

Acknowledgments

We would like to express our appreciation to all those people who have helped us to finish this book. First, we would like to thank our co-authors of the articles dealing with DEA: (in alphabetic order) Juha Eskelinen (Aalto University School of Business), Merja Halme (Aalto University School of Business), Petri Hilli (Helsinki School of Economics), Matti Koivu (Helsinki School of Economics), Mikulas Luptacik (Vienna University of Economics and Business Administration), Paul Na (J.P.Morgan), Seppo Salo (Helsinki School of Economics), Aapo Siljamäki (NumPlan Ltd.), Margareta Soismaa (Aalto University School of Business), Mikko Syrjänen (Helsinki School of Economics), Sari Stenfors (Helsinki School of Economics), Risto Tainio (Aalto University School of Business), Esa-Jussi Viitala (Finnish Forest Research Institute), and Jyrki Wallenius (Aalto University School of Business).

At last we would like to thank all those persons who deserve our thanks, but we have forgotten to thank!

Index

A

Absolute weights restrictions, 128
Achievement scalarizing
 function (ASF), 44, 47
Actual efficient frontier, 9
Allocative efficiency, 6
Application driven theory, 56
ASF. *See* Achievement scalarizing
 function (ASF)
Aspiration levels, 48

B

BCC-model, 18
Benchmark, 65, 68
Best-practice production frontier, 31

C

Cardinal information, 145
CCR models, 16
Cobb-Douglas function, 145
Combined primal model, 57
Combined unified model, 24
Constant returns to scale (CRS), 8
Convex cones, 151, 153
Convexity, 9
Convex PPS, 148
Cost function, 27
Criterion space, 31
CRS. *See* Constant returns
 to scale (CRS)

D

Data envelopment analysis (DEA), 2
Debreu-Farrell efficiency measure, 31
Decision maker (DM), 2
Decision making unit (DMU), 1, 4
Decision space, 31
Direction of improvement, 116
DM. *See* Decision maker (DM)
DMU. *See* Decision making unit (DMU)
Dominated, 31
Dominated by cone, 152

E

Economic efficiency, 6
Efficiency, 5
Efficiency score, 2, 16, 32, 65
Efficient, 30, 42, 150
Efficient extreme points, 147
Efficient extreme solution, 113
Efficient frontier, 2, 30, 79
Efficient set, 42
Efficient solutions, 42
Efficient surface, 68
Efficient target, 32
Efficient unit, 2
Empirical production frontier, 9
Empirical production possibility set, 27
Envelopment model, 17
Evolutionary multiple objective, 31
Ex ante planning tool, 55
Ex postevaluation tool, 55

F

Färe-Lovell efficiency measure, 79
 FDH. *See* Free disposal hull (FDH)
 Feasible set, 42
 Form of a value function, 113
 Free disposal hull (FDH), 9, 28, 113, 150
 Free search, 122

G

General combined DEA model, 58
 General combined envelopment model, 58
 General combined multiplier model, 58
 General model, 32
 General projection vector, 117
 Generator of a production
 possibility set, 28
 Generator set, 28
 Goal programming, 41, 55, 79

H

Homogeneity, 143
 Homogenous of degree, 143
 Hyper-markets, 60

I

Indifference contour, 115, 148
 Inefficiency score, 2
 Inefficient, 31
 Inefficient unit, 2
 Input-oriented, 6
 Input-oriented CCR, 18
 Input oriented model, 16
 Inputs, 15
 Interactive multiple goal
 programming, 56
 Inverse DEA model, 56

K

Korhonen, P, 151

L

Lexicographical formulation, 23

M

MCDA. *See* Multiple criteria decision
 analysis (MCDA)
 MCDM. *See* Multiple criteria decision
 making (MCDM)

MCDS. *See* Multiple criteria decision
 support (MCDS)
 Minimal production possibility set, 28
 MOLP. *See* Multiple objective linear
 programming (MOLP)
 Most preferred solution (MPS), 3, 90
 Most preferred unit (MPU), 3
 MPS. *See* Most preferred solution (MPS)
 MPU. *See* Most preferred unit (MPU)
 Multiple criteria decision
 analysis (MCDA), 41
 Multiple criteria decision
 making (MCDM), 41, 79
 Multiple criteria decision
 support (MCDS), 41
 Multiple objective data envelopment
 analysis, 56
 Multiple objective linear programming
 (MOLP), 3, 41, 79
 Multiple objective mathematical
 programming, 41
 Multiplier model, 19

N

NDRS, 22
 NIRS. *See* Nonincreasing returns to scale
 Non-archimedean infinitesimal, 16
 Non-convex PPS, 147
 Non-convex VEA, 148
 Non-decreasing, 20
 Non-dominated, 9, 30, 150
 Nondominated criterion vectors, 42
 Nondominated set, 42
 Non-increasing, 20
 Nonincreasing returns
 to scale (NIRS), 20

O

Observed DMU, 147
 Optimal scale, 8
 Orientation, 15
 Output, 15
 Output-oriented, 6
 Output-oriented CCR, 18
 Overall efficient, 6

P

Pareto optimal, 5, 31
 Pareto race, 45, 62, 122
 Partial, 5
 Population, 31

PPS. *See* Production possibility set (PPS)
 Preference information, 3, 65, 67
 Preference weighting, 56
 Production frontier, 5, 30
 Production possibility set (PPS), 5, 21, 27
 Productivity, 4
 Projection point, 65
 Pseudoconcavity, 112

Q

Quasi-concave, 148,
 Quasiconvex, 148, 151

R

Radially, 2, 31
 Radial projection, 2, 32
 Rational DM, 44
 Reference direction approach, 41, 46
 Reference direction approach model, 60
 Reference point approach, 41, 46, 57
 Reference set, 10
 Reference units, 2, 10
 Relative efficiency, 8, 57
 Relative technical efficiency, 1
 Relative weights restrictions, 128
 Returns to scale, 8
 r-point cone, 151

S

Scale efficiency, 8
 Slack, 12
 Strong free disposability, 9
 Strongly dominated, 31
 Strongly dominated by cone, 152
 Strongly inefficient, 31
 Superefficiency, 31

T

Tangent cones, 116
 Target, 65, 68, 79, 80
 Target unit, 2, 10

Target values, 2
 Technical efficiency, 1
 Technical efficiency scores, 61
 Technically efficient, 5
 Technically inefficient, 5
 Theoretical production frontier, 9
 Theoretical production possibility set, 27
 Total factor productivity, 5
 True inefficiency score, 135
 True value efficiency, 90, 127
 Two-point cone, 151

V

Value difference/ratio interpretation, 127
 Value efficiency, 90
 Value efficiency analysis
 (VEA), 4, 97, 111
 Value efficiency scores, 4, 115, 127
 Value free, 9, 57
 Value function, 3, 90
 Value inefficiency score, 4, 143
 Value neutral approach, 57
 Variable returns to scale (VRS), 8, 18
 Variable space, 31
 VEA. *See* Value efficiency
 analysis (VEA)
 VIG software, 62, 122
 Virtual, 9
 Virtual input, 5
 Virtual most preferred point, 148
 Virtual output, 5
 Visual free search, 62
 VRS. *See* Variable returns
 to scale (VRS)

W

Weakly efficient, 7, 16, 31, 42
 Weakly nondominated
 criterion vectors, 42
 Weight, 67
 Weighted Tchebycheff procedure, 46, 55
 Weighted true value inefficiency score, 143
 Weights restrictions, 130