
Contents

Preface and acknowledgments	xi
Chapter 1. Backward induction	1
1.1 Tony's Accident	1
1.2 Games in extensive form with complete information	3
1.3 Strategies	5
1.4 Backward induction	6
1.5 Big Monkey and Little Monkey 1	9
1.6 Threats, promises, commitments	10
1.7 Ultimatum Game	12
1.8 Rosenthal's Centipede Game	13
1.9 Continuous games	15
1.10 Stackelberg's model of duopoly 1	16
1.11 Stackelberg's model of duopoly 2	20
1.12 Backward induction for finite horizon games	24
1.13 Critique of backward induction	25
1.14 Problems	27
Chapter 2. Eliminating dominated strategies	37
2.1 Prisoner's Dilemma	37
2.2 Games in normal form	39
2.3 Dominated strategies	40
2.4 Israelis and Palestinians	41
2.5 Global Warming	44
2.6 Hagar's Battles	45
2.7 Second-price auctions	47
2.8 Iterated elimination of dominated strategies	49
2.9 The Battle of the Bismarck Sea	49
2.10 Normal form of a game in extensive form with complete information	51
2.11 Big Monkey and Little Monkey 2	51
2.12 Backward induction	53
2.13 Critique of elimination of dominated strategies	55
2.14 Problems	55

Chapter 3. Nash equilibria	61
3.1 Big Monkey and Little Monkey 3 and the definition of Nash equilibria	61
3.2 Finding Nash equilibria by inspection: Important examples	63
3.3 Water Pollution 1	66
3.4 Arguing over Marbles	67
3.5 Tobacco Market	69
3.6 Iterated elimination of dominated strategies	71
3.7 Big Monkey and Little Monkey 4	74
3.8 Finding Nash equilibria using best response	75
3.9 Big Monkey and Little Monkey 5	76
3.10 Water Pollution 2	77
3.11 Cournot's model of duopoly	77
3.12 Problems	79
Chapter 4. Games in extensive form with incomplete information	88
4.1 Utility functions and lotteries	88
4.2 Buying Fire Insurance	89
4.3 Games in extensive form with incomplete information	90
4.4 Buying a Used Car	91
4.5 The Travails of Boss Gorilla 1	95
4.6 Cuban Missile Crisis	98
4.7 Problems	104
Chapter 5. Mixed strategy Nash equilibria	114
5.1 Mixed strategy Nash equilibria	114
5.2 Tennis	120
5.3 Other ways to find mixed strategy Nash equilibria	122
5.4 One-card Two-round Poker	123
5.5 Two-player zero-sum games	128
5.6 The Ultimatum Minigame	132
5.7 Colonel Blotto vs. the People's Militia	134
5.8 Water Pollution 3	140
5.9 Equivalent games	141
5.10 Software for computing Nash equilibria	142
5.11 Critique of Nash equilibrium	143
5.12 Problems	144
Chapter 6. More about games in extensive form with complete information	151
6.1 Subgame perfect Nash equilibria	152
6.2 Big Monkey and Little Monkey 6	152

6.3	Subgame perfect equilibria and backward induction	153
6.4	Duels and Truels	155
6.5	The Rubinstein bargaining model	160
6.6	Discount factor and repeated games	163
6.7	The Wine Merchant and the Connoisseur	165
6.8	The Folk Theorem	168
6.9	Maximum value of a function	172
6.10	The Samaritan's Dilemma	173
6.11	The Rotten Kid Theorem	177
6.12	Problems	180
Chapter 7. Symmetries of games		186
7.1	Interchangeable players	186
7.2	Reporting a Crime	189
7.3	Sex Ratio 1	191
7.4	Other symmetries of games	193
7.5	Problems	198
Chapter 8. Alternatives to the Nash equilibrium		203
8.1	Correlated equilibrium	203
8.2	Epistemic game theory	205
8.3	Evolutionary stability	206
8.4	Evolutionary stability with two pure strategies	209
8.5	Sex Ratio 2	213
8.6	Problems	214
Chapter 9. Differential equations		217
9.1	Differential equations and scientific laws	217
9.2	The phase line	219
9.3	Vector fields	220
9.4	Functions and differential equations	222
9.5	Linear differential equations	225
9.6	Linearization	228
Chapter 10. Evolutionary dynamics		232
10.1	Replicator system	232
10.2	Microsoft vs. Apple	235
10.3	Evolutionary dynamics with two pure strategies	237
10.4	Hawks and Doves revisited	238
10.5	Side-blotched Lizards	240
10.6	Equilibria of the replicator system	244
10.7	Cooperators, Defectors, and Tit-for-Tatters	246

10.8	Dominated strategies and the replicator system	249
10.9	Asymmetric evolutionary games	251
10.10	Big Monkey and Little Monkey 7	253
10.11	Hawks and Doves with Unequal Value	255
10.12	The Ultimatum Minigame revisited	256
10.13	Problems	258
Appendix. Sources for examples and problems		265
References		269
Index		271