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HANDBOOK ON DATA ENVELOPMENT ANALYSIS

edited by
William W. Cooper
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Joe Zhu

Handbook On Data Envelopment Analysis International Series In Operations Research Management Science

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Handbook On Data Envelopment Analysis International Series In Operations Research Management Science:

Handbook on Data Envelopment Analysis William W. Cooper, Lawrence M. Seiford, Joe Zhu, 2011-08-23 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.

Handbook on Data Envelopment Analysis William W. Cooper, Lawrence M. Seiford, Joe Zhu, 2004-03-31 This Handbook has been developed as a comprehensive reference for researchers, students and practitioners. It reflects the state of the art in Data Envelopment Analysis. It also represents a milestone in the progression of a continuously advancing methodology which has extensive utility. Written by experts who are the major research contributors to the topics covered, the Handbook is organized in three sections. The first section is a comprehensive examination of the basic DEA models and DEA extensions. The second section consists of a collection of coverages by persons experienced in applications to the areas of banking, education, sports, retailing, health care, etc. The final section is a review of current DEA software technology.

Handbook of Operations Analytics Using Data Envelopment Analysis Shiuh-Nan Hwang, Hsuan-Shih Lee, Joe Zhu, 2016-07-01 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 OECD 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 bank 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

Handbook On Data Envelopment Analysis In Business, Finance, And Sustainability: Recent Trends And Developments Sabri Boubaker, Thanh Ngo, 2024-07-26 This Handbook presents recent trends and new developments in Data Envelopment Analysis DEA research within the realms of business finance and sustainability Divided into three distinct parts it encompasses 19 chapters that offer insightful studies conducted in diverse national environments and organizational settings Part I focuses on DEA applications in business including healthcare supply chain management and governmental organizations Part II delves into the application of DEA in banking and finance providing valuable insights into the efficiency and performance of financial institutions Part III explores DEA s diverse applications in sustainability addressing topics such as sustainability indicators resource mobilization food production and farming In essence this Handbook stands as an invaluable reference work for stakeholders seeking to optimize organizational efficiency and performance across a variety of sectors

Data Envelopment Analysis with R Farhad Hosseinzadeh Lotfi, Ali Ebrahimnejad, Mohsen Vaez-Ghasemi, Zohreh Moghaddas, 2019-07-23 This book introduces readers to the use of R codes for optimization problems First it provides the necessary background to understand data envelopment analysis DEA with a special emphasis on fuzzy DEA It then describes DEA models including fuzzy DEA models and shows how to use them to solve optimization problems with R Further it discusses the main advantages of R in optimization problems and provides R codes based on real world data sets throughout Offering a comprehensive review of DEA and fuzzy DEA models and the corresponding R codes this practice oriented reference guide is intended for masters and Ph D students in various disciplines as well as practitioners and researchers

Research Methodology on Data Envelopment Analysis (DEA) Jibendu Kumar Mantri, 2008 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%. *Handbook of Research on Strategic Performance Management and Measurement Using Data Envelopment Analysis* Osman, Ibrahim H., Anouze, Abdel Latef, Emrouznejad, Ali, 2013-08-31

Organizations can use the valuable tool of data envelopment analysis (DEA) to make informed decisions on developing successful strategies, setting specific goals and identifying underperforming activities to improve the output or outcome of performance measurement. The *Handbook of Research on Strategic Performance Management and Measurement Using Data Envelopment Analysis* highlights the advantages of using DEA as a tool to improve business performance and identify sources of inefficiency in public and private organizations. These recently developed theories and applications of DEA will be useful for policymakers, managers and practitioners in the areas of sustainable development of our society including environment, agriculture, finance and higher education sectors. **Data Envelopment Analysis** Joe Zhu, 2015-03-18

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 F. Färe, Julie Harrison, Raha Imanirad, Andrew Johnson, Chiang Kao, Abolfazl Keshvari, Timo Kuosmanen, Sungmook Lim, Wenbin Liu, Dimitri Margaritis, Reza Kazemi, Martin Ole B. Olesen, Jesus T. Pastor, Niels Chr. Petersen, Victor V. Podinovski, Paul Rouse, Antti Saastamoinen, Biresh K. Sahoo, Kaoru Tone and Zhongbao Zhou. *Navigating the Technological Tide: The Evolution and Challenges of Business Model Innovation* Bahaaeddin Alareeni, Allam Hamdan, 2024-07-31

In an era defined by technological breakthroughs such as AI, blockchain and IoT, this book offers a fresh and practical approach to Business Model Innovation (BMI). It delves into how technological advancements drive new business models and enhance operational efficiency, providing actionable insights and real-world examples for business leaders, strategists, operations managers, entrepreneurs and students in business and technology disciplines. Encouraging diverse research methods including theoretical, empirical and multimethod studies, it

welcomes manuscripts with clear managerial or policy implications Aimed at students scholars researchers professionals executives government agencies and policymakers this book equips readers with tools to succeed in today s dynamic business environment and supports multidisciplinary research to advance innovation management practices

Data Envelopment Analysis Wade D. Cook, Joe Zhu, 2014-07-08 This handbook serves as a complement to the Handbook on Data Envelopment Analysis eds W W Cooper L M Seiford and J Zhu 2011 Springer in an effort to extend the frontier of DEA research It provides a comprehensive source for the state of the art DEA modeling on internal structures and network DEA Chapter 1 provides a survey on two stage network performance decomposition and modeling techniques Chapter 2 discusses the pitfalls in network DEA modeling Chapter 3 discusses efficiency decompositions in network DEA under three types of structures namely series parallel and dynamic Chapter 4 studies the determination of the network DEA frontier In chapter 5 additive efficiency decomposition in network DEA is discussed An approach in scale efficiency measurement in two stage networks is presented in chapter 6 Chapter 7 further discusses the scale efficiency decomposition in two stage networks Chapter 8 offers a bargaining game approach to modeling two stage networks Chapter 9 studies shared resources and efficiency decomposition in two stage networks Chapter 10 introduces an approach to computing the technical efficiency scores for a dynamic production network and its sub processes Chapter 11 presents a slacks based network DEA Chapter 12 discusses a DEA modeling technique for a two stage network process where the inputs of the second stage include both the outputs from the first stage and additional inputs to the second stage Chapter 13 presents an efficiency measurement methodology for multi stage production systems Chapter 14 discusses network DEA models both static and dynamic The discussion also explores various useful objective functions that can be applied to the models to find the optimal allocation of resources for processes within the black box that are normally invisible to DEA Chapter 15 provides a comprehensive review of various type network DEA modeling techniques Chapter 16 presents shared resources models for deriving aggregate measures of bank branch performance with accompanying component measures that make up that aggregate value Chapter 17 examines a set of manufacturing plants operating under a single umbrella with the objective being to use the component or function measures to decide what might be considered as each plant s core business Chapter 18 considers problem settings where there may be clusters or groups of DMUs that form a hierarchy The specific case of a set off electric power plants is examined in this context Chapter 19 models bad outputs in two stage network DEA Chapter 20 presents an application of network DEA to performance measurement of Major League Baseball MLB teams Chapter 21 presents an application of a two stage network DEA model for examining the performance of 30 U S airline companies Chapter 22 then presents two distinct network efficiency models that are applied to engineering systems

Data Envelopment Analysis Joe Zhu, 2016-03-22 This handbook compiles state of the art empirical studies and applications using Data Envelopment Analysis DEA It includes a collection of 18 chapters written by DEA experts Chapter 1 examines the performance of CEOs of

U S banks and thrifts Chapter 2 describes the network operational structure of transportation organizations and the relative network data envelopment analysis model Chapter 3 demonstrates how to use different types of DEA models to compute total factor energy efficiency scores with an application to energy efficiency In chapter 4 the authors explore the impact of incorporating customers willingness to pay for service quality in benchmarking models on cost efficiency of distribution networks and chapter 5 provides a brief review of previous applications of DEA to the professional baseball industry followed by two detailed applications to Major League Baseball Chapter 6 examines efficiency and productivity of U S property liability P L insurers using DEA while chapter 7 presents a two stage network DEA model that decomposes the overall efficiency of a decision making unit into two components Chapter 8 presents a review of the literature of DEA models for the performance assessment of mutual funds and chapter 9 discusses the management strategies formulation of the international tourist hotel industry in Taiwan Chapter 10 presents a novel use of the two stage network DEA to evaluate sustainable product design performances In chapter 11 authors highlight limitations of some DEA environmental efficiency models and chapter 12 reviews applications of DEA in secondary and tertiary education Chapter 13 measures the relative performance of New York State school districts in the 2011 2012 academic year Chapter 14 provides an introductory prelude to chapters 15 and 16 which both provide detailed applications of DEA in marketing Chapter 17 then shows how to decompose a new total factor productivity index that satisfies all economically relevant axioms from index theory with an application to U S agriculture Finally chapter 18 presents a unique study that conducts a DEA research front analysis applying a network clustering method to group the DEA literature over the period 2000 to 2014

Just-in-Time Scheduling Joanna Jozefowska, 2007-07-19 Just in Time Scheduling Models and Algorithms for Real Time Operating Systems is the first expository treatment surveying the theoretical work on computer systems models and algorithms utilized in just in time scheduling With the impact of globalization and supply chains on manufacturing there are immense amounts of material flowing through supply chains at any given time worldwide Therefore the scheduling of all the stages of material arriving at different geographical points at precise times is a highly significant problem Moreover the theoretical work in this area has larger ramifications for operational scheduling in many application areas The scheduling models and algorithms presented and illustrated in the book will be done so in the context of extensive use of computer systems in a real time context The book will survey and synthesize all the research in this topical area

Stochastic Linear Programming Peter Kall, János Mayer, 2005

CONTENIDO Basic Linear Programming Prerequisites Nonlinear Programming Prerequisites Single Stage SLP models Models involving probability functions Quantile functions Value at Risk Models based on expectation Models built with deviation measures Modeling risk and opportunity Risk measures Multi stage SLP models The general SLP with recourse The two stage SLP The multi stage SLP Algorithms Single stage models with separate probability functions Single stage models with joint probability functions Single stage models based on expectation Single stage models involving VaR

Single stage models with deviation measures Two stage recourse models Multistage recourse models Modeling systems for SLP

Health Care Benchmarking and Performance Evaluation Yasar A. Ozcan, 2007-12-08 Hugely relevant in today's world of healthcare performance management this comprehensive work applies the analytical framework of Data Envelopment Analysis methodology to provide health care administrators with specific tools for performance evaluation Most important the book provides health care practitioners and administrators with information of what is lacking in specific aspects of performance and then outlines the ways how these performance inadequacies can be improved

Handbook of Quantitative Supply Chain Analysis David Simchi-Levi, S. David Wu, Zuo-Jun Max Shen, 2004-05-31 About quantitative supply chain analysis in the electronic business environment

Foreign-Exchange-Rate Forecasting with Artificial Neural Networks Lean Yu, Shouyang Wang, Kin Keung Lai, 2007-08-02 The book focuses on forecasting foreign exchange rates via artificial neural networks It creates and applies the highly useful computational techniques of Artificial Neural Networks ANNs to foreign exchange rate forecasting The result is an up to date review of the most recent research developments in forecasting foreign exchange rates coupled with a highly useful methodological approach to predicting rate changes in foreign currency exchanges Foreign Exchange Rate Forecasting with Artificial Neural Networks is targeted at both the academic and practitioner audiences Managers analysts and technical practitioners in financial institutions across the world will have considerable interest in the book and scholars and graduate students studying financial markets and business forecast will also have considerable interest in the book The book discusses the most important advances in foreign exchange rate forecasting and then systematically develops a number of new innovative and creatively crafted neural network models that reduce the volatility and speculative risk in the forecasting of foreign exchange rates The book discusses and illustrates three general types of ANN models Each of these model types reflect the following innovative and effective characteristics

- 1 The first model type is a three layer feed forward neural network with instantaneous learning rates and adaptive momentum factors that produce learning algorithms both online and offline algorithms to predict foreign exchange rates
- 2 The second model type is the three innovative hybrid learning algorithms that have been created by combining ANNs with exponential smoothing generalized linear auto regression and genetic algorithms Each of these three hybrid algorithms has been crafted to forecast various aspects synergetic performance
- 3 The third model type is the three innovative ensemble learning algorithms that combining multiple neural networks into an ensemble output Empirical results reveal that these creative models can produce better performance with high accuracy or high efficiency

Network Data Envelopment Analysis Chiang Kao, 2023-07-24 This second edition systematically presents the underlying theory model development and applications of network Data Envelopment Analysis DEA It discusses the models used to measure the efficiency of systems in specific network structures and introduces readers to the latest applications It demonstrates how the network DEA approach helps identify and manage the specific components that cause inefficiencies in the overall system The existing models for

measuring the efficiency of systems in specific network structures are also discussed and the relationships between system efficiency and component efficiency are explored. Moreover, the book provides an advanced exposition on performance evaluation of systems with network structures. It explores the networked nature of most production and operation systems and explains why network analyses are necessary. Accordingly, the book will inspire new research and applications based on the state of the art. In this new edition, the latest research advances and discoveries are discussed. Two new chapters on Linkage Efficiency and External and Internal Evaluations have been added. This book is mainly aimed at researchers and graduate students who are interested in performance evaluation, DEA and multi-criteria decision analysis. Practitioners who want to measure the performance of production operation or any type of decision making units will also find it useful.

Uncertainty in the Electric Power Industry Christoph Weber, 2006-01-06. Around the world, liberalization and privatization in the electricity industry have led to increased competition among utilities. At the same time, utilities are now exposed more than ever to risk and uncertainties which they cannot pass on to their customers through price increases as in a regulated environment. Especially electricity generating companies have to face volatile wholesale prices, fuel price uncertainty, limited long-term hedging possibilities, and huge to a large extent sunk investments. In this context, *Uncertainty in the Electric Power Industry: Methods and Models for Decision Support* aims at an integrative view on the decision problems that power companies have to tackle. It systematically examines the uncertainties power companies are facing and develops models to describe them, including an innovative approach combining fundamental and finance models for price modeling. The optimization of generation and trading portfolios under uncertainty is discussed with particular focus on CHP and is linked to risk management. Here, the concept of integral earnings at risk is developed to provide a theoretically sound combination of value at risk and profit at risk approaches, adapted to real market structures and market liquidity. Also, methods for supporting long-term investment decisions are presented: technology assessment based on experience curves and operation simulation for fuel cells and a real options approach with endogenous electricity prices.

Proceedings of the Second International Conference on Soft Computing for Problem Solving (SocProS 2012), December 28-30, 2012 B. V. Babu, Atulya Nagar, Kusum Deep, Millie Pant, Jagdish Chand Bansal, Kanad Ray, Umesh Gupta, 2014-07-08. The present book is based on the research papers presented in the International Conference on Soft Computing for Problem Solving SocProS 2012 held at JK Lakshmipat University, Jaipur, India. This book provides the latest developments in the area of soft computing and covers a variety of topics including mathematical modeling, image processing, optimization, swarm intelligence, evolutionary algorithms, fuzzy logic, neural networks, forecasting, data mining, etc. The objective of the book is to familiarize the reader with the latest scientific developments that are taking place in various fields and the latest sophisticated problem solving tools that are being developed to deal with the complex and intricate problems that are otherwise difficult to solve by the usual and traditional methods. The book is directed to the researchers and scientists.

engaged in various fields of Science and Technology *Building Supply Chain Excellence in Emerging Economies* Hau L. Lee, Chung-Yee Lee, 2007-12-14 xv Global Supply Chain General Strategies and Framework There are five chapters on the general strategies and framework In On the Globalization of Operations and Supply Chain Strategies A Conceptual Framework and its Applications Panos Kouvelis and Julie Niederhoff describe the forces that shape globalization and a framework to develop strategies The authors illustrate how the framework can be used with the case of Acrilan an acrylic fiber manufacturer As the emerging economies begin to mature and the supply and demand points in a supply chain begin to shift companies need to re-optimize the design of their global supply chain so as to make the best use of their global resources This is the subject of Globalization and Emerging Markets The Challenge of Continuous Global Network Optimization by Peter Koudal and Douglas A Engel Many emerging economies have lower direct labor costs and are so attractive offshoring locations But there could be many hidden costs The decision to offshore has to be based on a sound comprehensive analysis of the total landed costs the tradeoffs of associated risks and the business strategies of the company David Pyke provides us with the approach to tackle this decision and share with us his personal experience in helping companies to make such decisions in his chapter titled Shanghai or Charlotte The Decision to Outsource to China and Other Low Cost Countries

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Introduction

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