CAMBRIDGE

Cambridge University Press
978-0-521-82401-9 - Rational Herds: Economic Models of Social Learning
Christophe P. Chamley
Table of Contents
More information

Contents

Preface *page* xiii

1 Introduction 1
1.1 Overview 3
1.2 A Bit of History 13
1.3 How to Use This Book 15

PART ONE. Social Learning 17

2 Bayesian Tools 19
2.1 The Bayesian Framework 21
2.2 Binary and Gaussian Information 23
2.2.1 The Binary Model 23
2.2.2 The Gaussian Model 24
2.2.3 Comparison of the Two Models 26
2.2.4 The Rate of Convergence of Learning 27
2.3 Private Signals and Beliefs 30
2.3.1 Equivalence between Private Signals and Private Beliefs 30
2.3.2 Examples of Distributions of Beliefs with Two States 31
2.3.3 Other Constructions of Private Information 33
2.4 Martingales 33
2.4.1 Convergence of Beliefs 35
EXERCISES 38
2.5 Appendix 38
2.5.1 Some Definitions Regarding Convergence 38
2.5.2 The Model of Youngsters and Old Timers 39

3 Social Learning with a Common Memory 42
3.1 A Canonical Model of Social Learning 43
3.1.1 The Model 43
3.1.2 The Process of Social Learning 45
3.2 Efficient Learning 45
3.2.1 The Gaussian–Quadratic Model 46
3.3 Observation Noise 48
3.3.1 One Action per Period 49
3.3.2 Large Number of Agents 51
3.3.3 Application: A Market Equilibrium 52

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-0-521-82401-9 - Rational Herds: Economic Models of Social Learning
Christophe P. Chamley
Table of Contents
More information

3.4 Extensions 53
3.4.1 Learning with a Private Cost of Information 53
3.4.2 Policy 54
EXERCISES 55
3.5 Appendix 55

4 Cascades and Herds 58
4.1 The Basic Model of Herding 62
4.1.1 The 2-by-2-by-2 Model 63
4.1.2 Informational Cascades 63
4.2 The Standard Model with Bounded Beliefs 67
4.2.1 Social Learning 68
4.2.2 Bounded Beliefs 69
4.3 The Convergence of Beliefs 71
4.3.1 Unbounded Beliefs: Convergence to the Truth 71
4.4 Herds and the Slow Convergence of Beliefs 74
4.4.1 Herds 74
4.4.2 The Asymptotic Rate of Convergence Is Zero 75
4.4.3 Why Do Herds Occur? 76
4.4.4 Discrete Actions and the Slow Convergence of Beliefs 77
4.5 Pricing the Informational Externality 77
4.5.1 The Social Optimum 78
4.5.2 A Monopoly 81
4.6 Crashes and Booms 84
4.7 Bibliographical Notes 86
EXERCISES 87
4.8 Appendix 90
4.8.1 Proofs 90
4.8.2 A Model of Learning with Two Types of Agents 91

5 Limited Memories 95
5.1 The Sequential Model with Sampling 97
5.1.1 The Case of One Observation ($N = 1$): Asymptotic Herding 99
5.1.2 The Case of More than One Observation ($N \geq 2$) 100
5.2 The Welfare-Improving Principle 103
5.2.1 The Average Welfare Function 103
5.2.2 The Welfare-Improving Principle 104
5.2.3 Convergence 105
5.3 Sampling in a Very Large Population 107
5.3.1 Two Examples 108
5.3.2 Convergence 110
5.4 Social Learning or Sampling in a Large Population? 112
EXERCISES 113

6 Delays 115
6.1 The Simplest Model 118
6.2 A General Model with Heterogeneous Beliefs 123
6.2.1 Characterization and Existence of Equilibria 124

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-0-521-82401-9 - Rational Herds: Economic Models of Social Learning
Christophe P. Chamley
Table of Contents
More information

6.3 Properties 127
6.3.1 Arbitrage 127
6.3.2 Representation of Beliefs 128
6.3.3 Herds: A Comparison with Exogenous Sequences 129
6.3.4 Two Agents 130
6.3.5 Strategic Complementarity and Substitutability 132
6.3.6 Period Length 133
6.3.7 Large Number of Agents 134
EXERCISES 136
6.4 Appendix 137
6.4.1 A Continuum of Agents with Observation Noise 137
6.4.2 Investments of Variable Size 141
6.4.3 Proofs 145

7 More Delays 149
7.1 The Length of a Period 151
7.1.1 Are Longer Periods More Efficient? 151
7.1.2 Vanishingly Short Periods 151
7.2 Continuous Time 152
7.2.1 The Nonexistence of an Equilibrium with Discrete Actions 152
7.2.2 Nondiscrete Actions 153
7.3 Buildup of Private Information 158
7.4 Observation of Payoffs 161
EXERCISES 163
7.5 Appendix 165

8 Outcomes 167
8.1 Incomplete Learning 170
8.1.1 A Monopoly Facing a Zero–One Demand 170
8.1.2 A Linear Demand 174
8.2 The Determinant of Economic Success: Luck or Effort? 175
8.2.1 One-Dimensional Beliefs 175
8.2.2 Two-Dimensional Beliefs 176
8.3 Complete Learning with a Diversity of Private Beliefs 181
8.3.1 The Framework 181
8.3.2 Some General Properties of the Learning Mechanism 183
8.3.3 Learning from the Whole History and Sequential Actions 184
8.3.4 Extensions 186
8.3.5 Observation of Outputs May Reduce Welfare 187
8.4 Bibliographical Notes 188
EXERCISES 189
8.5 Appendix 191

9 Networks and Diffusion 193
9.1 Optimization and Diffusion of Innovations 196
9.1.1 Learning about the Profitability of an Innovation 196
9.1.2 Learning How to Use a New Technology 200
9.2 Learning in Networks 205
9.2.1 Neighbors 205
9.2.2 The Curse of Information 207

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-0-521-82401-9 - Rational Herds: Economic Models of Social Learning
Christophe P. Chamley
Table of Contents
More information

9.3 Bibliographical Notes 209
EXERCISES 210

10 Words 211
10.1 Advice by One Expert 213
10.1.1 Evaluation Payoff after Verification 214
10.1.2 Equilibrium with an Evaluation Based on Reputation 215
10.1.3 Reputation for Nonmanipulation: PC Behavior? 218
10.2 Larger Sets of States and Messages 222
10.2.1 A Set of Signals Richer Than the Set of States 222
10.2.2 A Continuum of States and Messages 224
10.2.3 "Yes Men" for a Partially Informed Receiver 225
10.3 Panel of Experts 227
10.3.1 Reputational Herding 228
10.3.2 Who Should Speak First: The Strongly or the Weakly Informed? 228
10.3.3 The Receiver Does Not Make the Evaluation 231
10.4 Bibliographical Notes 232
EXERCISES 233

PART TWO. Coordination 235

11 Guessing to Coordinate 237
11.1 Overview 239
11.1.1 The Coordination of Simultaneous Actions 239
11.1.2 Rationalizable Strategies and Iterative Elimination 241
11.2 Eductive Stability in a Standard Market 244
11.2.1 The Model and Its Equilibrium 244
11.2.2 Supply Decisions in a Sequence 246
11.2.3 Discussion 248
11.3 Strategic Complementarities 249
11.3.1 The Gaussian Distribution of Investment Costs 250
11.3.2 The Cumulative Value Function and the SREE 253
11.3.3 Stag Hunts 257
11.4 Speculative Attacks against a Fixed Exchange Rate 261
11.5 Bibliographical Notes 264
EXERCISES 264

12 Learning to Coordinate 268
12.1 A Distribution with a Cluster 272
12.1.1 An Analytical Model 274
12.1.2 The Equilibrium under Imperfect Information 276
12.1.3 Application to Policy 282
12.1.4 Observation Lags and Random Walks with Drift 282
12.2 Observation Noise 282
12.3 Appendix 285
12.3.1 An Analytical Model of Regime Switches 285
12.3.2 The Model with Noise 287

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-0-521-82401-9 - Rational Herds: Economic Models of Social Learning
Christophe P. Chamley
Table of Contents
More information

13 Delays and Payoff Externalities 288
13.1 Strategic Substitutability 291
13.1.1 Learning the Demand 291
13.1.2 Learning the Supply 295
13.2 Strategic Complementarities 302
13.2.1 Pivotal Effects: Learning through Time May Foster Coordination 302
13.2.2 Large Number of Agents: Learning May Prevent Coordination 306
13.2.3 Interactions with Complementarities and Learning 307
EXERCISES 312

PART THREE. Financial Herding 315

14 Sequences of Financial Trades 317
14.1 Learning in the Model of Glosten and Milgrom 319
14.2 Herds 322
14.3 Avalanches 324
14.4 Herding in Auctions 328

15 Gaussian Financial Markets 330
15.1 Actions in the CARA–Gauss Model 333
15.1.1 The Individual 333
15.1.2 The Demand of a Large Number of Agents with Independent Information 336
15.2 Markets 338
15.2.1 The Transmission of the Information through the Market 339
15.2.2 Elasticities of Demand 341
15.2.3 The Variance of the Price 342
15.2.4 The Aggregation of Independent Private Information 343
15.3 The Convergence of Beliefs 344
15.3.1 Limit Orders and Fast Learning 346
15.3.2 Market Orders and Slow Learning 346
15.4 Multiple Equilibria, Crashes, and Booms 350
EXERCISES 354
15.5 Appendix 355

16 Financial Frenzies 358
16.1 Speculative Attacks against a Fixed Exchange Rate 359
16.1.1 The Model 361
16.1.2 Equilibria 365
16.1.3 An Example with Gaussian Noise 369
16.1.4 A Numerical Example 369
16.1.5 Defense Policies 370
16.2 Information Delays in Financial Markets 373
16.2.1 The Model 373
16.2.2 Equilibria 374
16.3 The Crash of a Bubble 378

References 385
Author Index 395
Subject Index 399

© in this web service Cambridge University Press www.cambridge.org