



Experimental Economics: An Introduction

Joseph Tao-yi Wang


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What is Experimental Economics?

- Science (Wikipedia)
 - “[A] system of acquiring knowledge based on the scientific method, ... [or] the organized body of knowledge gained through such research.”
 - What is the “Scientific Method”?
- 


What is Experimental Economics?

- Scientific Methods: (Wikipedia)
 - The scientific method seeks to explain the events of nature in a reproducible way, and to use these reproductions to make useful predictions. It is done through observation of natural phenomena, and/or through experimentation that tries to simulate natural events under controlled conditions.
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What is Experimental Economics?

- Experimental Economics is the field of economics that seeks “experimentation that tries to simulate natural (economic) events under controlled conditions”
 - Other empirical work are “observation of natural (economic) phenomena”
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Two Traditions of Experimental Economics

- Two Nobel Laureates of 2002
 - Vernon Smith
 - Market Experiments
 - Experimental Economics = Economic Science
 - Daniel Kahneman
 - Bringing Psychology into Economics
 - The two traditions interacted and grew...
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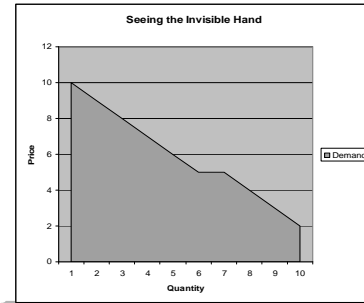
Two Traditions of Experimental Economics

1. Market Experiments and Market Design:
 - How Adam Smith’s “invisible hand” really works
 2. Behavioral Game Theory:
 - What players actually do in games
- Like Two Traditions in Economic Theory:
- General Equilibrium Theory
 - Game Theory
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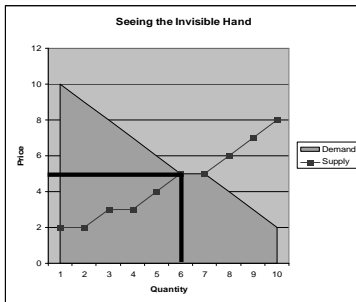
Market Experiments and Market Design

- The Pit Market
 - Chamberlin (JPE, 1948)
 - Smith (JPE, 1962)
- Experiment: Seeing the Invisible Hand
 - Ran in Principles of Microeconomics Class
 - See instructions

Seeing the Invisible Hand



Seeing the Invisible Hand



Seeing the Invisible Hand

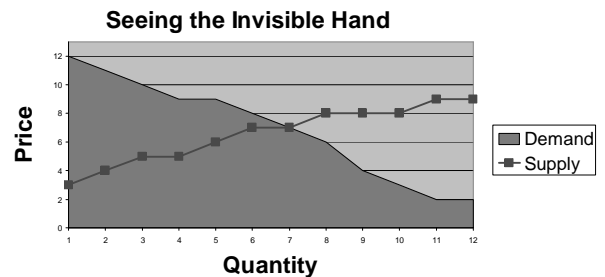
- Price Sequence:
 - Pit Market A: 6, 6, 6, 8, 5, 6, 6
 - Pit Market B: 5, 5, 4, 6, 6, 6, 7
 - Double Auction A: 5, 5, 5, 5, 5
 - Double Auction B: 5, 5, 6, 6, 6
 - Double Auction A: 4, 5, 5, 6, 5, 5

Seeing the Invisible Hand

回合		價格	買方利潤	賣方利潤
1	平均值	6.1	1	2
	變異數	0.8	5.3	2.7
2	平均值	5.6	1.6	2.1
	變異數	1.0	1.3	1.5
3	平均值	5	3	2.2
	變異數	0	2.5	0.7
4	平均值	5.6	2.4	2.2
	變異數	0.3	2.8	1.2
5	平均值	5	2.5	1.8
	變異數	0.4	2.3	0.6

Seeing the Invisible Hand

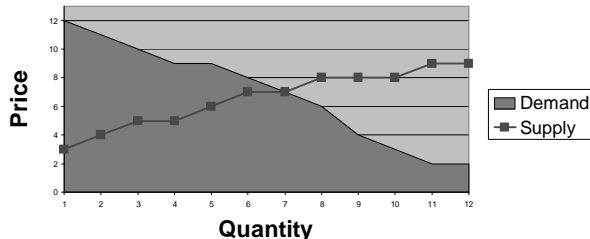
- Pit Market 1: 5, 6, 5, 3, 8, 8, 8
- Pit Market 2: 6, 4, 8, 4, 6, 7, 7, 5



Seeing the Invisible Hand

- Double Auction 1: 6,10,7, 7, 7, 8, 8, 7
- Double Auction 2: 7, 6, 6, 6, 6, 7, 7, 7 (mistake?)

Seeing the Invisible Hand



Behavioral Game Theory

- We will go over Camerer (2003)
- Colin F. Camerer (2003), "*Behavioral Game Theory*", Princeton University Press
- Topic today: BGT, Chapter 1 - Introduction

Outline: BGT, Ch. 1: Introduction

1. What is Game Theory Good For?
2. Three Examples:
 1. Ultimatum Bargaining
 2. Continental Divide
 3. Beauty Contests
3. Experimental Regularity & Beh. Game Th.
4. Conclusion
 - Appendix: Basic Game Theory
 - Appendix: Experimental Design

What is Game Theory?

- Game Theory is about what happens when people---or genes, or nations---interact.
 - Strategies, Players, Utility
 - Von Neumann and Morgenstern (1944)
 - Nash Equilibrium (Nash, PNAS, 1950)
 - Types (Harsanyi, MS, 1967-68)
- The power of game theory is its generality and mathematical precision

What is Game Theory?

- Game: A taxonomy of strategic situations
- Analytical Game Theory:
 - A mathematical derivation of what players with different cognitive capabilities are likely to do in games.
- Possible Problems:
 - Highly mathematical
 - Based on introspection and guesses, not observations about how people actually play

What is Behavioral Game Theory?

- Von Neumann and Morgenstern (1944):
 - Our knowledge of the relevant facts of economics is incomparably smaller than that commanded in physics at the time when mathematization of that subject was achieved... It would have been absurd in physics to expect Kepler and Newton without Tycho Brahe---and there is no reason to hope for an easier development in economics.
- BGT is about what players actually do.
 - Utilize results from hundreds of experiments in which people interact strategically

What is Game Theory Good For?

- Is Game Theory meant to
 - Predict what people do,
 - Explain why people act in certain ways, or
 - Advise people what to do?
- A case study on auction theory and its role in real world auctions
 - Auction Theory vs. Experimental Evidence
 - Auction Theory vs. Real world auction design

Three Examples

- Goal:
 - Show how BGT can explain what people do more accurately by extending analytical game theory to include social preferences (fairness), limited strategic thinking, and learning.
- Three Examples:
 1. Ultimatum Bargaining
 2. Continental Divide
 3. Beauty Contests

Example 1: Ultimatum Bargaining

- Photographer vs. Tourist Story
- AGT Predictions
 - Responders accept any low offer
 - Proposers offer “unfairly” (99-1, 90-10, etc.)
- Experimental Results
 - Responders reject “unfair” offers
 - Proposers often offer “fairly” (50-50)
- BGT Explanation: Negative Reciprocity

Example 1: Ultimatum Bargaining

- Responders don't maximize own earnings
 - Still thinking strategically (w/ social preferences)
- Further Investigation:
 - Negative Reciprocity primitive societies under different culture of “fairness” (Ch.2)
 - Knoch, ..., Fehr, Science 2006
 - TMS someone's DLPFC, and s/he will accept “unfair” offers

Example 2: Continental Divide

- Location Problem: S. Valley or Hollywood?
- Seven people a group, each choose 1~14
- Your choice and “median of the group” determines your payoff
 - Main part of the payoff matrix in the next slide
- Key Feature:
 - Pick low if others pick low
 - Pick high if others pick high

Example 2: Continental Divide

	3	4	5	6	7	8	9	10	11	12
3	60	66	70	74	72	1	-20	-32	-41	-48
4	58	65	71	77	80	26	8	-2	-9	-14
5	52	60	69	77	83	46	32	25	19	15
6	42	52	62	72	82	62	53	47	43	41
7	28	40	51	64	78	75	69	66	64	63
8	11	23	37	51	69	83	81	80	80	80
9	-11	3	18	35	57	88	89	91	92	94
10	-37	-21	-4	15	40	89	94	98	101	104
11	-66	-49	-31	-9	20	85	94	100	105	110
12	-100	-82	-61	-37	5	78	91	99	106	112

Example 2: Continental Divide

- Location Problem: S. Valley or Hollywood?
- AGT Predictions
 - Multiple Equilibrium: 3 or 12
- Experimental Results
 - People don't always gravitate toward Good Eq.
 - Small history accidents have a big LR impact
- BGT Explanation
 - Learning in the basin of attraction
 - Initial Conditions: Lucky 7 vs. Lucky 8?

Example 3: Beauty Contest

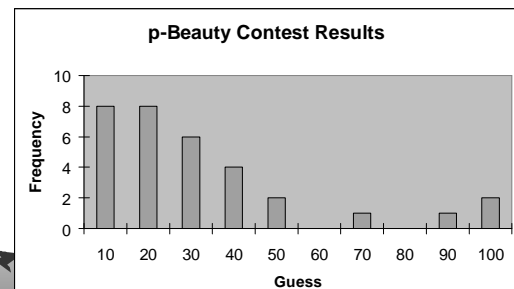
- Keynes (1936, p. 156)
 - It is not a case of choosing those which, to the best of one's judgment, are really the prettiest, nor even those which average opinion genuinely thinks the prettiest. We have reached the third degree, where we devote our intelligences to anticipating what average opinion expects the average opinion to be. And there are some, I believe, who practice the fourth, fifth, and higher degrees.

Example 3: Beauty Contest

- AGT Predictions
 - Unique Nash: Choose 0 (dominant solvable)
- Experimental Results
 - First-round choices around 21-40
 - Converge to 0 within 10 rounds
- BGT Explanations
 - Limited iterated reasoning (level-k models)
 - Learning Theory: Towards equilibrium

Result from Last Time

- Average = 27.75; Target = 18.5 (all data)
- Average = 20.93; Target = 13.95 (excluding 3...)



Experimental Regularity & BGT

- The goal is to *improve* game theory by establishing regularity & inspiring new th'y.
- Why has empirical observation played a small role in game theory until recently?
- How others react to data?
 - People are confused, not motivated
 - Experimental designs are all bad
 - People were playing a different game
 - Non-rational behavior cannot be modeled

Conclusion

- AGT → Experimental Regularities → BGT
- Three Examples
- Want to see more?
 - Come next time and see more...
- Appendix: Basic Game Theory
 - Note the last section on QRE!
- Readings: BGT, ch.1; MGS: ch.1-5