provide an empirical, battalion-level basis for management decisions regarding the Service-Joint advertising issue and other resource trade-offs. The rate of change measure is easily incorporated into previously developed informatics utilized for DEA. True decision support can then be provided to the recruiting command through DEA on the impact of advertising of different types, and on the allocation of other resources. Thus DEA can provide the basis of a Decision Support System which will systematically provide insights from the data while maintaining the managerial level resolution needed to implement those insights into decisions. Keywords: Advertising effectiveness, Resource allocation, Joint advertising mix experiment, Sensitivity analysis, U.S. Army recruiting command, Service advertising, Joint advertising. This volume emphasizes the possibilities to adjust and develop the methodology of Data Envelopment Analysis in order to meet the requirements of the service sector.

Data envelopment analysis (DEA) is one of the best mathematical techniques to compute the overall performance of units with some inputs and outputs. The original DEA methods are developed to tackle the information based on the crisp number but no ability to handle the indeterminacy, impreciseness, vagueness, inconsistent, and incompleteness information such as triangular neutrosophic numbers (TNNs). This study attempts to establish a new model of DEA, where the information on decision-making units is TNNs. Initially, the concept and features of a conventional DEA model and the comparative TNNs are discussed. Besides, some new ranking functions of TNNs are presented. Furthermore, based on the mentioned ranking functions, an algorithm for solving the new model has been established. A comparison of the new model with an existing method and other kinds of uncertainty tools has been provided. In comparison with the existing methods, the significant characteristic of the new model is that it can handle the triangular neutrosophic information simply and effectively. Finally, the implementation of this strategy for an example has been applied for various models of DEA.

The intensity of global competition and ever-increasing economic uncertainties has led organizations to search for more efficient and effective ways to manage their business operations. Data envelopment analysis (DEA) has been widely used as a conceptually simple yet powerful tool for evaluating organizational productivity and performance. Fuzzy DEA (FDEA) is a promising extension of the conventional DEA proposed for dealing with imprecise and ambiguous data in performance measurement problems. This book is the first volume in the literature to present the state-of-the-art developments and applications of FDEA. It is designed for students, educators, researchers, consultants and practicing managers in business, industry, and government with a basic understanding of the DEA and fuzzy logic concepts.

Data Envelopment Analysis

Improving Service Performance using Data Envelopment Analysis (DEA)

Handbook of Operations Analytics Using Data Envelopment Analysis

Research Methodology on Data Envelopment Analysis (DEA)

A Handbook of Models and Methods

A Tool for Performance Measurement

CD-ROM contains: DEA-Solver and sample problems -- Comprehensive bibliography.

Data Envelopment Analysis is one of the paramount mathematical methods to compute the general performance of organizations, which utilizes similar sources to produce similar outputs. Original DEA schemes involve crisp information of inputs and outputs that may not always be accessible in real-world applications. Nevertheless, in some cases, the values of the data are information with indeterminacy, impreciseness, vagueness, inconsistent, and incompleteness. Furthermore, the conventional DEA models have been originally formulated solely for desirable outputs. However, undesirable outputs may additionally be present in the manufacturing system, which wishes to be minimized. To tackle the mentioned issues and in order to obtain a reliable measurement that keeps original advantage of DEA and considers the influence of undesirable factors under the indeterminate environments, this paper presents a neutrosophic DEA model with undesirable outputs. This book presents the underlying theory, model development, and applications of network Data Envelopment Analysis (DEA) in a systematic way. The field of network DEA extends and complements conventional DEA by considering not only inputs and outputs when measuring system efficiency, but also the internal structure of the system being analyzed. By analyzing the efficiency of individual internal components, and more particularly by studying the effects of relationships among components which are modeled and implemented by means of various network structures, the "network DEA" approach is able to help identify and manage the specific components that contribute inefficiencies into the overall systems. This relatively new approach comprises an important analytical tool based on mathematical programming techniques, with valuable implications to production and operations management. The existing models for measuring the efficiency of systems of specific network structures are also discussed, and the relationships between the system and component efficiencies are explored. This book should be able to inspire new research and new applications based on the current state of the art. Performance evaluation is an important task in management, and is needed to (i) better understand the past accomplishments of an organization and (ii) plan for its future development. However, this task becomes rather challenging when multiple performance metrics are involved. DEA is a powerful tool to cope with such issues. For systems or operations

composed of interrelated processes, managers need to know how the performances of the various processes evaluated and how they are aggregated to form the overall performance of the system. This book provides an advanced exposition on performance evaluation of systems with network structures. It explores the network nature of most production and operation systems, and explains why network analyses are necessary.

Data Envelopment Analysis (DEA) represents a milestone in the progression of a continuously advancing methodology for data analysis, which finds extensive use in industry, society and even in education. This book is a handy encyclopedia for researchers, students and practitioners looking for the latest and most comprehensive references in DEA. J.K. Mantri has specifically selected 22 research papers where DEA is applied in different fields so that the techniques discussed in this book can be used for various applications. In A Bibliography of Data Envelopment Analysis (1978-2001), Gabriel Tavares states that DEA is a mathematical programme for measuring performance efficiency of organizations popularly named as decision-making units (DMU). The DMU can be of any kind such as manufacturing units, a number of schools, banks, hospitals, police stations, firms, etc. DEA measures the performance efficiency of these kinds of DMUs, which share a common characteristic: they have a non-profit organization where measurement is difficult. DEA assumes the performance of the DMU using the concepts of efficiency and productivity, which are measured as the ratio of total outputs to total inputs. The efficiencies estimated are relative to the best performing DMU, which is given a score of 100%. The performance of other DMUs varies between 0% and 100%. Quantitative Modelling in Marketing and Management (second Edition)

Foundations and Extensions

Service Productivity Management

With DEA-Solver Software and References

Extension of Data Envelopment Analysis with Preference Information

Data envelopment analysis (DEA), a non-parametric technique, has emerged as a popular management tool for measuring the performance of a set of entities, known as decision making units. This book, Data Envelopment Analysis and Its Applications to Management, is a collection of contributions from DEA experts from various countries. It covers a wide range of research papers from the theoretical development of DEA to its applications in various sectors such as economy, banking, education, revenue management, sports, branch networks, cities, and live stock production systems. The book

is useful for researchers as well as practitioners who intend to apply DEA to their strategic and managerial decisions.

This book presents the methodology and applications of Data Envelopment Analysis (DEA) in measuring productivity, efficiency and effectiveness in Financial Services firms such as banks, bank branches, stock markets, pension funds, mutual funds, insurance firms, credit unions, risk tolerance, and corporate failure prediction. Financial service DEA research includes banking; insurance businesses; hedge, pension and mutual funds; and credit unions. Significant business transactions among financial service organizations such as bank mergers and acquisitions and valuation of IPOs have also been the focus of DEA research. The book looks at the range of DEA uses for financial services by presenting prior studies, examining the current capabilities reflected in the most recent research, and projecting future new uses of DEA in finance related applications.

This new edition continues to emphasize the use of data envelopment analysis (DEA) to create optimization-based benchmarks within hospitals, physician group practices, health maintenance organizations, nursing homes and other health care delivery organizations. Suitable for graduate students learning DEA applications in health care as well as for practicing administrators, it is divided into two sections covering methods and applications.

Section I considers efficiency evaluations using DEA; returns to scale; weight restricted (multiplier) models; non-oriented or slack-based models, including in this edition two versions of non-controllable variable models and categorical variable models; longitudinal (panel) evaluations and the effectiveness dimension of performance evaluation. A new chapter then looks at new and advanced models of DEA, including super-efficiency, congestion DEA, network DEA, and dynamic network models. Mathematical formulations of various DEA models are placed in end-of-chapter appendices. Section II then looks at health care applications within particular settings, chapter-by-chapter, including hospitals, physician practices, nursing homes and health maintenance organizations (HMOs). Other chapters then explore home health care and home health agencies; dialysis centers, community mental health centers, community-based your services, organ procurement organizations, aging agencies and dental providers; DEA models to evaluate provider performance for specific treatments, including stroke, mechanical ventilation and perioperative services. A new chapter then examines international-country-based applications of DEA in health care in 16 different countries, along with OECD and multi-country studies. Most of the existing chapters in this

section were expanded with recent applications. Included with the book is online access to a learning version of DEA Solver software, written by Professor Kaoru Tone, which can solve up to 50 DMUs for various DEA models listed in the User's Guide at the end of the book. 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.

Efficiency Models in Data Envelopment Analysis

Multi-Objective Programming and Goal Programming

Data Mining, Data Envelopment Analysis, Value Focused Thinking

Health Care Benchmarking and Performance Evaluation

A Comprehensive Text with Models, Applications, References and DEA-Solver Software

Handbook on Data Envelopment Analysis

For any organization, analysis of performance and effectiveness through available data allows for informed decision making. Data envelopment analysis, or DEA, is a popular, effective method that can be used to measure productive efficiency in operations management assessment. Data Envelopment Analysis and Effective Performance Assessment addresses the myriad of practical uses and innovative developments of DEA. Emphasizing the importance of analyzing productivity by measuring inputs, goals, economic growth, and performance, this book covers a wide breadth of innovative knowledge. This book is essential reading for managers, business professionals, students of business and ICT, and computer engineers. The current book introduces the methodology of data envelopment analysis (DEA). DEA uses mathematical programming techniques and models to evaluate the performance of peer units (e.g., bank branches, hospitals and schools) in terms of multiple inputs used and multiple outputs produced. DEA examines the resources available to each unit and monitors the "conversion" of these resources (inputs) into the desired outputs. The book gives an overview of the various models from the literature, and the geometric interpretations provided permit the reader to go beyond the mathematics. Various topics are covered relating to important practical considerations. These include dealing with time series data as well as methods for

restricting multipliers. The book will thus provide students, researchers and practitioners with a solid understanding of the methodology, its uses and its potential.

1 DATA ENVELOPMENT ANALYSIS Data Envelopment Analysis (DEA) was initially developed as a method for assessing the comparative efficiencies of organisational units such as the branches of a bank, schools, hospital departments or restaurants. The key in each case is that they perform feature which makes the units comparable the same function in terms of the kinds of resource they use and the types of output they produce. For example all bank branches to be compared would typically use staff and capital assets to effect income generating activities such as advancing loans, selling financial products and carrying out banking transactions on behalf of their clients. The efficiencies assessed in this context by DEA are intended to reflect the scope for resource conservation at the unit being assessed without detriment to its outputs, or alternatively, the scope for output augmentation without additional resources. The efficiencies assessed are comparative or relative because they reflect scope for resource conservation or output augmentation at one unit relative to other comparable benchmark units rather than in some absolute sense. We resort to relative rather than absolute efficiencies because in most practical contexts we lack sufficient information to derive the superior measures of absolute efficiency. DEA was initiated by Charnes Cooper and Rhodes in 1978 in their seminal paper Charnes et al. (1978). The paper operationalised and extended by means of linear programming production economics concepts of empirical efficiency put forth some twenty years earlier by Farrell (1957).

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.

Theory and Applications

Performance Measurement with Fuzzy Data Envelopment Analysis

An Assessment using Data Envelopment Analysis (DEA)

Introduction to the Theory and Application of Data Envelopment Analysis

Modeling Data Irregularities and Structural Complexities in Data Envelopment Analysis

Techniques of Evaluation of Productivity of Firms in a Growing Economy

"The field of marketing and management has undergone immense

changes over the past decade. These dynamic changes are driving an increasing need for data analysis using quantitative modelling. Problem solving using the quantitative approach and other models has always been a hot topic in the fields of marketing and management. Quantitative modelling seems admirably suited to help managers in their strategic decision making on operations management issues. In social sciences, quantitative research refers to the systematic empirical investigation of social phenomena via statistical, mathematical or computational techniques. The first edition of "Quantitative Modelling in Marketing and Management" focused on the description and applications of many quantitative modelling approaches applied to marketing and management. The topics ranged from fuzzy logic and logical discriminant models to growth models and k-clique models. The second edition follows the thread of the first one by covering a myriad of techniques and applications in the areas of statistical, computer, mathematical as well as other novel nomothetic methods. It greatly reinforces the areas of computer, mathematical and other modeling tools that are designed to bring a level of awareness and knowledge among academics and researchers in marketing and management, so that there is an increase in the application of these new approaches that will be embedded in future scholarly output."--

This volume constitutes the proceedings of the Fifth International Conference on Multi-Objective Programming and Goal Programming: Theory & Applications (MOPGP'02) held in Nara, Japan on June 4-7, 2002. Eighty-two people from 16 countries attended the conference and 78 papers (including 9 plenary talks) were presented. MOPGP is an international conference within which researchers and practitioners can meet and learn from each other about the recent development in multi-objective programming and goal programming. The participants are from different disciplines such as Optimization, Operations Research, Mathematical Programming and Multi-Criteria Decision Aid, whose common interest is in multi-objective analysis. The first MOPGP Conference was held at Portsmouth, United Kingdom, in 1994. The subsequent conferences were held at Torremolinos, Spain in 1996, at Quebec City, Canada in 1998, and at Katowice, Poland in 2000. The fifth conference was held at Nara, which was the capital of Japan for more than seventy years in the eighth century. During this Nara period the basis of Japanese society, or culture established itself. Nara is a beautiful place and has a number of historic monuments in the World Heritage List. The members of the International Committee of MOPGP'02 were Dylan Jones, Pekka Korhonen, Carlos Romero, Ralph Steuer and Mehrdad Tamiz. The author is one of the prominent researchers in the field of

Data Envelopment Analysis (DEA), a powerful data analysis tool that can be used in performance evaluation and benchmarking. This book is based upon the author's years of research and teaching experiences. It is difficult to evaluate an organization's performance when multiple performance metrics are present. The difficulties are further enhanced when the relationships among the performance metrics are complex and involve unknown tradeoffs. This book introduces Data Envelopment Analysis (DEA) as a multiple-measure performance evaluation and benchmarking tool. The focus of performance evaluation and benchmarking is shifted from characterizing performance in terms of single measures to evaluating performance as a multidimensional systems perspective. Conventional and new DEA approaches are presented and discussed using Excel spreadsheets — one of the most effective ways to analyze and evaluate decision alternatives. The user can easily develop and customize new DEA models based upon these spreadsheets. DEA models and approaches are presented to deal with performance evaluation problems in a variety of contexts. For example, a context-dependent DEA measures the relative attractiveness of similar operations/processes/products. Sensitivity analysis techniques can be easily applied, and used to identify critical performance measures. Two-stage network efficiency models can be utilized to study performance of supply chain. DEA benchmarking models extend DEA's ability in performance evaluation. Various cross efficiency approaches are presented to provide peer evaluation scores. This book also provides an easy-to-use DEA software — DEAFrontier. This DEAFrontier is an Add-In for Microsoft® Excel and provides a custom menu of DEA approaches. This version of DEAFrontier is for use with Excel 97-2013 under Windows and can solve up to 50 DMUs, subject to the capacity of Excel Solver. It is an extremely powerful tool that can assist decision-makers in benchmarking and analyzing complex operational performance issues in manufacturing organizations as well as evaluating processes in banking, retail, franchising, health care, public services and many other industries.

The current book introduces the methodology of data envelopment analysis (DEA). DEA uses mathematical programming techniques and models to evaluate the performance of peer units (e.g., bank branches, hospitals and schools) in terms of multiple performance measures or metrics. These multiple performance measures are classified or coined as DEA inputs and DEA outputs. Although DEA has a strong link to production theory in economics, the tool is also used for benchmarking in operations management, where a set of measures is selected to benchmark the performance of manufacturing and service operations. In the

circumstance of benchmarking, the efficient DMUs, as defined by DEA, may not necessarily form a "production frontier", but rather lead to a "best-practice frontier". DEA's empirical orientation and absence of a priori assumptions have resulted in its use in a number of studies involving efficient or best-practice frontier estimation in the nonprofit, regulated, and private sectors. DEA applications involve a wide range of contexts, such as education, health care, banking, armed forces, auditing, market research, retail outlets, organization effectiveness, transportation, public housing, and manufacturing. DEA is a balanced benchmarking tool that will help organizations to examine their assumptions about their productivity and performance. The book provides students, researchers, and practitioners with a solid understanding of the methodology, its uses and potentials in business analytics. The Measurement of Productive Efficiency and Productivity Growth Introduction to Data Envelopment Analysis and Its Uses Theory and Techniques for Economics and Operations Research An Introduction to Data Envelopment Analysis New Efficiency Theory

Advances in Research Methods for Information Systems Research

Using the neo-classical theory of production economics as the analytical framework, this book, first published in 2004, provides a unified and easily comprehensible, yet fairly rigorous, exposition of the core literature on data envelopment analysis (DEA) for readers based in different disciplines. The various DEA models are developed as nonparametric alternatives to the econometric models. Apart from the standard fare consisting of the basic input- and output-oriented DEA models formulated by Charnes, Cooper, and Rhodes, and Banker, Charnes, and Cooper, the book covers developments such as the directional distance function, free disposal hull (FDH) analysis, non-radial measures of efficiency, multiplier bounds, mergers and break-up of firms, and measurement of productivity change through the Malmquist total factor productivity index. The chapter on efficiency measurement using market prices provides the critical link between DEA and the neo-classical theory of a competitive firm. The book also covers several forms of stochastic DEA in detail.

This handbook focuses on Data Envelopment Analysis (DEA) applications in operations analytics which are fundamental tools and techniques for improving operation functions and attaining long-term competitiveness. In fact, the handbook demonstrates that DEA can be viewed as Data Envelopment Analytics. Chapters include a review of cross-efficiency evaluation; a case study on measuring the environmental performance of OECS countries; how to select a set of performance metrics in DEA with an application to American banks; a relational network model to take the operations of individual periods into account in measuring efficiencies; how the efficient frontier methods DEA and stochastic frontier analysis (SFA)

can be used synergistically; and how to integrate DEA and multidimensional scaling. In other chapters, authors construct a dynamic three-stage network DEA model; a bootstrapping based methodology to evaluate returns to scale and convexity assumptions in DEA; hybridizing DEA and cooperative games; using DEA to represent the production technology and directional distance functions to measure band performance; an input-specific Luenberger energy and environmental productivity indicator; and the issue of reference set by differentiating between the uniquely found reference set and the unary and maximal types of the reference set. Finally, additional chapters evaluate and compare the technological advancement observed in different hybrid electric vehicles (HEV) market segments over the past 15 years; radial measurement of efficiency for the production process possessing multi-components under different production technologies; issues around the use of accounting information in DEA; how to use DEA environmental assessment to establish corporate sustainability; a summary of research efforts on DEA environmental assessment applied to energy in the last 30 years; and an overview of DEA and how it can be utilized alone and with other techniques to investigate corporate environmental sustainability questions. Most environmental data involve a large degree of complexity and uncertainty. Environmental Data Analysis is created to provide modern quantitative tools and techniques designed specifically to meet the needs of environmental sciences and related fields. This book has an impressive coverage of the scope. Main techniques described in this book are models for linear and nonlinear environmental systems, statistical & numerical methods, data envelopment analysis, risk assessments and life cycle assessments. These state-of-the-art techniques have attracted significant attention over the past decades in environmental monitoring, modeling and decision making. Environmental Data Analysis explains carefully various data analysis procedures and techniques in a clear, concise, and straightforward language and is written in a self-contained way that is accessible to researchers and advanced students in science and engineering. This is an excellent reference for scientists and engineers who wish to analyze, interpret and model data from various sources, and is also an ideal graduate-level textbook for courses in environmental sciences and related fields. Contents: Preface Time series analysis Chaos and dynamical systems Approximation Interpolation Statistical methods Numerical methods Optimization Data envelopment analysis Risk assessments Life cycle assessments Index

This handbook represents a milestone in the progression of Data Envelopment Analysis (DEA). Written by experts who are often major contributors to DEA theory, it includes a collection of chapters that represent the current state-of-the-art in DEA research. Topics include distance functions and their value duals, cross-efficiency measures in DEA, integer DEA, weight restrictions and production trade-offs, facet analysis in DEA, scale elasticity, benchmarking and context-dependent DEA, fuzzy DEA,

non-homogenous units, partial input-output relations, super efficiency, treatment of undesirable measures, translation invariance, stochastic nonparametric envelopment of data, and global frontier index. Focusing only on new models/approaches of DEA, the book includes contributions from Juan Aparicio, Mette Asmild, Yao Chen, Wade D. Cook, Juan Du, Rolf Färe, Julie Harrison, Raha Imanirad, Andrew Johnson, Chiang Kao, Abolfazl Keshvari, Timo Kuosmanen, Sungmook Lim, Wenbin Liu, Dimitri Margaritis, Reza Kazemi Matin, Ole B. Olesen, Jesus T. Pastor, Niels Chr. Petersen, Victor V. Podinovski, Paul Rouse, Antti Saastamoinen, Biresh K. Sahoo, Kaoru Tone, and Zhongbao Zhou.

***Quantitative Models for Performance Evaluation and Benchmarking
Data envelopment analysis based on triangular neutrosophic numbers
Methods and Applications***

Data Envelopment Analysis: Balanced Benchmarking

Data Envelopment Analysis in the Service Sector

Modeling Operational Processes and Measuring Productivity

This book offers new transparent views and step-by-step methods for performance evaluation of a set of units using Data Envelopment Analysis (DEA). The book has twelve practical chapters. Elementary concepts and definitions are gradually built in Chapters 1-6 based upon four examples of one input and one output factors, two input factors, two output factors, and four input and three output factors. Simultaneously, the mathematical foundations using linear programming are also introduced without any prerequisites. A reader with basic knowledge of mathematics and computers is able to understand the contents of the book. In addition, to prevent pre-judgment about the available concepts and definitions in the DEA literature, some new phrases are introduced and, after elucidating each phrase in detail in Chapters 1-6, they are reintroduced for industry-wide accuracy in Chapter 7. After that, some of the more advanced DEA topics are illustrated in Chapters 8-12, such as: production-planning problems, output-input ratio analysis, efficiency over different time periods, Malmquist efficiency indexes, and a delta neighborhood model. A clear overview of many of the elementary and advanced concepts of DEA is provided, including Technical Efficiency, Relative Efficiency, Cost/Revenue/Profit Efficiency, Price/Overall Efficiency, the DEA axioms, the mathematical background to measure technical efficiency and overall efficiency, the multiplier/envelopment form of basic DEA models in input/output-orientation, the multiplier/envelopment of Additive DEA model, the multiplier/envelopment of slacks-based models, and others. The book also covers a variety of DEA techniques, input-output ratio analysis, the natural relationships between DEA frontier and the ratio of output to input factors, production-planning problems, planning ideas with a centralized decision-making unit, context-dependent DEA, Malmquist efficiency index, efficiency over different time periods, and others. End-of-chapter exercises are provided for each chapter.

Data Envelopment Analysis A Handbook of Models and Methods Springer

Here is an in-depth guide to the most powerful available benchmarking technique for improving service organization performance — Data Envelopment Analysis (DEA). The book outlines DEA as a benchmarking technique, identifies high cost service units, isolates specific changes for elevating performance to the best practice services level providing high quality service at low cost and most important, it guides the improvement process.

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.

Network Data Envelopment Analysis

Data Envelopment Analysis and Effective Performance Assessment

Data Envelopment Analysis Methods in the Management of Personnel Recruitment Under Competition in the Context of U.S. Army Recruiting

A Comprehensive Text With Models, Applications, References and Dea-Solver Software

Data Envelopment Analysis and Its Applications to Management

Productivity of Cities

This handbook covers DEA topics that are extensively used and solidly based. The purpose of the handbook is to (1) describe and elucidate the state of the field and (2), where appropriate, extend the frontier of DEA research. It defines the state-of-the-art of DEA methodology and its uses. This handbook is intended to represent a milestone in the progression of DEA. Written by experts, who are generally major contributors to the topics to be covered, it includes a comprehensive review and discussion of basic DEA models, which, in the present issue extensions to the basic DEA methods, and a collection of DEA applications in the areas of banking, engineering, health care, and services. The handbook's chapters are organized into two categories: (i) basic DEA models, concepts, and their extensions, and (ii) DEA applications. First edition contributors have returned to update their work. The second edition includes updated versions of selected first edition chapters. New chapters have been added on: different approaches with no need for a priori choices of weights (called "multipliers) that reflect meaningful trade-offs, construction of static and dynamic DEA technologies, slacks-based model and its extensions, DEA models for DMUs that have internal structures network DEA that can be used for measuring supply chain operations, Selection of DEA applications in the service sector with a focus on building a conceptual framework, research design and interpreting results.

Advances in social science research methodologies and data analytic methods are changing the way research in information systems is conducted. New developments in statistical software technologies for data mining (DM) such as regression splines or decision tree induction can be used to assist researchers in systematic post-positivist theory testing and development. Established management science techniques like data envelopment analysis (DEA), and value focused thinking (VFT) can be used in combination with traditional statistical analysis and data mining techniques to more effectively explore behavioral questions in information systems research. As adoption and use of these research methods expand, there is growing need for a resource book to assist doctoral students and advanced researchers in understanding their potential to contribute to a broad range of research problems. Advances in Research Methods for Information Systems Research: Data Mining, Data Envelopment Analysis, Value Focused Thinking focuses on bridging and unifying these three different methodologies in order to bring them together in a unified volume for the information systems community. This book serves as a resource that provides overviews on each method, as well as applications on how they can be employed

to address IS research problems. Its goal is to help researchers in their continuous efforts to set the pace for having an appropriate interplay between behavioral research and design science.

From the Foreword: 'This book is an excellent tool for practitioners who are interested in the merits and pitfalls of the technique.... (The author's) research is an example of inventiveness, diligence and accuracy' - Freerk A. Lootsma, Delft Institute of Technology

Data envelopment Analysis is a Mathematical Programme for measuring performance efficiency of organizational units. The organizational units, termed as decision-making units (DMU) can be of any kind: manufacturing units, a set of schools, banks, hospitals, power plants, police stations, prisons, a set of firms etc. DEA has been unsuccessfully applied to measure the performance efficiency of these different kinds of DMUs which share a common characteristic - that they are non-profit organization where measurement of performance efficiency is difficult. DEA has been employed for assessing the relative performance of a set of firms that use a variety of identical inputs-say in the case of a school: quality of students, teachers, grants etc.,-to produce a variety of identical outputs-number of students who pass the final year, average grades obtained by the students in the final year etc. DEA assumes the performance of the DMUs by using the concepts of efficiency or productivity which is measured as the ratio of total outputs to total inputs. Also, the efficiencies estimated are relative to the best performing DMU or DMUs. The best performing DMU is given a score of 100% and the performance of other DMUs vary between 0 -100%. New efficiency theory refers to the various parametric and semi-parametric methods of estimating production and cost frontiers, which include data envelopment analysis (DEA) with its diverse applications in management science and operations research. This monograph develops and generalizes the new efficiency theory by highlighting the interface between economic theory and operations research. Some of the outstanding features of this monograph are: (1) integrating the theory of firm efficiency and industry equilibrium, (2) emphasizing growth efficiency in a dynamic setting, (3) incorporating uncertainty of market demand and prices, and (4) the implications of group efficiency by sharing investments. Applications discuss in some detail the growth and decline of the US computer industry, and the relative performance of mutual fund portfolios.

Value Efficiency

With Applications in the Ph.D. Programs in the United States and the Higher Educations Institutions in China

Decision Making and Performance Evaluation Using Data Envelopment Analysis

Measuring the Impact of National Advertising on Recruiting by Data Envelopment Analysis Methods

Data Envelopment Analysis in the Financial Services Industry

With Applications of Data Envelopment Analysis

This book represents a milestone in the progression of Data Envelopment Analysis (DEA). It is the first reference text which includes a comprehensive review and comparative discussion of the basic DEA models. The development is anchored in a unified mathematical and graphical treatment and includes the most important modeling extensions. In addition, this is the first book that addresses the actual process of conducting DEA analyses including combining DEA and 1 parametric techniques. The book has three other distinctive features. It traces the applications driven evolution and diffusion of DEA models and

extensions across disciplinary boundaries. It includes a comprehensive bibliography to serve as a source of references as well as a platform for further developments. And, finally, the power of DEA analysis is demonstrated through fifteen novel applications which should serve as an inspiration for future applications and extensions of the methodology. The origin of this book was a Conference on New Uses of DEA in 2 Management and Public Policy which was held at the IC Institute of the University of Texas at Austin on September 27-29, 1989. The conference was made possible through NSF Grant #SES-8722504 (A. Charnes and 2 W. W. Cooper, co-PIs) and the support of the IC Institute.

The book aims to introduce the reader to DEA in the most accessible manner possible. It is specifically aimed at those who have had no prior exposure to DEA and wish to learn its essentials, how it works, its key uses, and the mechanics of using it. The latter will include using DEA software. Students on degree or training courses will find the book especially helpful. The same is true of practitioners engaging in comparative efficiency assessments and performance management within their organisation. Examples are used throughout the book to help the reader consolidate the concepts covered.

**A Neutrosophic-Based Approach in Data Envelopment Analysis with Undesirable Outputs
Environmental Data Analysis**