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# Handbook on Data Envelopment Analysis

Second Edition



 Springer

# Handbook On Data Envelopment Analysis Handbook On Data Envelopment Analysis

**Lingsheng Yao**



## **Handbook On Data Envelopment Analysis Handbook On Data Envelopment Analysis:**

*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 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.

*Handbook on Data Envelopment Analysis* William W. Cooper, Lawrence M. Seiford, Joe Zhu, 2011-08-31 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 **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, 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 Freije 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      **Handbook of Operations Analytics Using Data**

**Envelopment Analysis** Shih-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* William W. Cooper, Lawrence M. Seiford, Joe Zhu, 2014-01-15      *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

**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

**Data Envelopment Analysis** William W. Cooper, Lawrence M. Seiford, Kaoru Tone, 2007-01-10 Data Envelopment Analysis A Comprehensive Text with Models Applications References And DEA Solver Software 2nd Edition is designed to provide a systematic introduction to DEA and its uses as a multifaceted tool for evaluating problems in a variety of contexts Each chapter accompanies its developments with simple numerical examples and discussions of actual applications Emphasis is placed on the use as well as an understanding of DEA and the topics in this book have been selected and treated accordingly

The first nine chapters cover the basic principles of DEA and the final seven chapters are more advanced treatment of DEA. These final chapters were completely revised into new chapters reflecting recent developments that greatly extend the power and scope of DEA and lead to new directions for research and DEA uses. Together with the first ten chapters of the basic principles, they will provide students and researchers with a solid understanding of the methodology, its uses, and its potential.

**Data Envelopment Analysis with GAMS** Ali Emrouznejad, Konstantinos Petridis, Vincent Charles, 2023-07-04. This book provides a comprehensive and practical introduction to Data Envelopment Analysis (DEA). It explains how this non-parametric technique is used to measure performance and extract efficiency from homogeneous entities within a production procedure. It situates DEA within a growing field of productivity analysis and performance measurement for which numerous models have been proposed. This book encapsulates all of the advances in DEA models proposed in the literature. These models are presented in the context of the GAMS software, which is a powerful tool for mathematical programming models. This book serves two educational purposes: it introduces readers to DEA models and provides examples using GAMS. In addition, the reader is introduced to GAMS programming as well as innovative and practical applications. GAMS codes are available for free, allowing readers to test and expand the models to meet their specific needs. [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 (DMUs). 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%. *Data Envelopment Analysis (DEA) Methods*

*for Maximizing Efficiency* Ajibesin, Adeyemi Abel, Vajjhala, Narasimha Rao, 2024-01-16. In today's highly competitive and rapidly evolving global landscape, the quest for efficiency has become a crucial factor in determining the success of organizations across various industries. *Data Envelopment Analysis (DEA) Methods for Maximizing Efficiency* is a comprehensive guide that delves into the powerful mathematical tool of DEA, designed to assess the relative efficiency of decision-making units (DMUs) and provides valuable insights for performance improvement. This book presents a systematic

overview of DEA models and techniques from fundamental concepts to advanced methods showcasing their practical applications through real world examples and case studies Catering to a broad audience this book is designed for students researchers consultants decision makers and enthusiasts in the field of efficiency analysis and performance measurement Consultants and practitioners will gain practical insights for applying DEA in various contexts and decision makers will be equipped to make informed decisions for maximizing efficiency Additionally individuals with a general interest in data analysis and performance measurement will find this book accessible and informative This book covers a wide range of topics including mathematical foundations of DEA DEA models and variations DEA efficiency and productivity measures DEA applications in various industries such as healthcare finance supply chain management environmental management education management and public sector management

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

**Introduction to Data Envelopment Analysis and Its Uses** William W. Cooper, Lawrence M. Seiford, Kaoru Tone, 2006-03-20 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

*Environmental Assessment on Energy and Sustainability by Data Envelopment Analysis* Toshiyuki Sueyoshi, Mika Goto, 2018-02-02 Introduces a bold new model for energy industry pollution prevention and sustainable growth Balancing industrial pollution prevention with economic growth is one of the knottiest problems faced by industry today This book introduces a novel approach to using data envelopment analysis DEA as a powerful tool for achieving that balance in the energy industries the world s largest producers of greenhouse gases It describes a rigorous framework that integrates elements of the social sciences corporate strategy regional economics energy economics and environmental policy and delivers a methodology and a set of strategies



for promoting green innovation while solving key managerial challenges to greenhouse gas reduction and business growth In writing this book the authors have drawn upon their pioneering work and considerable experience in the field to develop an unconventional holistic approach to using DEA to assess key aspects of sustainability development The book is divided into two sections the first of which lays out a conventional framework of DEA as the basis for new research directions In the second section the authors delve into conceptual and methodological extensions of conventional DEA for solving problems of environmental assessment in all contemporary energy industry sectors Introduces a powerful new approach to using DEA to achieve pollution prevention sustainability and business growth Covers the fundamentals of DEA including theory statistical models and practical issues of conventional applications of DEA Explores new statistical modeling strategies and explores their economic and business implications Examines applications of DEA to environmental analysis across the complete range of energy industries including coal petroleum shale gas nuclear energy renewables and more Summarizes important studies and nearly 800 peer reviewed articles on energy the environment and sustainability Environmental Assessment on Energy and Sustainability by Data Envelopment Analysis is must reading for researchers academics graduate students and practitioners in the energy industries as well as government officials and policymakers tasked with regulating the environmental impacts of industrial pollution

*Stochastic Benchmarking* Alireza Amirteimoori, Biresh K. Sahoo, Vincent Charles, Saber Mehdizadeh, 2021-12-11 This book introduces readers to benchmarking techniques in the stochastic environment primarily stochastic data envelopment analysis DEA and provides stochastic models in DEA for the possibility of variations in inputs and outputs It focuses on the application of theories and interpretations of the mathematical programs which are combined with economic and organizational thinking The book's main purpose is to shed light on the advantages of the different methods in deterministic and stochastic environments and thoroughly prepare readers to properly use these methods in various cases Simple examples along with graphical illustrations and real world applications in industry are provided for a better understanding The models introduced here can be easily used in both theoretical and real world evaluations This book is intended for graduate and PhD students advanced consultants and practitioners with an interest in quantitative performance evaluation

**Decision-Making Models and Applications in Manufacturing Environments** Pushpdant Jain, Kumar Abhishek, Prasenjit Chatterjee, 2024-02-20 Multi criteria decision making MCDM has gained vast popularity for its ability to help make decisions in the presence of various similar and conflicting choices This new volume applies the MCDM theory to solving problems and challenges in manufacturing environments It discusses using MCDM computational methods to evaluate and select the most optimal solution or method for real world real time manufacturing engineering issues It details the decision making process in relation materials selection identification assessment and evaluation of risk sustainability assessment selection of green suppliers and more The chapter authors demonstrate the application of myriad MCDM techniques in decision making including MADM multiple attribute decision making DEA data

envelopment analysis fuzzy TOPSIS technique for order preference by similarities to ideal solution fuzzy VIKOR multicriteria optimization and compromise solution MOORA multi objective optimization on the basis of ratio analysis EWM entropy weight method AHP analytic hierarchy process TODIM TOMada de Decisao Interativa Multicriterio and others The volume illustrates these MCDM models in several industries and industrial processes including for experimental analysis and optimization of drilling of glass fiber reinforced plastic in the textile industries for selection of refrigerants for domestic applications and others *Modeling Data Irregularities and Structural Complexities in Data Envelopment Analysis* Joe Zhu, Wade D. Cook, 2007-06-08 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

**DATA ANALYTICS** Dr. Manish Kumar,

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