Contents

List of figures *page* x
Preface xi

I Difference equations 1

1 Basic concepts 3

1.1 One-dimensional maps 3
1.2 Explicit difference equations 10
1.3 Implicit difference equations 18
1.4 Exercises 24
1.5 Comments and references 27

2 Linear difference equations 29

2.1 Terminology and general results 29
2.2 Homogeneous equations 33
2.3 Two-dimensional systems of homogeneous equations 44
2.4 Non-homogeneous equations 51
2.5 Exercises 55
2.6 Comments and references 57

3 Autonomous difference equations 59

3.1 Invariant sets, fixed points, and periodic points 59
3.2 Local linearization 65
3.3 Stability 69
3.4 Saddle points 74
3.5 Sunspot equilibria 83
3.6 Exercises 89
3.7 Comments and references 91

4 One-dimensional maps 93

4.1 Monotonic maps 93
4.2 Local bifurcations 96
4.3 Deterministic chaos 114
4.4 Exercises 121
4.5 Comments and references 122

II Dynamic optimization 123

5 Optimization techniques 125

5.1 Model formulation and terminology 125
5.2 Euler equation and transversality condition 131
5.3 The Lagrangian approach 141
5.4 The recursive approach 147
5.5 Stationary discounted problems 155
5.6 Exercises 166
5.7 Comments and references 169

6 Dynamic inconsistency and commitment 170

6.1 Dynamic inconsistency 170
6.2 Optimization without commitment 179
6.3 Optimization with partial commitment 186
6.4 Exercises 190
6.5 Comments and references 193

7 Dynamic games 194

7.1 A general framework 194
7.2 Nash equilibria with closed-loop strategies 198
7.3 Markov-perfect Nash equilibria 210
7.4 Hierarchical dynamic games 215
7.5 Exercises 227
7.6 Comments and references 229

8 Dynamic competitive equilibrium 231

8.1 The sequence formulation 232
8.2 The recursive formulation 239
8.3 Optimal policy under commitment 247
8.4 Discretionary optimal policy 263
8.5 Exercises 272
8.6 Comments and references 276

References 277
Index 282