William W. Cooper • Lawrence M. Seiford
Joe Zhu
Editors

Handbook on Data Envelopment Analysis

Second Edition

Springer

Contents

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**	71
4	**Choices and Uses of DEA Weights** **William W. Cooper, Jose L. Ruiz, and Inmaculada Sirvent**	93
5	**Malmquist Productivity Indexes and DEA** **Rolf Fare, Shawna Grosskopf, and Dimitris Margaritis**	127
6	**Qualitative Data in DEA** **Wade D. Cook**	151
7	**Congestion: Its Identification and Management with DEA** **William W. Cooper, Honghui Deng, Lawrence M. Seiford, and Joe Zhu**	173
8	**Slacks-Based Measure of Efficiency** **Kaoru Tone**	195
9	**Chance-Constrained DEA** **William W. Cooper, Zhimin Huang, and Susan X. Li**	211
10	**Performance of the Bootstrap for DEA Estimators and Iterating the Principle** Leopold Simar and Paul W. Wilson	241

11 Statistical Tests Based on DEA Efficiency Scores **273**
Rajiv D. Banker and Ram Natarajan

12 Modeling DMU's Internal Structures: Cooperative and Noncooperative Approaches **297**
Wade D. Cook, Liang Liang, and Joe Zhu

13 Assessing Bank and Bank Branch Performance **315**
Joseph C. Paradi, Zijiang Yang, and Haiyan Zhu

14 Engineering Applications of Data Envelopment Analysis **363**
Konstantinos P. Triantis

15 Applications of Data Envelopment Analysis in the Service Sector **403**
Necmi K. Avkiran

16 Health-Care Applications: From Hospitals to Physicians, from Productive Efficiency to Quality Frontiers **445**
Jon A. Chilingerian and H. David Sherman

Index : **495**