

Contents

1	Introduction and Outline	1
1.1	Bounded Rationality	2
1.2	Theory of Nonlinear Dynamics	4
1.2.1	Nonlinear economic dynamics: a historical perspective	5
1.2.2	An example	7
1.3	Outline	12
2	A Tâtonnement Process	17
2.1	Introduction	17
2.2	Price adjustment models	18
2.3	The Model	28
2.3.1	Price normalization	28
2.3.2	Model specifications	30
2.3.3	Some typical numerical simulations	32
2.4	Symmetry	34
2.5	Local bifurcation analysis	39
2.5.1	Symmetry and the Jacobian matrix	40
2.5.2	Rotational symmetry and the Hopf bifurcation	43
2.5.3	Reflection symmetry and the period-doubling bifurcation	43
2.5.4	D_3 symmetry and the Equivariant Branching Lemma	45
2.6	Global dynamics	48
2.6.1	Symmetry-breaking and -increasing bifurcations	48
2.6.2	Rotational symmetry	50
2.6.3	Reflection symmetry	53
2.7	An asymmetric price adjustment process	57
2.8	Multiplicity of equilibria	60

2.8.1	Transcritical and saddle-node bifurcations: a case study	60
2.8.2	The continuous tâtonnement process	62
2.9	Summary and conclusions	63
3	Perfect Foresight Cycles in Overlapping Generations Models	65
3.1	The overlapping generations model	65
3.2	Equivalence	71
3.2.1	A cyclical exchange economy	71
3.2.2	An overlapping generations model	74
3.2.3	Equivalence of cycles and asymmetric equilibria	75
3.2.4	A special case: the two generations overlapping generations model and Sarkovskii's theorem	78
3.2.5	Extensions	80
3.3	Examples	83
3.3.1	A three generations overlapping generations model with CES utility functions	83
3.3.2	A two generations overlapping generations model with CARA utility functions	85
3.3.3	An example with two generations and capital	88
4	Learning in Overlapping Generations Models	91
4.1	Perfect foresight versus learning	91
4.2	The overlapping generations model	94
4.3	Static expectations	99
4.4	A regression on price levels	105
4.5	A regression on inflation rates – part I	110
4.6	A regression on inflation rates – part II	117
4.7	Summary	123
5	An Evolutionary Model of Cournot Competition	125
5.1	Introduction	125
5.2	The Model	128
5.2.1	Traditional Cournot Duopoly Analysis	128
5.2.2	Quantity Dynamics	131
5.2.3	Population Dynamics	133
5.2.4	Local Instability Results	139
5.3	Best-Reply versus Rational Players	143
5.4	Local Bifurcation Analysis	145

5.4.1	Discrete Choice Dynamics	146
5.4.2	Replicator Dynamics	153
5.5	Global Bifurcation Analysis	158
5.5.1	Homoclinic Bifurcation Theory	159
5.6	Imitators versus Best-Reply Players	171
5.6.1	Discrete Choice Model	172
5.6.2	Replicator Dynamics	175
5.7	Concluding Remarks	176
5.8	Appendix	178
5.8.1	Derivation of Profit Functions	178
5.8.2	Equivalence of the Cournot and Cobweb Model . .	179
5.8.3	The Jacobian matrix	181
5.8.4	Some Important Curves	183
5.8.5	Diffeomorphisms	184
6	Price Adjustment in Monopolistic Competition	187
6.1	Introduction	187
6.2	A partial equilibrium model	189
6.2.1	Best-reply dynamics	191
6.2.2	Gradient systems	197
6.3	A short memory learning procedure	199
6.3.1	Examples: convergence	202
6.3.2	Example: nonconvergence	204
6.4	A long memory learning procedure	210
6.5	Concluding remarks	217
References		219
Index		231