Evolution in Games

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Learning in Games

beliefs modified through experience

- playing repeatedly against a fixed opponent

vs. myopia

- pick a players at random from a large population everyone sees play
- players randomly matched, results of all matches revealed anonymously
- players matched randomly see results only of own match (this is how experiments are conducted)

- evolution: better strategies do better/ random mutation
- random experimentation
- Bayesian beliefs

consistency between beliefs and reality

for example: many models implicitly suppose a steady state, that is a fixed distribution of opponents strategies you would like to learn about

but this is true only in the steady state

Dynamics: Best Response Dynamics

- discrete time best response
- discrete time partial best response

    -individual vs population model

- continuous time best response

2,2	0,0
0,0	1,1

mixed equilibrium 1/3-2/3

illustrate three dynamics

Shapley example

0,0	1,2	2,1
2,1	0,0	1,2
1,2	2,1	0,0

note that (0,0) is never hit, but always in Nash equilibrium

“smoothed best response” saddles and medium run

Dynamics: Replicator

- definition
- as a model of social learning
- as a stimulus-response model
- probability matching issues

Kandori-Mailath-Rob Young and the Ultra Long-Run

1>x>y>0

x,x	y,0
0,y	1,1

p=pr(x)=(1-y)/(x-y+1) (indifference between up and down)

1 is pareto efficient

x is risk dominant if and only if 1<x+y

for example, x=3/4, y=1/2

finite population of N players

- deterministic dynamic
- mutations
- 1-p mutations x->1
- p mutations x->1
- relative waiting times

Comments:

Nachbar: it can take a long time to learn to eliminate dominated strategies (deterministic dynamic)

Ellison: the very long run can be very long, but much shorter with local interaction

Johnson, Pesendorfer and Levine