

## HANDBOOK ON DATA ENVELOPMENT ANALYSIS

edited by

William W. Cooper

University of Texas at Austin, U.S.A.

Lawrence M. Seiford

University of Michigan at Ann Arbor, U.S.A.

Joe Zhu

Worcester Polytechnic Institute, U.S.A.

## **CONTENTS**

	<b>Preface</b> William W. Cooper, Lawrence M. Seiford and Joe Zhu	xi
1	Data Envelopment Analysis: History, Models and Interpretations William W. Cooper, Lawrence M. Seiford and Joe Zhu	1
2	Returns to Scale in DEA Rajiv D. Banker, William W. Cooper, Lawrence M. Seiford and Joe Zhu	41
3	Sensitivity Analysis in DEA William W. Cooper, Shanling Li, Lawrence M. Seiford and Joe Zhu	75
4	<b>Incorporating Value Judgments in DEA</b> Emmanuel Thanassoulis, Maria Conceicao Portela, and Rachel Allen	99
5	<b>Distance Functions with Applications to DEA</b> Rolf Fare, Shawna Grosskopf and Gerald Whittaker	139
6	Qualitative Data in DEA Wade D. Cook	153
7	Congestion: Its Identification and Management with DEA William W. Cooper, Honghui Deng, Lawrence M. Seiford and Joe Zhu	177
8	Malmquist Productivity Index: Efficiency Change Over Time Kaoru Tone	203

viii	Contents
viii	Conte

9	Chance Constrained DEA William W. Cooper, Zhimin Huang and Susan X. Li	229
10	Performance of the Bootstrap for DEA Estimators and Iterating the Principle Leopold Simar and Paul W.Wilson	265
11	<b>Statistical Tests Based on DEA Efficiency Scores</b> Rajiv D. Banker and Ram Natarajan	299
12	Performance Evaluation in Education: Modeling Educational Production John Ruggiero	323
13	Assessing Bank and Bank Branch Performance: Modeling Considerations and Approaches Joseph C. Paradi, Sandra Vela and Zijiang Yang	349
14	<b>Engineering Applications of Data Envelopment Analysis: Issues and Opportunities</b> Konstantinos P. Triantis	401
15	Benchmarking in Sports: Bonds or Ruth: Determining the Most Dominant Baseball Batter Using DEA Timothy R. Anderson	443
16	Assessing the Selling Function in Retailing: Insights from Banking, Sales forces, Restaurants & Betting shops Antreas D. Athanassopoulos	455
17	Health Care Applications: From Hospitals to Physicians, From Productive Efficiency to Quality Frontiers Jon A. Chilingerian and H. David Sherman	481

ix

18	DEA Software Tools and Technology: A State-of-the-Art Survey Richard Barr	539
	Notes about Authors	567
	Author Index	579
	Subject Index	587