BEEM109
Experimental Economics and Finance
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Rosie Nagel's Guessing Game

Motivation: Levels of Reasoning

- In social interaction a lot depends about what one person thinks other persons think and what they think about him/her etc.
- Example: Suppose you are competing in market with another firm and costs an dother circumstances change.
- Level zero: Should I change the price

Levels of reasoning

- Level one: Will my competitor change her price?
- Level two: Does my competitor think I will change my price?
- Level three: Maybe my competitor thinks that I will change my price only when he does…
- …an infinite regress problem

Other examples:

- Keynes: beauty contest and financial markets
  "It is not a case of choosing those [faces] which, to the best of one's judgment, are really the prettiest, nor even those which average opinion genuinely thinks the prettiest. We have reached the third degree where we devote our intelligences to anticipating what average opinion expects the average opinion to be. And there are some, I believe, who practise the fourth, fifth and higher degrees."
- In class: I don't understand this question. Should I ask?
- Maybe the others think I am stupid if I ask.
- Maybe be the others don't ask because they think we would consider them stupid if they asked…

Need for experiment

- Game theory typically assumes that people go through all the infinite steps of reasoning. But this seems unreasonable.
- Can one design an experiment where one can see that people pursue only finitely many steps of reasoning and how many levels they use?

The guessing game

- p=1/2
- Level -1: name any number.
- Level 0: A number above 50 cannot win. Being rational I should hence name a number 50 or smaller.
- Level 1: If everybody is rational and names a number 50 or smaller then I, being rational, should name 25 or less.
- Level 2: If everybody is rational and names a number 25 or smaller then I, being rational, should name 12.5 or less.
- Level 3: If everybody is rational and names a number 12.5 or smaller then I, being rational, should name 6.25 or less…………………
- Level ∞: If everybody is rational and names a number 0 or smaller then I, being rational, should also name 0.
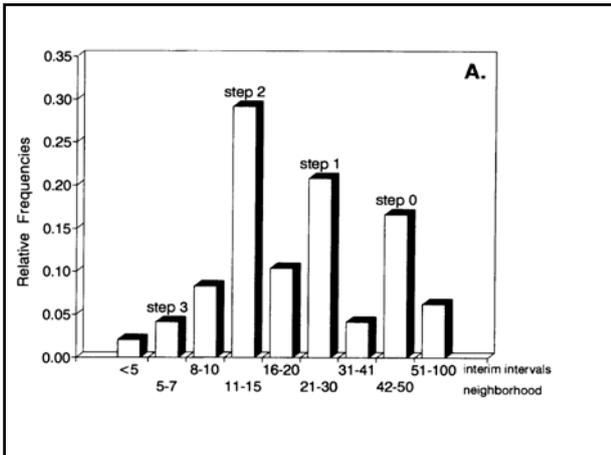
Notes of caution

- Some interpretations of the original ideas necessary to get this graphs.
- Theory is about levels of knowledge of rationality
- You are not clever if you think that everybody knows that everybody is … rational at level infinity.
- Identification of levels and choice of intervals

Hypothesis and Statistical Test

- H1: There are more more observations in the neighbourhood intervals for level 0 to 3 than in the interim intervals.
- H0: The number of observations are the same.
- Significant by a binomial test using the size of the intervals.

The modal choice

- Is also the best response against the actual population and coincides with the level 2 choice.

Treatments p=2/3, 4/3

- The above result is significant also for 2/3, but not for 4/3
- People tend to name higher numbers in the 4/3 experiment

Behaviour over time

- Numbers tend to decrease for p=1/2, 2/3, sharp increase for p=4/3
- Faster decrease for p=1/2
- No evidence for an increase in the level of reasoning

A learning direction therory

- $a_{i1}=x_{i1}/50$; $a_{it}=x_{it}/mean_t$
- $a_{opt,1}=(p*mean_1)/50$, $a_{opt,t}=(p*mean_t)/mean_{t-1}$
- If $a_{it}>a_{opt,t}$ then $a_{i,t+1}<a_{it}$
- If $a_{it}<a_{opt,t}$ then $a_{i,t+1}>a_{it}$