

Contents

Preface xiii
Suggested Reading xvii

I Optimization 1

1 Feasibility and Desirability 3

1.1 Examples 3
1.2 Separating *Can* from *Want* 3
1.3 What Is Meant by *Rational*? 5
1.4 Uncertainty 6
1.5 Zen and the Absurd 7
1.6 On Theories and Paradigms 9

2 Utility Maximization 11

2.1 Example 11
2.2 Two Points 17
2.3 Interpretations 17
2.3.1 *Normative* 18
2.3.2 *Descriptive* 19
2.3.3 *Metascientific* 20
2.4 Measurement Issues 21
2.5 Utility and Disutility 22

3 Constrained Optimization 25

3.1 General Framework 25
3.2 Example: The Consumer Problem 27
3.3 Marginality Principle 29

II	Risk and Uncertainty	33
4	Expected Utility	35
4.1	Examples	35
4.2	Expected Value Maximization	36
4.2.1	<i>i.i.d. Random Variables</i>	36
4.2.2	<i>Law of Large Numbers</i>	37
4.2.3	<i>Practical Meaning of Expected Value</i>	38
4.3	Expected Utility Maximization	39
4.3.1	<i>von Neumann and Morgenstern's Theorem</i>	39
4.3.2	<i>Uniqueness of Utility</i>	40
4.3.3	<i>Risk Aversion</i>	41
4.3.4	<i>Prospect Theory</i>	43
4.4	Elicitation of Utility	44
4.5	From Simple to Complex	46
5	Probability and Statistics	49
5.1	What Is Probability?	49
5.2	Relative Frequencies as Objective Probabilities	52
5.3	Subjective Probabilities	54
5.4	Statistical Pitfalls	56
5.4.1	<i>Confounding Conditional Probabilities</i>	57
5.4.2	<i>Biased Samples</i>	59
5.4.3	<i>Regression to the Mean</i>	61
5.4.4	<i>Correlation and Causation</i>	64
5.4.5	<i>Statistical Significance</i>	67
III	Group Choices	71
6	Aggregation of Preferences	73
6.1	Summation of Utilities	73
6.2	Condorcet's Paradox	77
6.3	Impossibility Theorems	78
6.3.1	<i>Arrow's Theorem</i>	78
6.3.2	<i>Scoring Rules and Grading Systems</i>	80
6.3.3	<i>Gibbard-Satterthwaite's Theorem</i>	83
6.3.4	<i>An Argument for Approval Voting</i>	85
6.3.5	<i>Conclusion</i>	85
6.4	Pareto Optimality/Efficiency	85
6.5	Limitations of Pareto Optimality	87

- 6.5.1 *Silent on Equality* 88
- 6.5.2 *A Partial Order* 88
- 6.5.3 *Subjective Beliefs* 90

7 Games and Equilibria 91

- 7.1 Prisoner's Dilemma 91
 - 7.1.1 *The Basic Story* 91
 - 7.1.2 *Dominated Strategies* 92
 - 7.1.3 *Back to Prisoner's Dilemma* 95
 - 7.1.4 *The Meaning of Utility* 95
 - 7.1.5 *Main Lessons* 97
 - 7.1.6 *Changing the Rules of the Game* 99
 - 7.1.7 *Repetition* 100
 - 7.1.8 *Kant's Categorical Imperative and the Golden Rule* 101
- 7.2 Nash Equilibria 103
 - 7.2.1 *Definition* 103
 - 7.2.2 *Justifications* 103
 - 7.2.3 *Mixed Strategies* 105
- 7.3 Equilibrium Selection 107
 - 7.3.1 *Stylized Examples* 107
 - 7.3.2 *Real-Life Examples* 109
- 7.4 The Power of Commitment 111
- 7.5 Common Knowledge 113
- 7.6 Extensive Form Games 113
- 7.7 Perfectness and Credible Threats 114
 - 7.7.1 *Backward Induction* 117

8 Free Markets 119

- 8.1 Example: The Case for Globalization 119
- 8.2 The First Welfare Theorem 123
- 8.3 Limitations of Free Markets 129
 - 8.3.1 *Externalities and Public Goods* 129
 - 8.3.2 *Market Power* 130
 - 8.3.3 *Asymmetric Information* 130
 - 8.3.4 *Existence versus Convergence* 132
 - 8.3.5 *Formation of Preference* 133
 - 8.3.6 *Irrational Behavior* 133
 - 8.3.7 *What Is Measured by Utility?* 134
 - 8.3.8 *A Limitation of Pareto Optimality* 134
- 8.4 Example 135

IV	Rationality and Emotions	137
9	Evolutionary View of Emotions	139
10	Utility and Well-Being	143
10.1	Money Isn't Happiness	143
10.2	Qualifications	145
10.2.1	<i>The Validity of Questionnaires</i>	145
10.2.2	<i>Don't Push Others off the Hedonic Treadmill</i>	147
10.2.3	<i>People Don't Adjust to Everything</i>	148
	Epilogue	149
	Notes	151
	Index	155

Contents of Online Appendixes

Available at <http://mitpress.mit.edu/rationalchoice>.

A Mathematical Preliminaries

A.1	Notation
A.2	Sets
A.3	Relations and Functions
A.4	Cardinalities of Sets
A.5	Calculus
A.5.1	<i>Limits of Sequences</i>
A.5.2	<i>Limits of Functions</i>
A.5.3	<i>Continuity</i>
A.5.4	<i>Derivatives</i>
A.5.5	<i>Partial Derivatives</i>
A.6	Topology
A.7	Probability
A.7.1	<i>Basic Concepts</i>
A.7.2	<i>Random Variables</i>
A.7.3	<i>Conditional Probabilities</i>
A.7.4	<i>Independence and i.i.d. Random Variables</i>
A.7.5	<i>Law(s) of Large Numbers</i>

B Formal Models

B.1	Utility Maximization
B.1.1	<i>Definitions</i>
B.1.2	<i>Axioms</i>

- B.1.3 *Result*
- B.1.4 *Generalization to a Continuous Space*
- B.2 *Convexity*
 - B.2.1 *Convex Sets*
 - B.2.2 *Convex and Concave Functions*
 - B.2.3 *Quasi-convex and Quasi-concave Functions*
- B.3 *Constrained Optimization*
 - B.3.1 *Convex Problems*
 - B.3.2 *Example: The Consumer Problem*
 - B.3.3 *Algebraic Approach*
 - B.3.4 *Geometric Approach*
 - B.3.5 *Economic Approach*
 - B.3.6 *Comments*
- B.4 *vNM's Theorem*
 - B.4.1 *Setup*
 - B.4.2 *The vNM Axioms*
 - B.4.3 *Continuity*
 - B.4.4 *Independence*
 - B.4.5 *The Theorem*
- B.5 *Ignoring Base Probabilities*
- B.6 *Arrow's Impossibility Theorem*
- B.7 *Nash Equilibrium*

C Exercises

D Solutions