Index

Analytic Hierarchy Process (AHP) 70
A posteriori approach 105
A priori approach 105
Adaptive approach 106
Adaptive interactive decision-making system 116, 118
Additional information representation 106
Additive reciprocal fuzzy preference relation 163
Aggregated payoff matrix 251, 258
Aggregated risks 252, 253
Aggregation operator 82, 114, 222, 269
Alternative 1, 4, 9–10, 278
Alpha (α) cut 33, 38, 194
Analytical model 5
Assignment principle 147
Attribute 9–10
Automorphism 139
Axiom of independence of irrelevant alternatives 146
Axiom of independence of rejected alternatives 205
Axiom of symmetry of indifference and incomparability relations 147
Bellman-Zadeh approach to decision-making 112–13, 120
Binary fuzzy relation
definition 56, 137, 138
properties 55, 56, 140
Boldur’s method 109
Brainstorming 278

Characteristic estimates 250, 252
Characteristic function 23, 42
Choice criteria 250, 252
Choice of alternatives 4, 202–3, 207
Classic approach to dealing with uncertainty of information 247
Clustering 76
Complement of a fuzzy set 46, 138
Concordance index 296–8, 302
Consensus 13, 293
Consensus index 296–8, 302, 305
Consensus scheme
Definition 295, 309–10
Guidance procedures 311–12, 318
Consistency
of fuzzy preference relation 148, 163
of multiplicative preference relation 55, 137
under group settings 275
Continuous decision space 10
Continuous models of multicriteria decision-making 103
Cooperative decision-making 12, 264, 293
Criteria
Hurwicz 248, 250
Laplace 248, 250
Savage 248, 250
Wald 248, 250
Criterion 10
Decision-maker (DM) 2–4
Decision-making 2, 4, 6, 9
Decision-making problem 2, 4, 6, 9
Decision-making process 2–3, 13
Decision space 7, 10, 278
Decision support 4, 6, 12
Decision support system 4, 6, 12
Decision uncertainty region 6–8
Decision variable 10
Dictatorial consensus 305
Discrete decision space 10, 278
Efficient solution 104–5
Extension principle 84
Feasible solutions 6
Fuzzy arithmetic 87
Fuzzy C-Means (FCM) 76
Fuzzy estimate 66, 160
Fuzzy number 28
Fuzzy objective function 76
Fuzzy preference relation 11, 141, 163,
202
Fuzzy quantifier 222, 224
Fuzzy relation 47, 49
Cartesian product 49, 52
Cylindrical extension 54
Equivalence 57
Operations 51
Projection 53
Reconstruction 55
Transposition 52
Fuzzy set
Cardinality 34
Convexity 33
Core 32
Equality 35
Equalization 80
Interpretation 22, 24
Normality 31
Normalization 32
Operations 41
Support 32
Specificity 37
Fuzzy set of non-dominated alternatives 204
Fuzzy solution 113
General scheme of multicriteria decision
making under uncertainty 253
Generalized preference relation 167
Goal programming 111
Goals 10, 111
Group decision environment 264
Group decision process 278
Group decision-making 11
Group decision-making problem 263
Harmonious solutions 112
Human participation 6, 9
Human-oriented interfaces 17
Ill-structured problem 4
Importance factor 110, 116, 207, 228, 268
Importance of objective function 110, 124
Importance weight of experts 268, 294, 305
Incommensurable unit 9
Incomparability relation 142–3, 145–6,
150
Indifference relation 142–3, 145–6, 150
Individual decision-making 6, 12
Information granularity 74
Information of qualitative character 16
Interactive approach 106
Intersection of fuzzy sets 44
Interval coefficients 254
Interval scale 158
Large preference relation 142
Lexicographic goal programming 112
Lexicographic character 207
Linguistic variable 29, 160
LP,τ-sequence 253
Measure of fuzziness
Energy 36
Entropy 36
Membership function 26
Definition 23
Elicitation 63
Gaussian 27
Triangular 26
Trapezoidal 27
Method of global criterion 112
Index

Method of successive concessions 111
Moderator 8, 294–5, 304
Modified criterion
   Hurwicz 253
   Laplace 252
   Savage 252
   Wald 252
Modified payoff matrix 251
Multiattribute decision-making 10–11, 202
Multicriteria decision-making 3, 9–10, 103, 193
Multicriteria power and energy shortage allocation 120, 122
Multicriteria Resource Allocation 115
Multiobjective decision making 10, 103
Multiperson and Multiattribute Aggregation Modes 265
Multiple criteria 2, 9
Multiplicative preference relation 70, 161
Negation 46
Non-compensatory behavior 124, 221, 272
Non-cooperative decision making 12, 264
Non-dominated solutions 104–5
Non-local search 116
Nonstrict preference relation 142
Nonreciprocal fuzzy preference relation 163–4
Normalization of objective functions 107–8
Objective function 6–7, 103
Objective space 104–5, 278
Objectives 9–10, 112
Operational research 3, 5
Optimal solution 3, 6–7
Optimization 6
Optimized (dictatorial) consensus 305
Ordered weighted average 203, 221, 271, 272, 274
Orlovsky choice function 203, 205
Outranking relation 203, 216
Pareto-optimal front 105
Pareto-optimal solution set 105
Pareto-optimal solutions 105
Particular risks 252–3
Payoff matrices 247–8
Positive association principle 146
Preference elicitation
   of fuzzy estimates 160
   of multiplicative preference relations 161–2
   of utility functions 157
Process 155
Preference formats 156
Fuzzy preference relation 163
Fuzzy estimates 160
Multiplicative preference relation 70, 161
Ordering of alternatives 156
Utility values 157
Preference function 226
Preference structures
   Definition 145
   Construction 146
Principle of justifiable granularity 73
Principle of optimality 107
Principle of just compromise 110
Principle of uniform optimality 110
Priorities of objective functions 107
Probabilistic methods 15
Promethee 216
Proximity relation 58
Quantifier guided dominance degree 224
Quantifier guided non-dominance degree 224
Ranking of the alternatives 203, 230, 266
Ratio scale 158, 161
Real-time decision support 5
Reciprocity (reciprocality)
   multiplicative 70,
   additive 140
Regret 249–50
Representation theorem 39
Representative combinations of initial data 247–8
Risk 249–50, 252
Risk matrix 250
<table>
<thead>
<tr>
<th>Index</th>
<th>Page Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scenario</td>
<td>247, 253</td>
</tr>
<tr>
<td>Semi-structured problem</td>
<td>4–5</td>
</tr>
<tr>
<td>State of nature</td>
<td>249</td>
</tr>
<tr>
<td>Strict preference relation</td>
<td>141–3, 146, 203</td>
</tr>
<tr>
<td>Structured problem</td>
<td>4</td>
</tr>
<tr>
<td>Triangular norm</td>
<td>43</td>
</tr>
<tr>
<td>T-conorm</td>
<td>45</td>
</tr>
<tr>
<td>T-norm</td>
<td>44</td>
</tr>
<tr>
<td>Transformation function</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Definition 172</td>
</tr>
<tr>
<td></td>
<td>For additive reciprocal fuzzy preference relation 172</td>
</tr>
<tr>
<td></td>
<td>For nonreciprocal fuzzy preference relation 180</td>
</tr>
<tr>
<td>Transitivity</td>
<td></td>
</tr>
<tr>
<td>Additive transitivity</td>
<td>163, 173, 176–8, 186, 273, 275,</td>
</tr>
<tr>
<td>Multiplicative transitivity</td>
<td>70, 162, 164, 174, 176, 178, 185–6</td>
</tr>
<tr>
<td>Min-transitivity</td>
<td>56, 141, 150</td>
</tr>
<tr>
<td>T-transitivity</td>
<td>140–1</td>
</tr>
<tr>
<td>Weak-transitivity</td>
<td>141, 149–50, 205, 271, 275</td>
</tr>
<tr>
<td>Uncertainty</td>
<td>2, 5–6</td>
</tr>
<tr>
<td>Uncertainty factor</td>
<td>2</td>
</tr>
<tr>
<td>Uncertainty of goals</td>
<td>7, 9</td>
</tr>
<tr>
<td>Uncertainty of information</td>
<td>6, 14</td>
</tr>
<tr>
<td>Union of fuzzy sets</td>
<td>45</td>
</tr>
<tr>
<td>Unstructured problems</td>
<td>4, 5</td>
</tr>
<tr>
<td>Weak domination</td>
<td>104</td>
</tr>
<tr>
<td>Weak Pareto optimal solutions</td>
<td>105</td>
</tr>
<tr>
<td>Weak preference relation</td>
<td>142</td>
</tr>
<tr>
<td>Weighted arithmetic mean</td>
<td>270–2, 274</td>
</tr>
<tr>
<td>Weighted geometric mean</td>
<td>271–2, 274</td>
</tr>
<tr>
<td>$&lt; X, M &gt;$ models</td>
<td>11, 17, 103, 107</td>
</tr>
<tr>
<td>$&lt; X, R &gt;$ models</td>
<td>11, 17, 202–3</td>
</tr>
</tbody>
</table>