Financial Markets and Beauty Contest Game in the Lab

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Bojos February 2025

Tools to do experiments

- https://classex.de/
- https://veconlab.econ.virginia.edu/

see here and goto Netflix in case you have it:

Watch Alice in Borderland | Netflix Official Site

sequence 2 (of 2) chapter 6, starts at about minute 30. You have to select Season 2.

Have fun. It is about 20 minutes, also connecting it to Organ transplantation.

https://econ-papers.upf.edu/papers/438.pdf

Newspaper Beauty Contest Games

The Beautifu mind, a movie about John Nash who invented the equilibrium concept

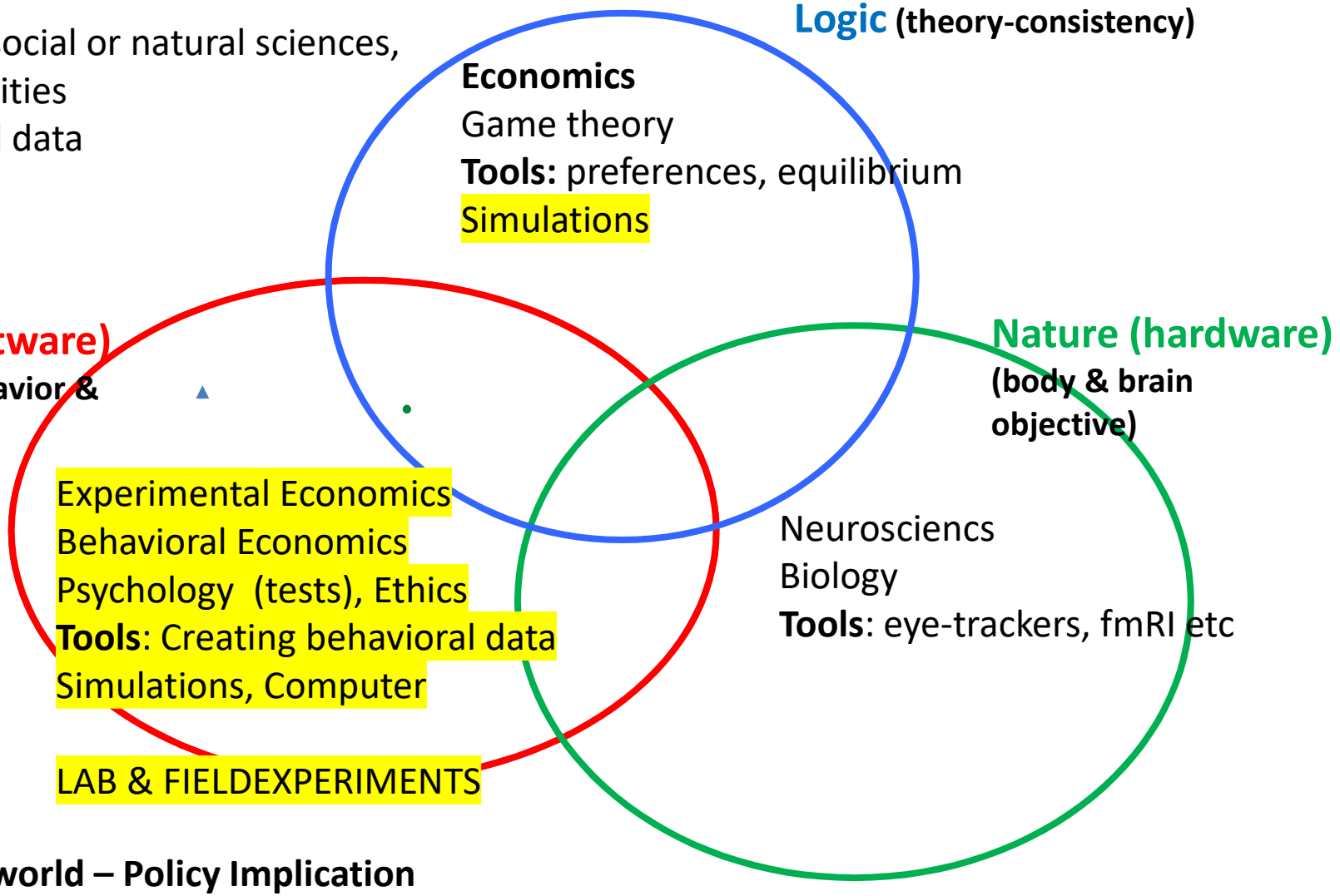
https://www.imdb.com/es-es/title/tt0268978/

What is economics?

- Economic models of (human) behavior, activity
  - Prediction, prescriptions, quantifying measures
  - Different kind of agents: firms, households, state, banks etc.
  - Macro: Aggregations of agent activity (inflation, taxes etc.)
  - Micro: individual activity (e.g. monopoly, oligopoly)
  - Coordination, exchange, scarcity, social norms, money
    - With or without prices as coordination devices
  - Implications for the real world
  - Tools: game theory, statistics, econometrics
  - Natural data (e.g. bank data on saving) or data creation (lab or field)
  - Rationality on aggregate level stronger than on individual level

My current view on research

- Other social or natural sciences,
- Humanities
- Natural data



⇒ **Real world – Policy Implication**
e.g. Central Banks,
Environmental issues,
Development

Computational tools, statistics, Econometrics etc.

Let’s do an experiment

Rules of the original Beauty Contest game

Choose a number between **0 and 100**. The winner is the person whose number is closest to **2/3 times the average of all chosen numbers.**

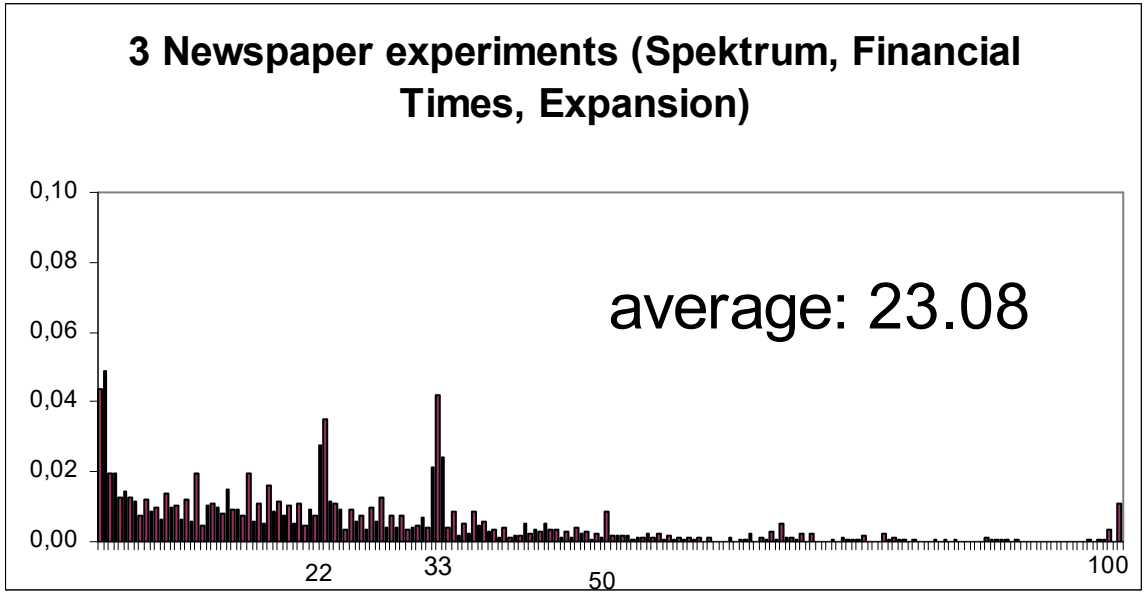
The winner will get 5 Euros, split when tied.

1.go to: https://classex.uni-passau.de
2.choose: Universitat Pompeu Fabra
3.choose: Rosemarie Nagel
4.choose: participant
5.enter password: experiment

Rules, theories, and data for the basic game

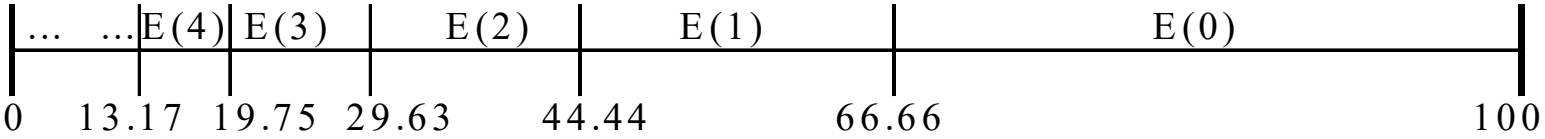
Rules

Choose a number between **0 and 100**. The winner is the person whose number is closest to **2/3 times the average of all chosen numbers**

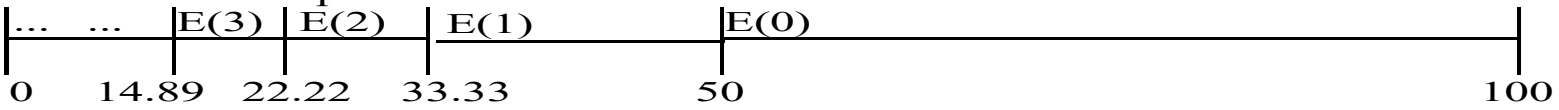


1. iterated elimination of dominated strategies

Equilibrium ←———— ITERATION

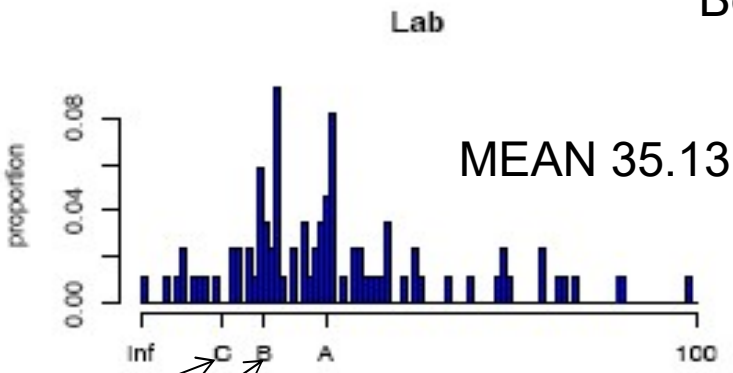


2. iterated best response

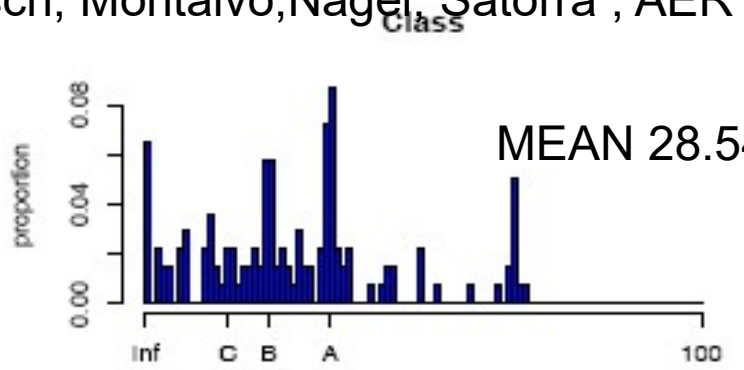


Main problem: starting point=level 0

Bosch, Montalvo,Nagel, Satorra , AER 2002

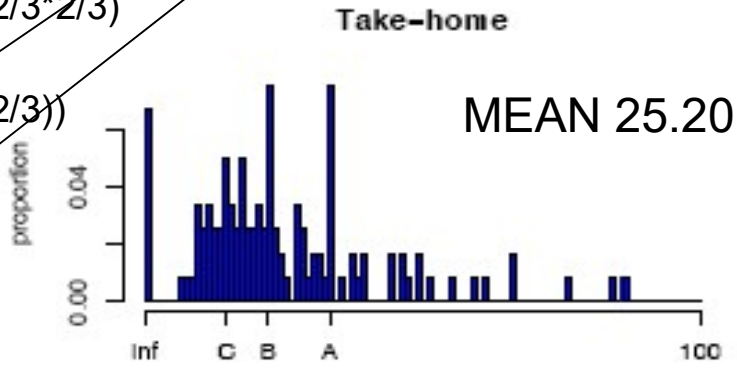


MEAN 35.13

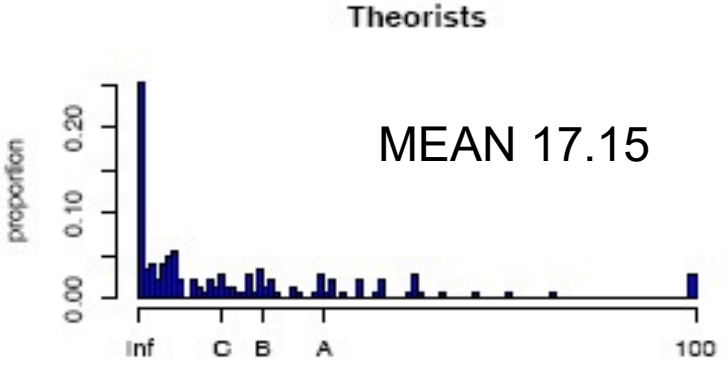


MEAN 28.54

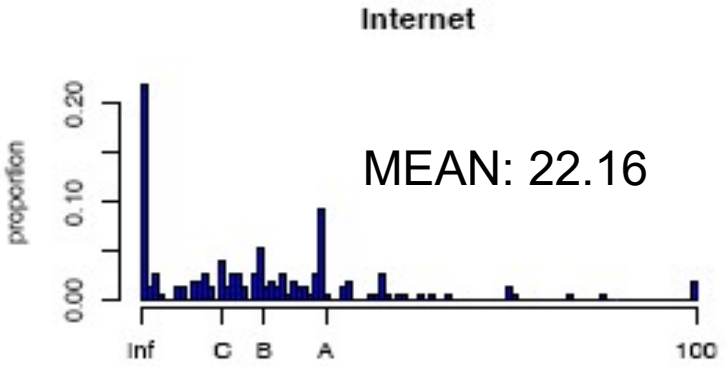
C=level 3
(15=50*2/3*2/3*2/3)
B=level 2
(22=50*2/3*2/3))
A=level 1
(33=50*2/3))



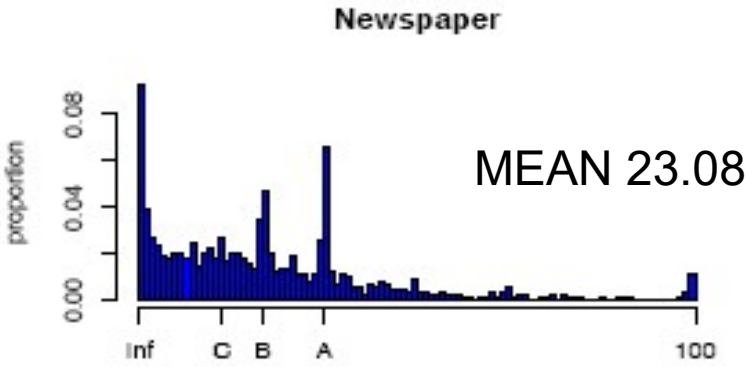
MEAN 25.20



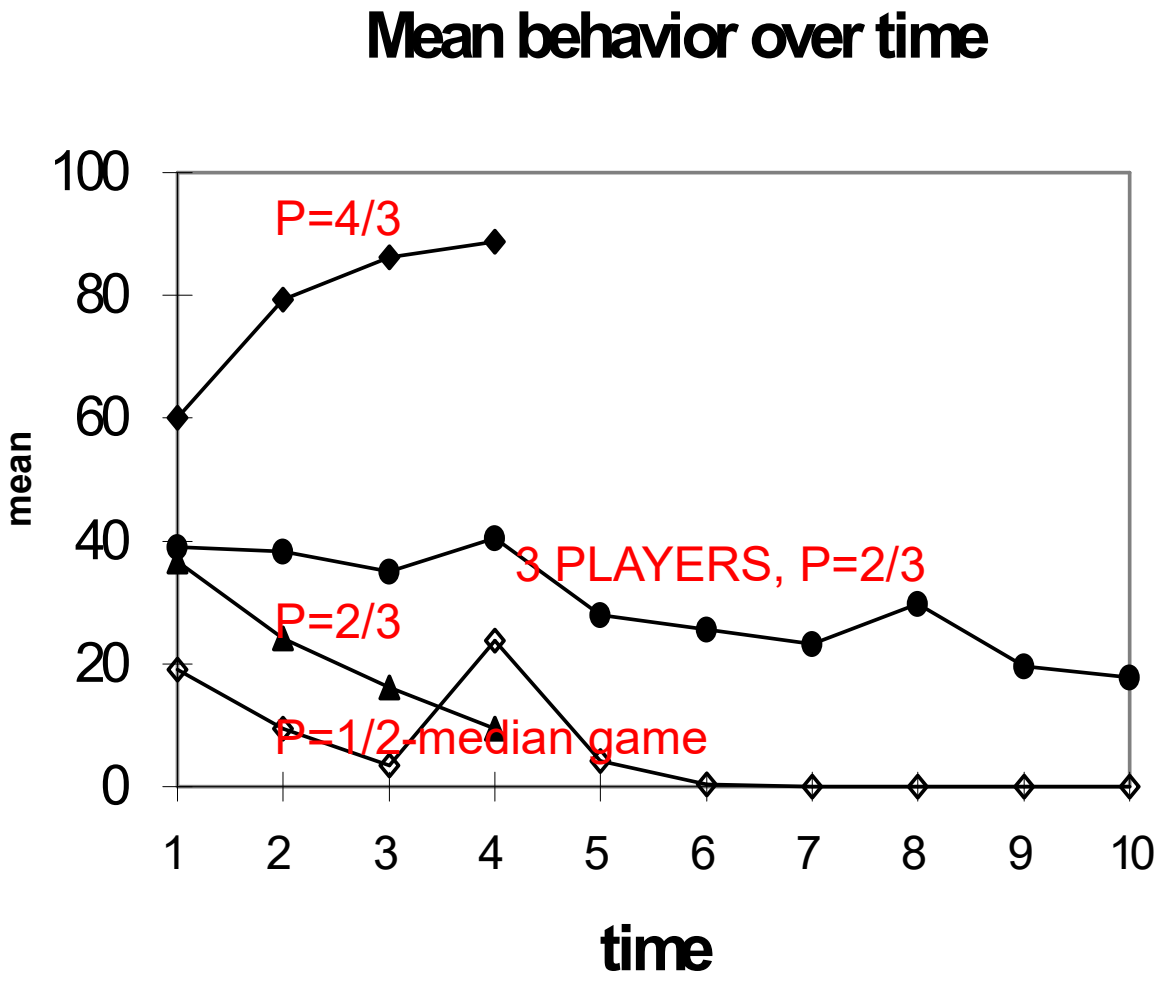
MEAN 17.15



MEAN: 22.16



MEAN 23.08



Nagel 1995, Camerer, Ho AER 1998)

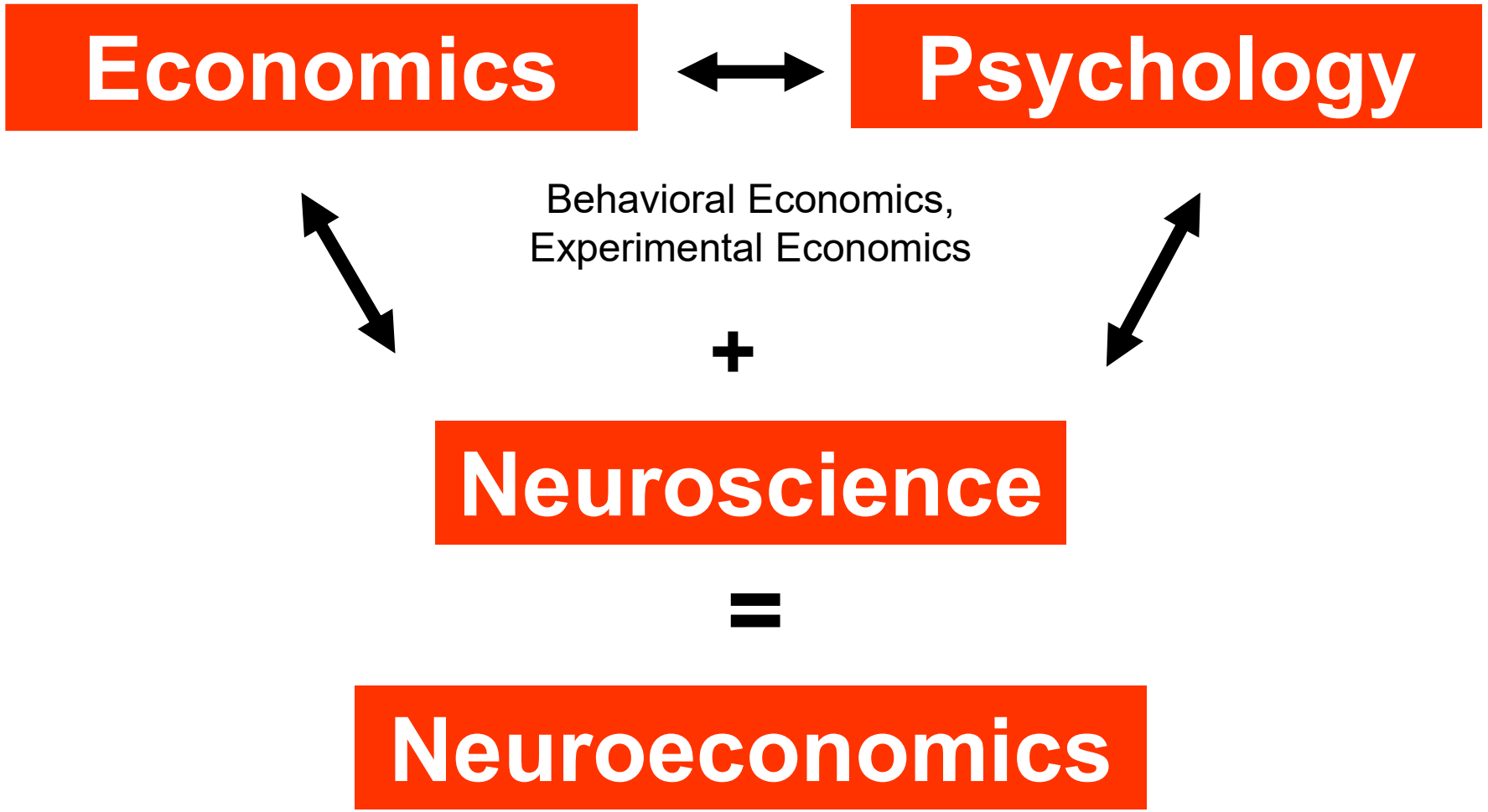
Beauty Contest Game

Or, to change the metaphor slightly, professional investment may be likened to those newspaper competitions in which the competitors have to pick out the six prettiest faces from a hundred photographs, the prize being awarded to the competitor whose choice most nearly corresponds to the average preferences of the competitors as a whole; so that each competitor has to pick not those faces which he himself finds prettiest, but those which he thinks likeliest to catch the fancy of the other competitors, all of whom are looking at the problem from the same point of view. It is not a case of choosing those 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.

Keynes (1936, p. 156)

What does it mean for the real world?

- When there is low rationality economic outcomes look different from the rational model
- Different policy implications


Economics
Psychology
Behavioral Economics,
Experimental Economics
+
Neuroscience
=
Neuroeconomics

Example of MRI scanner

Scanner

- a very powerful electro-magnet
- field strength of 3 teslas (T), ~60,000 times greater than the Earth's field

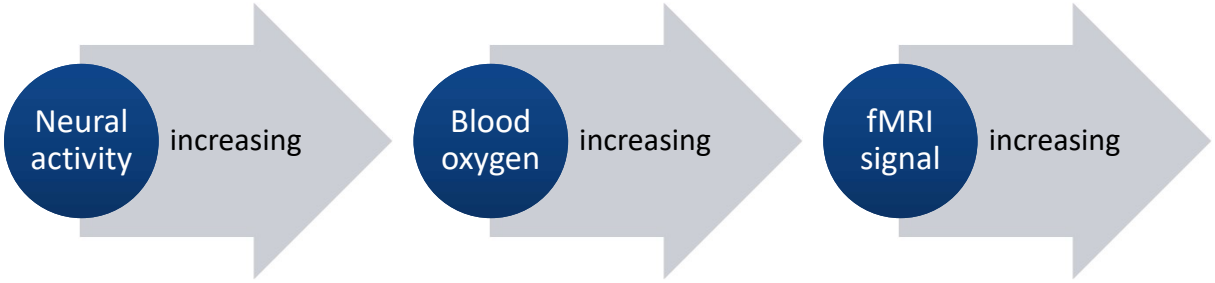
During the experiment:

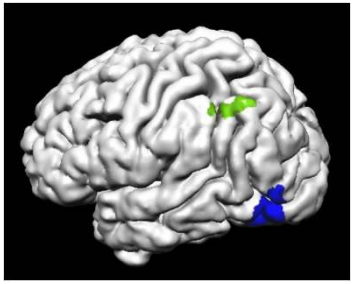
- subject lies in the scanner and is exposed to the stimuli
- scanner tracks the signal throughout the brain

Nature of fMRI activation

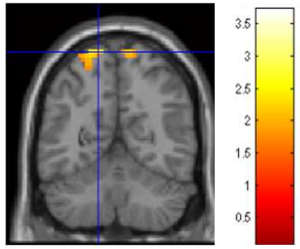
- When a brain area is more active it consumes more oxygen
- Changes in blood flow and blood oxygenation in the brain are indirect measures of neural activity

  (Blood Oxygenation Level Dependent (BOLD) signal)



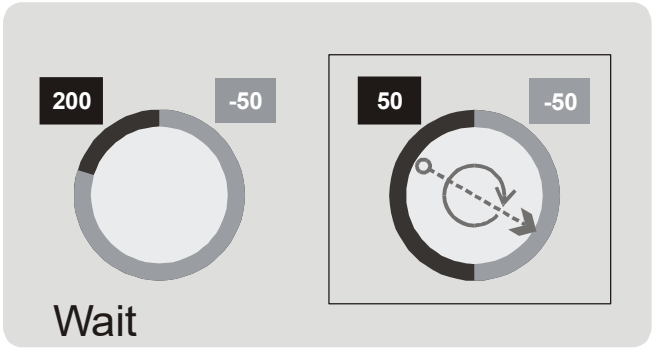


- Data is usually transformed into "activation" maps
- Activation maps show which parts of the brain are involved in a particular mental process



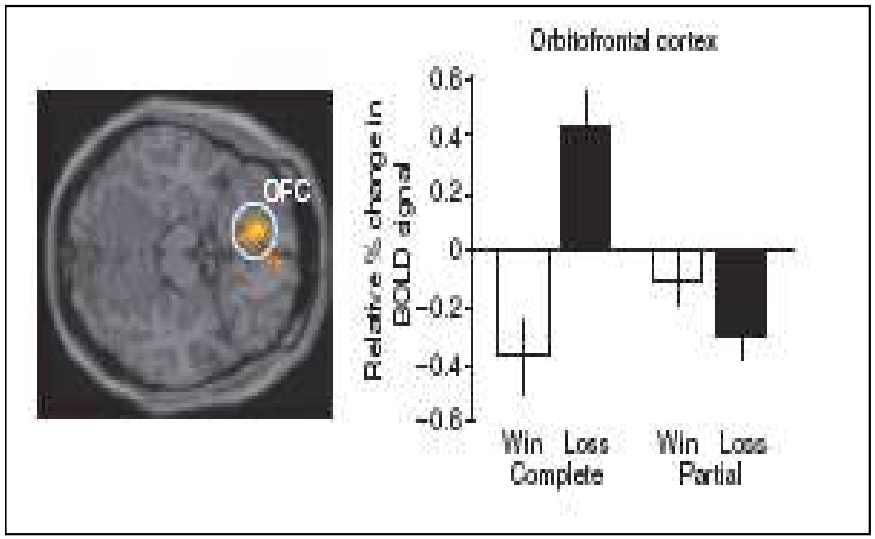
Objective of design: Link between stimulus (model, rules), behavior, biological data (e.g. brain activity), to find out thought processes

Stimulus



e.g. inside scanner

Behavior



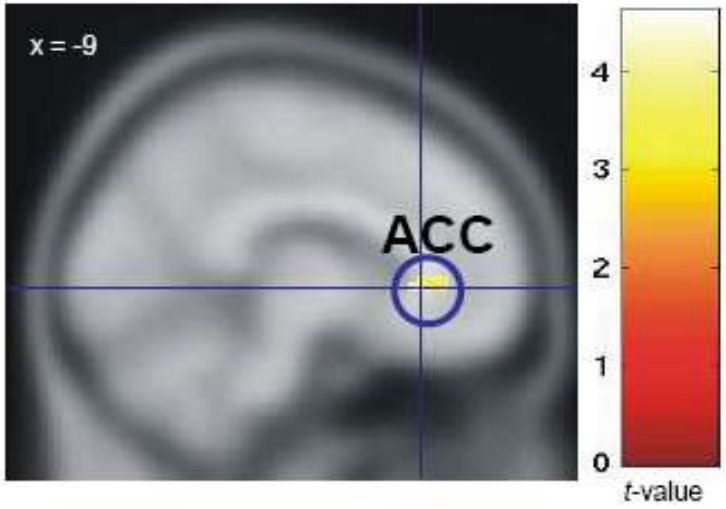
Economic/behavioral models

e.g.
- expected utility
- risk aversion
- risk loving
- regret models

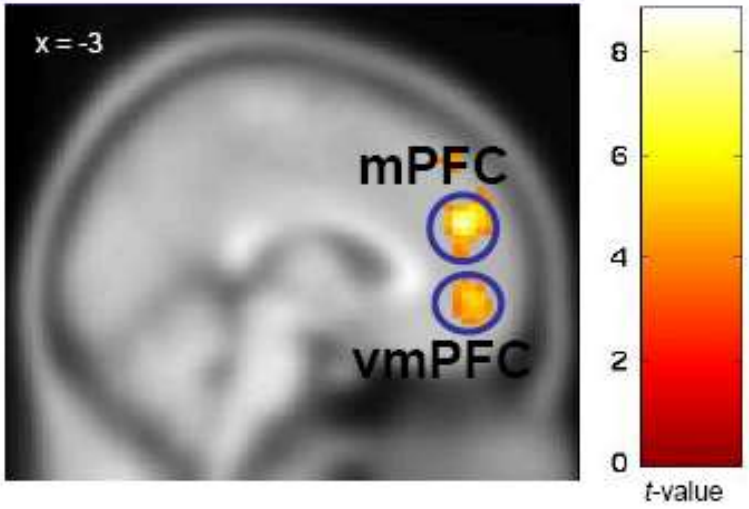
Adapted from Camerer et al. 2010

High vs. low level of reasoning

Low level of reasoning



High level of reasoning

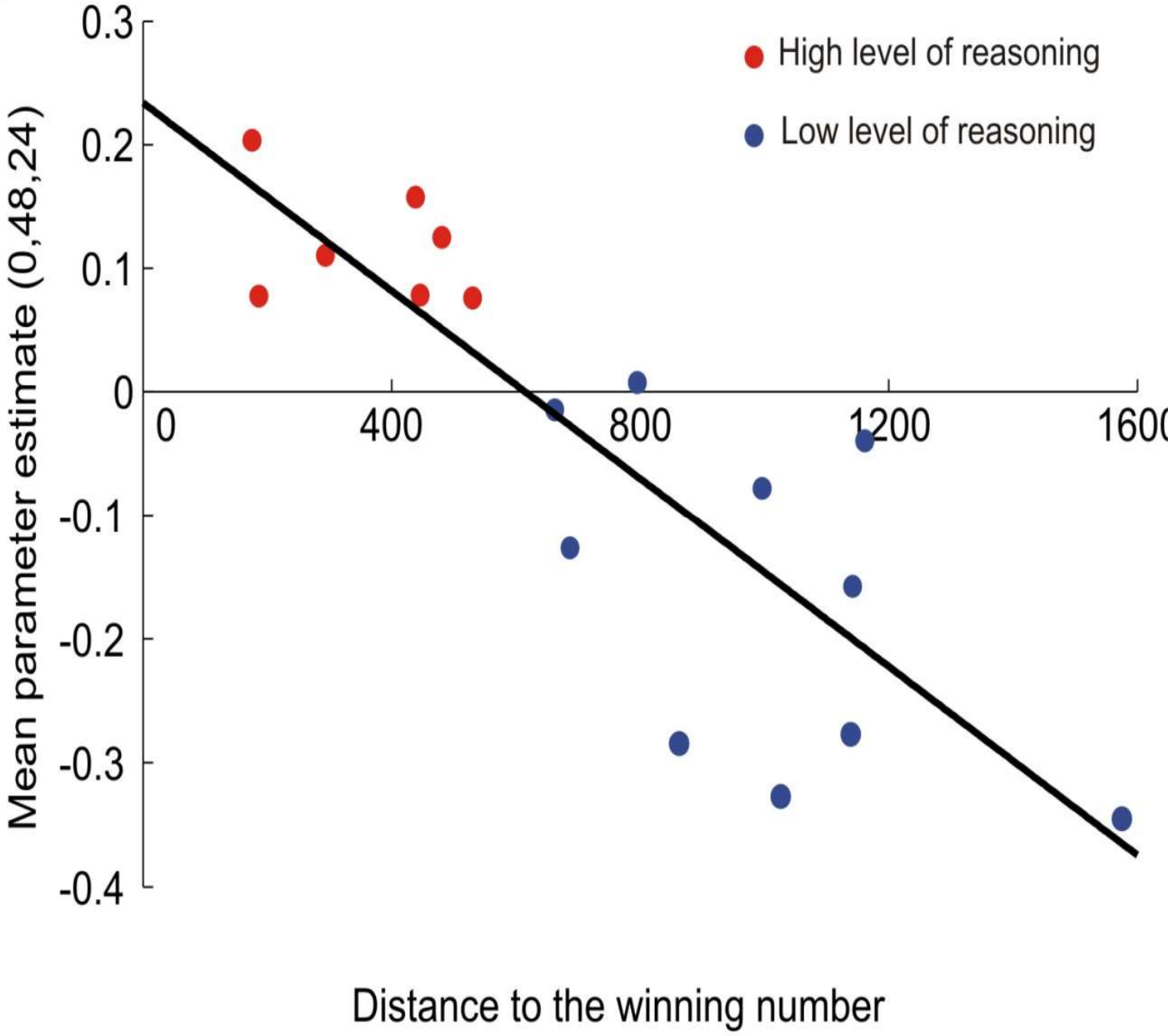


"CHOOSING 33"

"CHOOSING 22"

Coricelli Nagel (PNAS 2009)

MNI x=0, y=48, z=24



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sequence 2 (of 2) chapter 6, starts at about minute 30. You have to select Season 2.

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Financial markets

Definition

- *"A bubble may be defined loosely as a sharp rise the price of an asset …, with the initial rise generating expectations of further rises and attracting new buyers – generally speculators interested in profits from trading in the asset rather than its use or earning capacity*."

  -- Charles Kindleberger, *The New Palgrave*

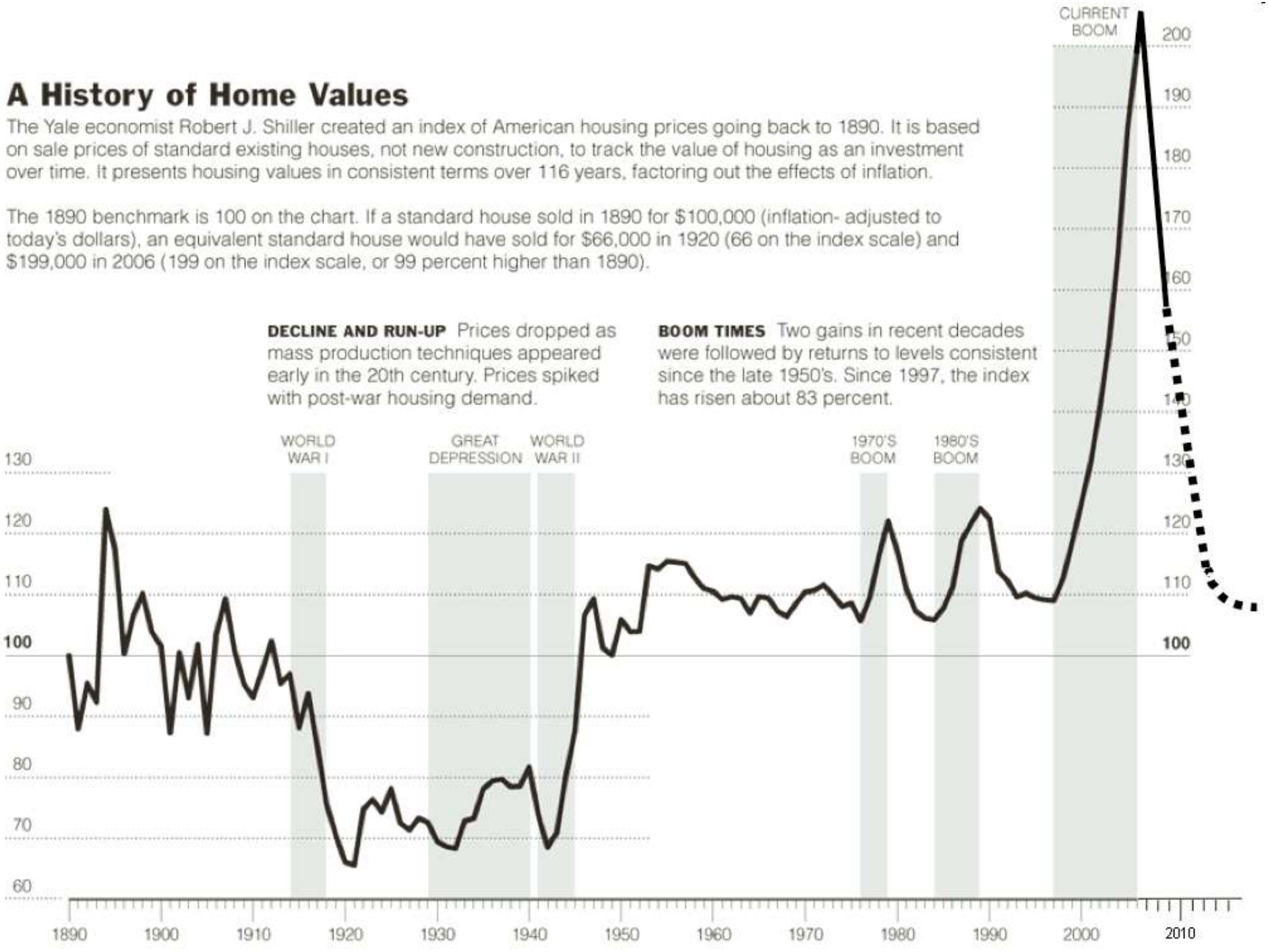
Can bubbles persist?

- Keynes (1936)
- "It might have been supposed that *competition between expert professionals*, possessing judgment and knowledge beyond that of the average private investor, would correct the vagaries of the ignorant individual left to himself."
- Fama (1965)
  "If there are many sophisticated traders in the market, they may cause these "bubbles" to burst before they really get under way."

A History of Home Values

The Yale economist Robert J. Shiller created an index of American housing prices going back to 1890. It is based on sale prices of standard existing houses, not new construction, to track the value of housing as an investment over time. It presents housing values in consistent terms over 116 years, factoring out the effects of inflation.

The 1890 benchmark is 100 on the chart. If a standard house sold in 1890 for $100,000 (inflation- adjusted to today's dollars), an equivalent standard house would have sold for $66,000 in 1920 (66 on the index scale) and $199,000 in 2006 (199 on the index scale, or 99 percent higher than 1890).



Source: "Irrational Exuberance," 2nd Edition, 2006, by Robert J. Shiller

Bill Marsh/The New York Times

Why a lab experiment?

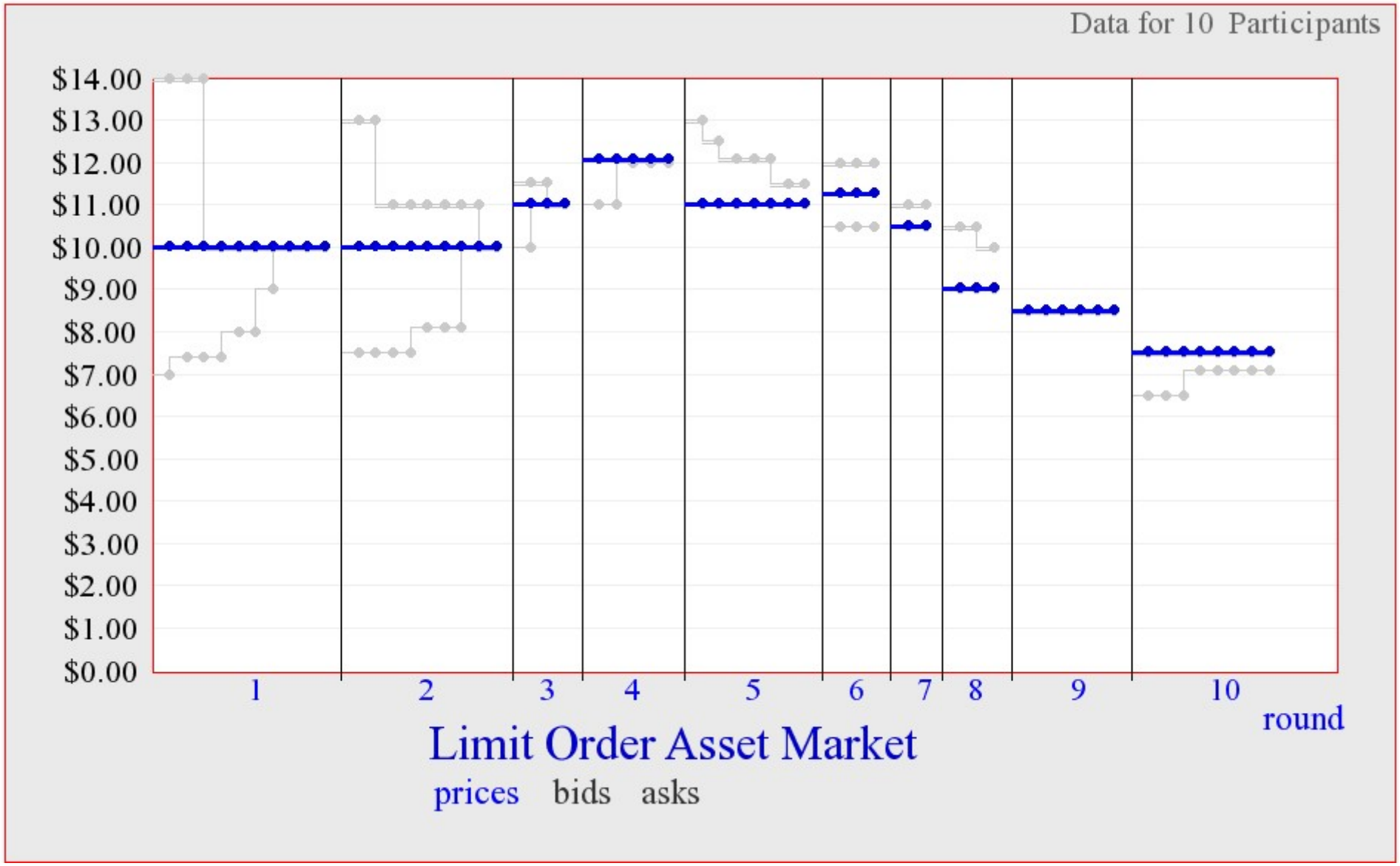
- Too many unknowns in the real world
- Control of important variables: Here:
  - Fundamental values (at least known to the experimenter)
  - Borrowing constraints are the same for all
  - Time horizon the same for all
  - Experience level of subjects can be made the same (repetition of the same market)
  - Controlled centralized market: here call market
  - Control of reason to buy/sell. In contrast e.g. in housing market, need for a house

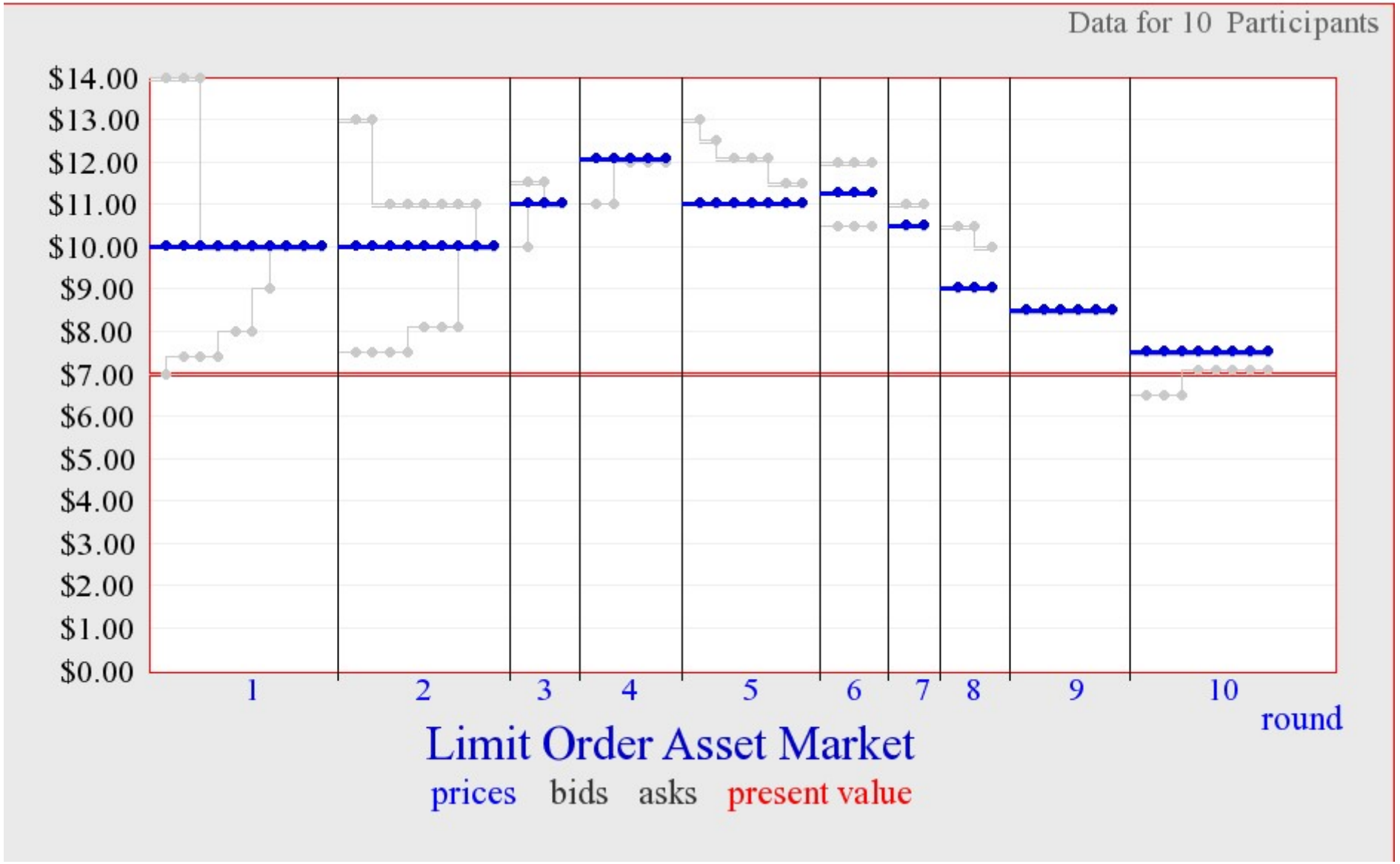
What should you bid

- If all were perfectly rational?
- P*i=D why?

- What to bid when you know that the others are not understanding the theory?

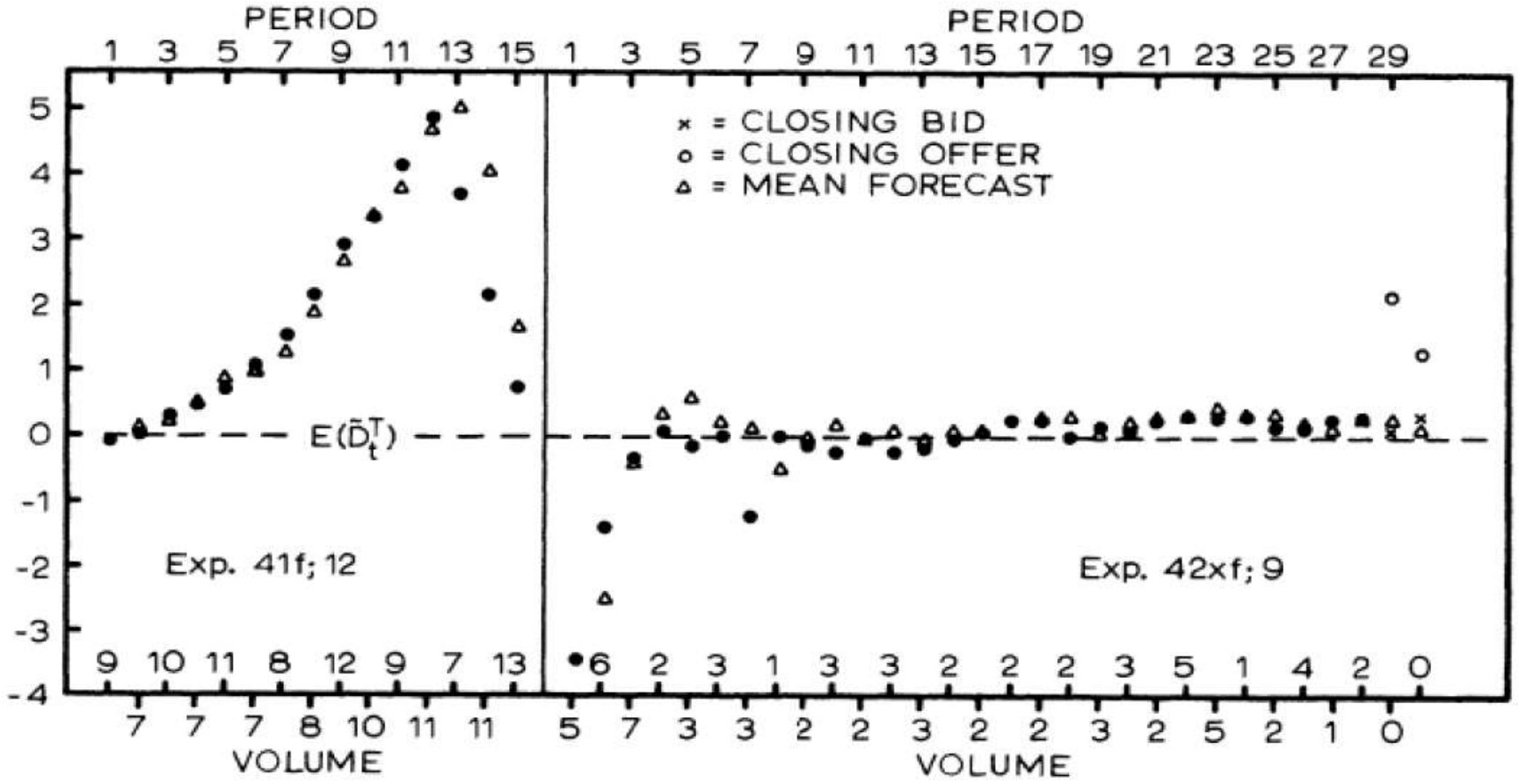
Are you different from others?




Data for 10 Participants
$14.00
$13.00
$12.00
$11.00
$10.00
$9.00
$8.00
$7.00
$6.00
$5.00
$4.00
$3.00
$2.00
$1.00
$0.00
1
2
3
4
5
6
7
8
9
10
round
Limit Order Asset Market
prices bids asks present value


Data for 13 Participants
$30.00
$27.00
$24.00
$21.00
$18.00
$15.00
$12.00
$9.00
$6.00
$3.00
$0.00
5
10
15
20
round
Limit Order Asset Market
prices bids asks
January 11 2013

Bubbles Often Disappear With Experienced Subjects (Two 15 Round Sessions)



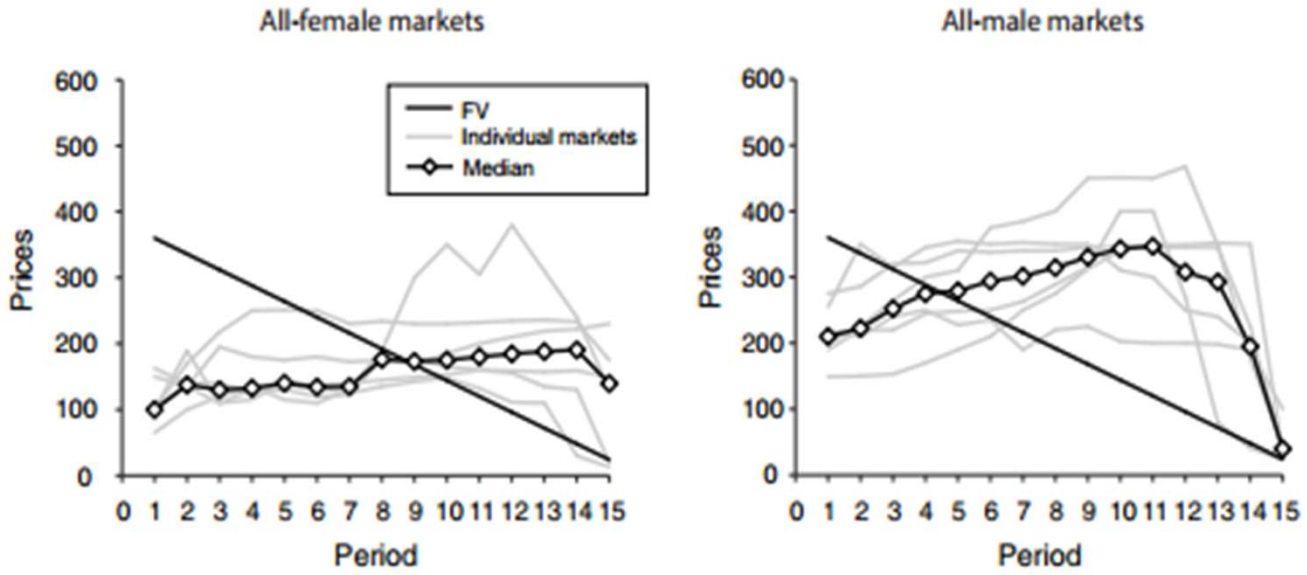


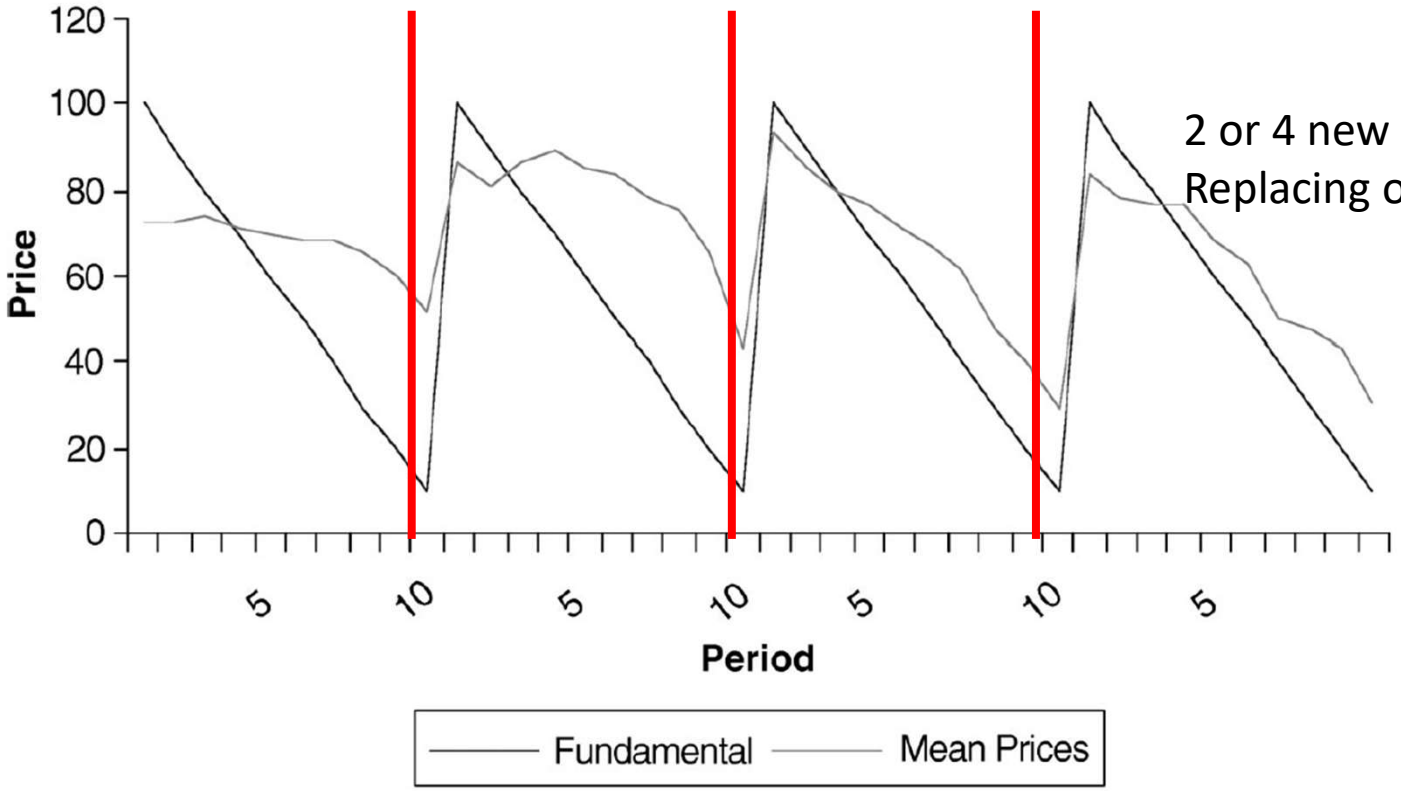
FIGURE 1. TIME SERIES OF MEDIAN TRANSACTION PRICES

Note: Median prices of individual markets (gray lines), fundamental value (FV, bold line), and average of median session prices (black line with diamonds) for each period.

Dufwenberg et al. AER 2005

Design:

- 6 subjects play 10 periods of one market game;
- the same market game with the same subjects is repeated again twice
- In the fourth game 2 or 4 subjects are replaced by inexperienced subjects



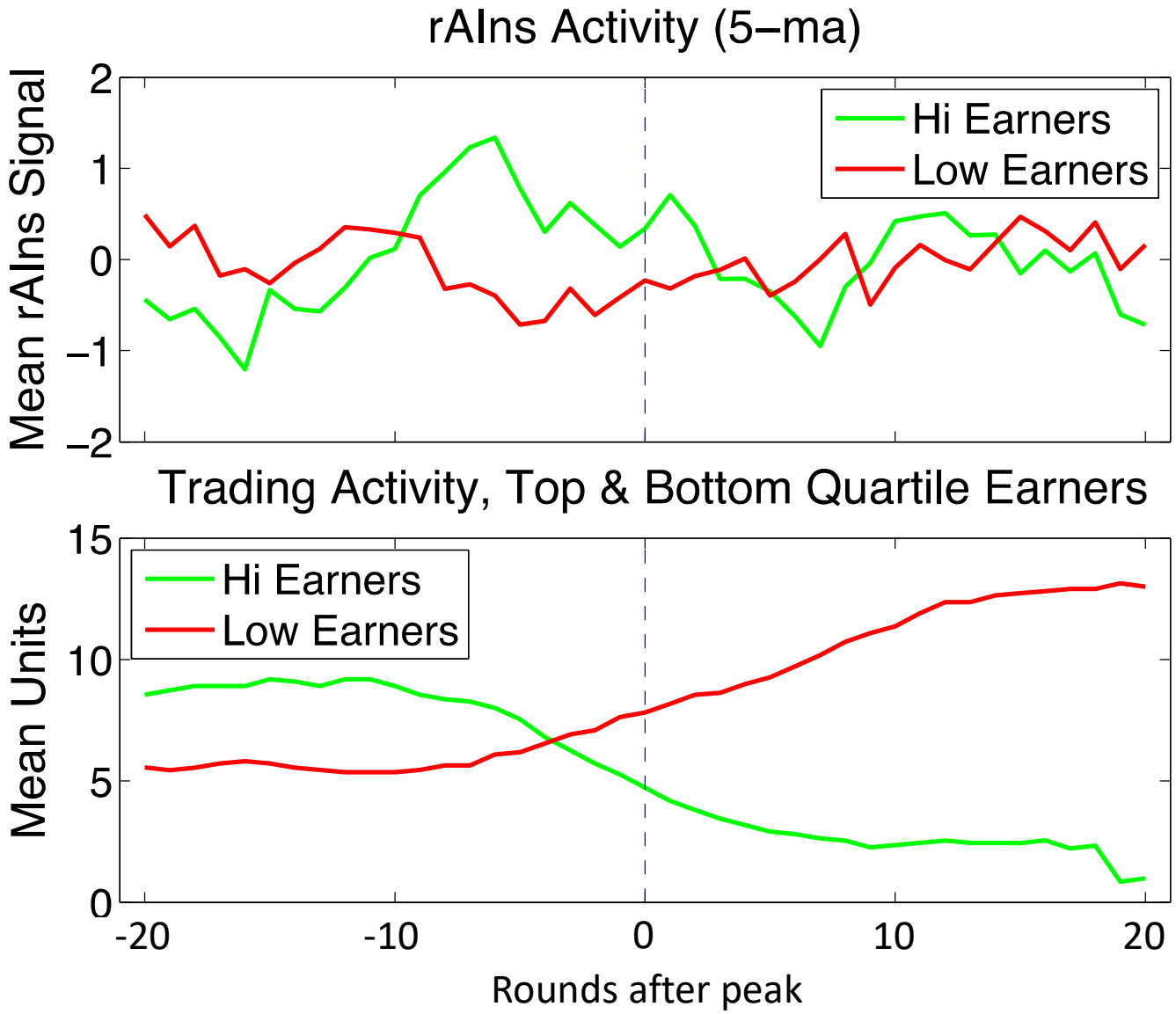
2 or 4 new subjects
Replacing old subjects

FIGURE 1. OBSERVED MEAN PRICES AND FUNDAMENTAL VALUES

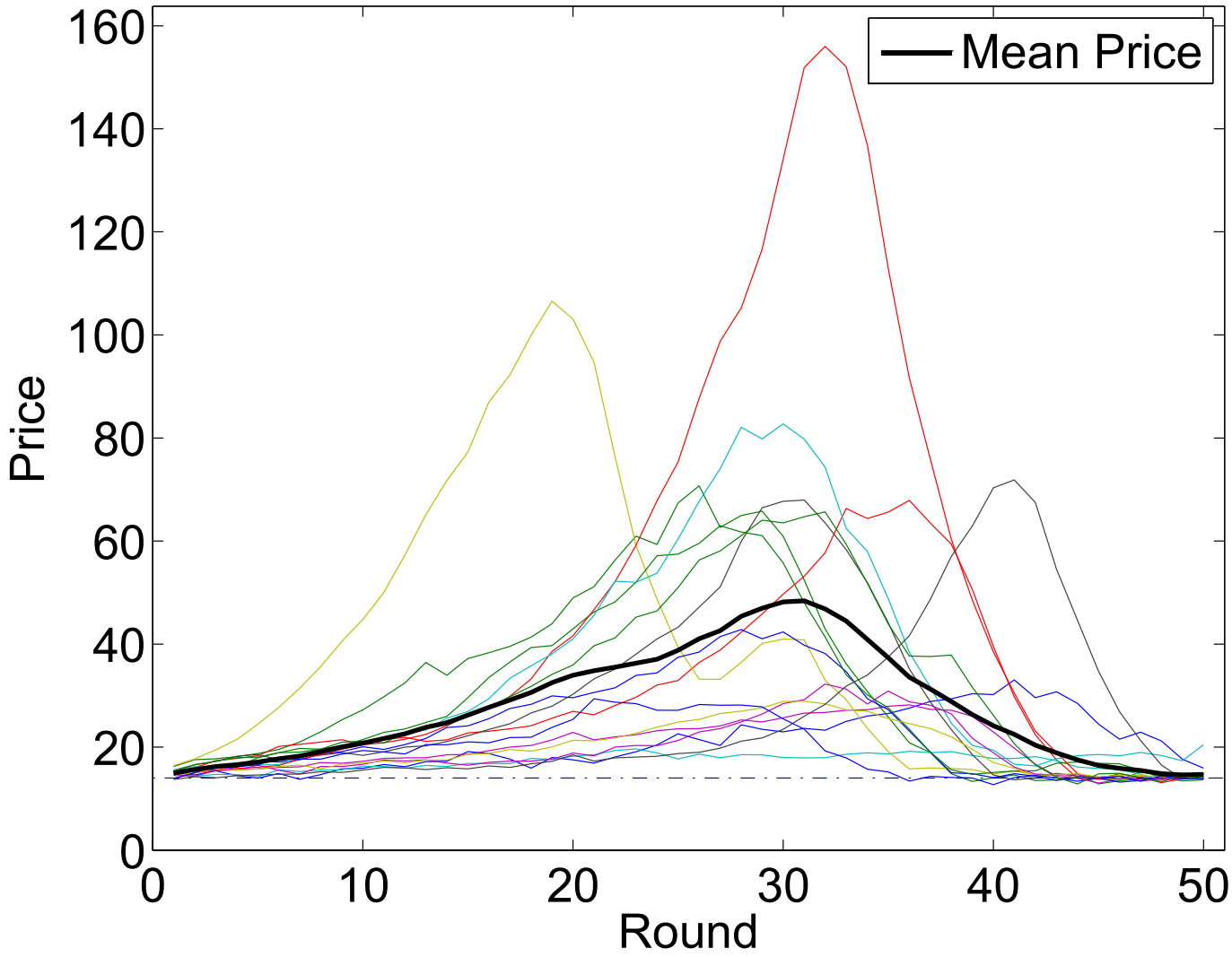
Another neuro economics study with financial markets creating bubbles

Question:

Brain of those who win vs those who loose


rAIns Activity (5–ma)
Mean rAIns Signal
2
1
0
−1
−2
Hi Earners
Low Earners
Trading Activity, Top & Bottom Quartile Earners
Mean Units
15
10
5
0
Hi Earners
Low Earners
-20
-10
0
10
20
Rounds after peak

Market Prices, 16 Sessions



Discussion: Insula

- We find evidence for a neural “early warning” signal in the right anterior insula
- Insula activity associated with awareness of bodily states, pain, risk, gut feelings & emotion
- Suggests causal changes that increase insula activity could reduce bubbles

Conclusion

- We can do experiments in economics
- Create real world phenomena in the lab
- Discuss actional behavior vs rational behavior