Lectures on Experimental Economics

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My lectures are written to my students. Please talk to me before circulating the notes. I deeply appreciate all comments and help to improve these lecture notes.

Syllabus

Objective: The main purpose of this course is to understand how experiments work and why they are important to economics. The volume of the material surrounding experimental economics is quite large and it is impossible to review it all in one semester. Nevertheless the topics that we are going to review build up the core of the field and without a doubt cover the most important ideas. This means that the course is designed to review the classic papers that gave birth to the field (or made a major modification to microeconomics). But don't get the wrong idea, the course will be full of frontier papers (I think 80% of the papers will be quite new). At the end of the course the approved student will understand how a experiment must be designed, what kind of experiments have changed the classical microeconomic theory, what are the theoretical implications and finally how does the researcher obtains the important results (i. e. econometrics).

Approve: This course is far from being an easy course, and probably will consume an important part of your time during the semester. My recommendation to approve the course is to study a lot. It is almost impossible to approve just reading the class notes and reading some papers. HARD WORK is required to approve. We will review more than one paper per class and it is expected that the student will read the paper at least once before entering the classroom, more readings will be needed to complete homework or to fully understand the theory.

Ethics: I believe that as future economists you should always be guided by social norms and ethic codes. According to the former idea you might NEVER cheat or copy in a homework, exam or whatever. Those students failing to behave honestly will be punished with an automatic D.A. with no consideration to negotiate. My grading scheme is designed to fail anyone that receives a D.A., so please don't try to make tricks on me. It is important to be respectful with others ideas, please be kind with everybody questions and pay attention to all ideas, they might appear on the exams or quizzes.

Grading scheme

- Two Partials exams, 30% of the final grade
- Problem Sets (around five), 20% of the final grade
- Final evaluation, 20% of the final grade
- 6 or 5 quizzes, 20% of the final grade
- Reading Controls, 10% of the final grade
- Bonus, extra 10% and will be only available for 2 or 3 students

Exams: The first partial exam will be on February 15, the second partial exam will be on April 5 and the final evaluation will be on May 10. These dates are fixed and I will not move any exam for any reason. So if you have more than one exam this day I suggest to you to try to move the other exam(s), otherwise good luck. Both partial exams cover all the topics we review in class or in the homework. The second partial exam covers the topics of the second partial and the first one. The final evaluation will be designed to be presented in teams or individual and will not be a paper based exam, perhaps a final work or an oral evaluation.

Quizzes: There will be 5 or 6 surprise quizzes. The quizzes will be one or two short questions about the material covered last week. The quizzes will be applied at 7:07 with a maximum length of 10 minutes. If you arrive later than 7:17 you will not have access to the quiz and will count as zero. Nevertheless you should come to class even if you miss the quiz, otherwise you will miss important material.

Problem-Sets: There will be 4 or 5 problem sets. The problem sets will have to be completed between two weeks you receive it. The problem sets are complicated and will require a lot of time to complete them, so start them as soon as possible. You might work in groups, pairs or whatever. Nevertheless you must deliver a personal problem set. This means that although you work with your friends, your opinion and personal questions must

be answered by yourself. The problem sets must be delivered physically to my box on the professor's office at the day we agreed. If you do not deliver the problem set on the death line your grade will automatically fall 20 points per day you miss.

Reading-Controls: The reading controls must be one page long and must answer the following questions. What is the relevant question of the paper and why is important? What is the perfect experiment to answer this question? What limitations does the researcher(s) has/have? What kind of data the author(s) use? Does the author answers the question? Are you convinced of their results and What will you do to improve the paper?. All the reports should be delivered in the classroom on the date we agreed. No late reports will be accepted.

Bonus: At the last part of the course there will be guest speakers to talk about their experiments and research. If you can ask a clever and relevant question to the speaker you might be eligible to the bonus. There will be 3 speakers, two of them were my classmates on my masters and the last one is my actual boss and former thesis adviser. I hope to finish the course earlier so we could invite more speakers, but I don't know that yet. I need to mention that in my exams there will be bonuses questions unrelated to the class, this bonuses counts only for the exam.

Topics

- Econometrics and Microeconomics Quick Review
- Introduction to Experiments
  - Angrist, J. and J. Pischke (2009) "Mostly Harmless Econometrics", Princeton, Chapters 1 and 2.
  - Duflo, E., R. Glennerster, and M. Kremer (2007) "Using Randomization in Development Economics Research: A ToolKit" Discussion Paper No. 6059
  - List, J. A. and I. Rasul (2011) "Field Experiments in Labor Economics". In Handbook of Labor Economics, eds. Ashenfelter, O. and D. Card, Vol. 4 104-213
  - Charness, G. and P. Kuhn (2011) "Lab Labor: what can labor economist learn from the lab?".In Handbook of Labor Economics, eds. Ashenfelter, O. and D. Card, Vol. 4 231-315
- Incentives
  - Gneezy, U., and A. Rustichini "A Fine is a Price," Journal of Legal Studies, vol. XXIX, 1, part 1, 2000, 1-18.
  - Gneezy, U., and A. Rustichini "Pay Enough or Don't Pay At All" Quarterly Journal of Economics August 2000, 791-810
  - Ariely, D., U. Gneezy, G. Loewenstein and N. Mazar (2008) "Large Stakes and Big Mistakes." Forthcoming in the Review of Economic Studies
- Behavioral Preferences, Elicitation Valuations
  - Kahneman, Daniel, Jack L. Knetsch, and Richard H. Thaler 1990, "Experimental Tests of the Endowment Effect and the Coase Theorem," JPE, 98, 6, 1325-1348
  - Dan Ariely, George Loewenstein and Drazen Prelec (2003), "Coherent Arbitrariness: Stable Demand Curves without Stable Preferences," Quarterly Journal of Economics, No.118 (1), (February), 73-105
  - Kahneman, Daniel, Peter Wakker and Rakesh Sarin, 1997, "Back to Bentham? Explorations of Experienced Utility", Quarterly Journal of Economics
  - Furche, Andreas and David Johnstone "Evidence of the Endowment Effect in Stock Market Order Placement",
- Guessing Games: Individual Rationality
  - Nagel, Rosemarie, "Unraveling in Guessing Games: An Experimental Study," American Economic Review 85(5), (1995) 1313-1326
  - Grosskopf, Brit, and Rosemarie Nagel, "Rational Reasoning or Adaptive Behavior? Evidence from Two-Person Beauty Contest Games". Games and Economic Behavior

- Minimum Game
  - Van Huyck, Battalio and Beil "Asset Markets as an Equilibrium Selection Mechanism: coordination failure, game form auctions, and forward induction."
  - Strategic Uncertainty, Equilibrium Selection, and Coordination Failure in Average Opinion Games," The Quarterly Journal of Economics, 106(3), August 1991, 885-911
  - Tacit Coordination Games, Strategic Uncertainty, and Coordination Failure," American Economic Review, March 1990, 234-248
- Bargaring Games,Fairness
  - Roth, A.E. and Malouf, M.K. "Game-Theoretic Models and the Role of Information in Bargaining", Psychological Review, Vol. 86, 1979, 574-594
  - Roth, A.E. and Murnighan, J.K. "The Role of Information in Bargaining: An Experimental Study," Econometrica, Vol. 50, 1982, 1123-1142
  - Roth, Murnighan and Schoumaker, "The Deadline Effect in Bargaining: Some Experimental Evidence," AER, 1988
  - Roth, A.E. and Schoumaker, F. "Expectations and Reputations in Bargaining: An Experimental Study", American Economic Review, Vol. 73, 1983, 362-372
  - Babcock, Loewenstein, Isacharoff and Camerer, 1995, "Self-Serving Bias and Bargaining Impasse" AER '95
  - Babcock, Linda, Xianghong Wang and George Loewenstein, 1996, "Choosing the wring pond: Social Comparisons in negotiations that reflect a self-serving bias," QJE
  - Gueth, Werner, Rolf Schmittberger und Bernd Schwarze, 1982, "An experimental analysis of ultimatum bargaining", Journal of Economic Behavior and Organization 3(4), 367-388.
- Trust Game, Best Shot Games
  - J. Berg, J Dickhaut. and K. McCabe "Trust, Reciprocity and Social History," with, Games and Economic Behavior, 1995
  - Harrison, Glenn W. and Jack Hirshleifer, "An Experimental Evaluation of Weakest Link/Best Shot Models of Public Goods," Journal of Political Economy, 97, 1989, 201-225
  - Prasnikar V. and Roth, A.E. "Considerations of Fairness and Strategy: Experimental Data From Sequential Games," Quarterly Journal of Economics, August, 1992, 865-888
- Discrimination
  - Fershtman, C., and U. Gneezy "Discrimination in a Segmented Society: An Experimental Approach Quarterly Journal of Economics, February 2001, 351- 377.
  - Fershtman, C, U. Gneezy, and F. Verboven "Discrimination and Nepotism: The Efficiency of the Anonymity Rule." Forthcoming in Journal of Legal Studies
  - Edward Glaeser, David Laibson, Jose Scheinkman, and Christine Soutter "Measuring Trust", Quarterly Journal of Economics, 65, August 2000, pp. 811- 846.
- Market Experiments
  - Smith, Vernon L. [1962], "An experimental study of competitive market behavior," Journal of Political Economy, 70, 111-137.
  - Chamberlin, Edward H. [1948], An experimental imperfect market," Journal of Political Economy, 56, 95-108
  - Gode, Dhananjay K, and Shyam Sunder [1993], Allocative efficiency of markets with zero-intelligence traders: Market as a partial substitute for individual rationality," Journal of Political Economy 101, 119-137.

- Prospect Theory and Risk Aversion
  - Kahneman, D., & Tversky, A. Prospect theory: An analysis of decisions under risk. Econometrica, 1979, 47, 313-327
  - Holt, C. A., and S.K. Laury. 2002. "Risk Aversion and Incentive Effects." American Economic Review, 92(5): 1644-55.
  - Cuilty, E., & Campos, R. Understanding Risk Averdsion: Linking Characteristics and Emotions to Prospect Theory, 2013, Working Paper at the Journal of Economy Psycology
- Network Experiments
- Auctions Experiments
- Alternatives to Nash Equilibrium
- Experiments on Market Desing (school choice)
- Assets Markets
- Behavioral Finance
- Public Goods
- Field Experiments
- Neuroeconomics

Chapter 1

Introduction to Experiments

Why we conduct experiments? Perhaps is because we want to understand something that it is not observed in the available data. Maybe we want to test a hypothesis about a theory or we just feel the urgency to answer a question we believe is important to our life, science or economics. Experiments are the gold standard for applied economics, if we have good experimental data we have little to worry about biases and questions on the method for estimating the results. In this class you will be convinced that a simple regression is all that you need to test hypothesis with an good experimental design. Before that lets first review what is what we want to understand with an experiment.

According to Angrist and Pischke the first question a researcher must answer is:

> What is the causal relationship of interest?

Causality is a major issue and defending if something is causal is quite complicated if you don't have experimental data. In the future if you want to make public policy evaluation, labor economics, health economics or attempts to explain a causal relationship without experimental data you will need to learn several microeconometric methods as: propensity score matching, matching, instrumental variables, panel data or discontinuity regression analysis. The book of Angrist and Pischke is focused on giving alternatives to experimental data, it is a great book for start dealing with this issues.

The major difference between causality and correlation is that in a correlation we only know how variables affect each other but we do not understand what is the order of action. $Y \to X$ or $X \to Y$ or $X \leftrightarrow Y$ or $Y \to K \to X$ or $X \longleftrightarrow Y \leftrightarrow K$?. We economist talk about causation they are sure that $Y \to X$, and this is quite important if you want to test a theory or make an evaluation. Imagine if today Sedesol ask you for an impact evaluation of program oportunidades. Sedesol wants to answer the question, oportunidades improves the school attending?, if you say to them yes it does, you must be sure that because an individual receives oportunidades they stay more time in the school. There must no room for ideas like, the individual stays more in the school because there are new schools, or better teachers, or in the worst scenario given that the individual stays longer in school they receive oportunidades.

Causation is important every time you start arguing something. As future economists you must be aware that even in a casual chat you can't argue with a correlation an not with a causal relationship. So it is important? of course. Causal relationships give us the opportunity to change the scenarios and see what occurs. For example a causal relationship can explain what could happen with your income if you study a master degree even if you only have information on your earnings in summer jobs.

1.1 What is needed to proof causation?

Imagine you want to understand the effect of a treatment over a state variable. In the ideal scenario you want to give a treatment to a person say professor Zamudio. Then observe what happens to the important state variable say for example his income. Then go back in time and don't give the treatment to Zamudio, then observe what happens to his income. Comparing the results of what you observe will be perfectly causal. Nevertheless you can't go back in time!.

A possible solution is to have two populations, one part of the population will be given the treatment (treatment group) and the other part will be without treatment (control group). Then take the average effect on the state variables of both groups and make a comparison. However does this works?

Here is a good treatment and control group selection: In the same school, all children from 1st B will be given a medicine to fight parasites. All children in 1st A will not have access to that medicine.

Here is a bad selection: All children from 1st grade will be given the medicine to fight parasites. All children from 2nd grade will have no access to that medicine.

The important thing to make a good selection is that the characteristics of the individuals must be exogenous from the treatment assignment. This means that the treatment affects the results but must be no correlated to any other things that could affect the outcome.

Issues:

Observable Issues: The teachers only give medicine to those kids whom attend class early

Unobservable Issues: The teacher only gives medicine to the favorite kids or to those children that ask for it

Lest define y_i as the outcome of interest of individual i, where $i = 1, 2, ..., N$ The treatment is

$$T_i = \begin{cases} 1 & \text{If the individual i recieves the treatment} \\ 0 & \text{If the individual i does not recieves the treatment} \end{cases}$$

From here it will be useful to define the binary outcome

$$y_i = \begin{cases} y_{1i} & \text{if } T_i = 1\text{for the individual i} \\ y_{0i} & \text{if } T_i = 0\text{for the individual i} \end{cases}$$

The fundamental problem of evaluation of treatment effects is that while there are two possible outcomes only one is observed. The result we do not observe is known as the counterfactual. A causal effect for the individual i is $y_{1i} - y_{o1}$, the effect of the treatment in a society is $y_{1i} - y_{o1}$ for each $i = 1, ..., N$.

Nevertheless we only observe y_1 and y_0. As before stated when we have a good assignment $E(y_1) - E(y_0)$ will be equal to $E(y_1 - y_0)$ and this will be the average treatment effect (ATE). In fact this is a good motivation why we in general don't use the medians, $med(y_1 - y_0) \neq med(y_1) - med(y_0)$ no matter if we had made a good selection. With our information we might never capture the median treatment effect (MTE), this occurs with any other quantil. When can we say that we have a good assignment?, only when we have no selection bias.

1.2 Random Experiments

The most important thing that a researcher must argue to convince a person of his results is that there is no selection bias.

A researcher can observe (most of the times)

$$E(y_1|T = 1) - E(y_0|T = 0)$$

This is the average effect of those who received the treatment and the average of those whom do not received the treatment. Now add and substract $E(y_0|T = 1)$ this is the counterfactual effect, the average effect of those who received the treatment but with out receiving it.

$E(y_1|T=1) - E(y_0|T=1) + E(y_0|T=1) - E(y_0|T=0)$ then we can arrange this in

$$E(y_1 - y_0|T=1) + E(y_0|T=1) - E(y_0|T=0)$$

The First term is what we actually want, the average treatment effect over the treated (ATT). However the remaining terms are a bias, the selection bias. If the researcher can argue that $E(y_0|T=1) - E(y_0|T=0) = 0$ then she has a causal relationship.

Given our limitations we are interested in the Average Treatment Effect(ATE)$E(y_1 - y_0)$, now assume that you have a random sample of the population of interest. Assume the treatment effect is independent of the outcome. Independence means that $f(x, w, z, ..c) = f(x)f(w)f(x)...f(c))$ Under this assumption the estimation of $E(y_1 - y_0)$ is simple.

$$E(y_1|T=1) - E(y_0|T=0) = E(y_1) - E(y_0) = E(y_1 - y_0)$$

Note that $E(y_1|T=1) = E(y_1)$ and $E(y_0|T=0) = E(y_0)$ given the fact of independence. This estimator is unbiased ,consistent and asymptotic normal.

However this assumption is too strong and the former properties can be achieved with less restrictive assumption. Mean Independence, this means that $E(y_1|T=1) = E(y_1)$ and $E(y_0|T=0) = E(y_0)$

Under independence or mean independence $E(y_0|T=1) - E(y_0|T=0) = E(y_0) - E(y_0) = 0$ so there is no selection bias.

Sometimes however it is possible to think that there is a correlation between treatment and the outcome, then another less restrictive assumption can be made.

Let X be a vector of observable covariates. Now the population is described by (T, y_0, y_1, X) where T, X, y is observed by the researcher.

Rosenbaun and Rubin proposed the ignorability of treatment. Given X, T (y_1, y_0) are independent. This is accomplished if T is a deterministic function of X. Another less restrictive assumption is the ignorability of treatment in a mean sense.

$$E(y_0|T, X) = E(y_0|X)$$

$$E(y_1|T, X) = E(y_0|X)$$

Either of those two assumptions leads in $E(y_1 - y_0|X) = E(y_1|T=1, X) - E(y_0|T=0, X)$

1.2.1 Consequences of Random Experiments

A random assignment of the treatment guarantees that y_0, y_1 are independent. This means there is no correlation in observables and no observables. In order to balance the observable covariates (X) and the non observable covariates (ϵ) It is important to have an important number of observations to appeal for the large numbers law.

To check that the covariates are balanced, we can use different test

Check balance in distribution

- Kolmogorov Smirnov Test: for Continuous variables, where the null hypothesis states that the difference in the distribution is equal to zero.
- Test Chi squared, is the same but with discrete variables
- T Test performs the same for dummy variables

Check balance in means

- T test for all variables
- Regression analysis

Chapter 2

Incentives

Perhaps one of the most standardized ideas is that humans react to incentives. If you want your students to attend a conference you could give extra points. If you want to avoid delays in meetings or classes you can set a punishment. Many employers will work harder if you offer a prize or a bigger salary. However recent findings in psychology contradicts this idea, and in fact shows that humans do not always react well to incentives or punishments. In this class we are going to review four papers that shred some light in the way humans behave under distinct incentives scenarios.

2.1 A fine is a Price

Gneezy and Rustichini showed us that a fine will not always work in the way we want too. Their experiment analyzed a delay situation in some children day care centers in Israel. Officially day care centers took care of children from 7:30 to 16:00, there were no information about what happens after 16:00. Even that at 16:00 parents were supposed to pick up their children, there were cases of late arrivals, rarely parents arrived after 16:30. In practice a teacher waited until the parent appeared to pick up their son(s).

The main question the authors want to answer is: is it possible to reduce the number of delays when a fine is introduced?

To attempt to answer this question the authors first observed 4 weeks, they kept records of the parents who arrived late. On the fifth week some day care center introduced a fine (the selection of treatment and control group was random). At the beginning of the seventh week the fine was removed with no explanation.

In the first 4 weeks the authors didn't find any difference in the delays of the control group and the treatment group. The authors found that in the 3 weeks the fine was imposed the numbers of delays increased sharply, almost as twice the originals levels. When the fine was removed the number of delays did not fall. There was no significant trend on the treatment group. So what happened?

2.1.1 A Neoclassical Model

In the initial period, parents who are not facing a fine can refer only to a partially specified contract to anticipate their consequences of their delay. As time passes parents adquier additional information. Parents might read the contract as "We are going to take care of your children after closing time if you come late. We are not going to put a price schedule for this extra service, which will therefore be performed free of charge. Of course, any delay on your part is supposed to be an exceptional case, and you should come late only when strictly necessary. If you come late too often, we might do something about it". To avoid a serious consequence parents abstain to came late too often. The introduction of a fine adds information, a fine is the worst thing could happen.

A Game scenario:

The players are the owner of the day care center and a finite number of parents.

There are two types of owners who differ in the action they can take

The first one is S and involve severe actions labeled K. The other type is the mild one M that only will impose a fine f.

The type is unknown to the parents, in fact the type has a uniform distribution of probability.

The game is played always, this means is a repeated infinite game. The players discount their utility each period. In every period the players play sequentially.

1) First the owner chooses an action, if she chooses f or K she must pay a fixed cost C. If she does nothing, she do not pay anything.

2) The parents choose the amount of time of delay from an interval, T

With a Fine

A) The payoff for the owner is $(f - C)T$

B) The payoff of the parent is $(v - f)T$

With a K

A) The payoff of the owner is zero

B) the payoff of the parent is a large negative number

In one Equilibrium Parents must choose an amount of delay $T*$ that is just enough to make both types of the owner indifferent between doing nothing or paying the fine
$(\frac{1}{\delta+1})^n((f - C)T*) = 0$
$(\frac{1}{\delta+1})^n((K - C)T*) = 0$

A possibility of this is that the owner never charges fine and the parents keep doing this forever Other possibility is the owner charges a fine, in this case the parents show the maximum level of delay because it brings them a positive utility.

Chapter 3

Behavioral Preferences, Elicitation Valuations

3.1 Experimental Test of the Endowment Effect and the Coase Theorem

Standard economic theory argues that with small income effects the difference between the maximum willingness to pay (WTP) and the minimum compensation demanded for a good (WTA) for the same good must be equal to zero. Also the Coase Theorem asserts that the allocation will be independent of the assignment of property rights when costless trades are possible. Nevertheless the literature has found that the seller prices is higher than the buyers price. Why does this happens?, it could be bargain habits, transaction cost or misconception of the true valuation. This paper focus on other explanation, the difference observed in WTP and WTA many times is an effect over a personal reference point, the endowment effect.

The endowment effect is the increased value of a good to an individual when the good became part of his endowment. An implication is that the good is observed as a loss when is given up and as gain when is acquired. What kind of scenarios does not have an endowment effect?, where the object is only purchased to be re sell it. For example a token in an experiment market, where only the value of the token can be used to be traded for other goods inside the experiment or claim the value at the end of the experiment. Otherwise the token is worthless.

Trading token experiments can be used to test if transaction cost exist, misunderstandings or habits of bragging. The paper present a series of experiments where the endowment effect was tested. Half of the subjects was randomly endowed with a good and became potential sellers. The other half were potential buyers. The standard economic prediction is that one half of the goods should be traded. This occurs because the same distribution of valuations is on the side of the sellers and on the side of the buyers, then the demand and supply curves should be mirrors intersecting in the median.

Let V^* represent the predicted trade in absence of endowment effect. With endowment effect the trade volume should be less, V. Then the ratio $\frac{V^*}{V}$ is the unit free measure of the endowment effect.

First experiment: 44 students (22 buyers and 22 sellers), each student had a form where they can mark if they want to sell or buy the good at a price.

Three market scenarios with only tokens, each student had a different token with a different value. Subjects alternate between seller or buyer and different token values was given to them. Each period experimenters collected the forms and calculated the clearance price

Four markets with mugs valued at 6 dollars, the initial assignment of buyer seller was on the 4 scenarios

Four markets with pens with value of 3.98 dollars, now sellers became buyers etc

Results: in the tokes scenario V^* was observed, in the mugs and pens the sellers price were more than twice the buyers price $\frac{V}{V*}pens = .41$ $\frac{V}{V*}mugs = .2$. In each period the volume sold did not change, so there is no learning or mistakes.

This paper has important implications, the first one is that preferences are dependent of the entitlements, preference depend on the reference positions. As a consequence preference depend of the endowment. A good A may be preferred to good B when A is part of the original endowment, but reverse may true when reference points are changed. Endowment effect reduce trade gains, this means that Pareto optimal will not occur. The Coase theorem might fail to the presence of endowment effect.

3.2 Coherent Arbitrariness: Stable Demand Curves without Stable Preferences

Ariely and his pals try to explain if the fundamentals determine the value that humans assign to a good (of if it is arbitrary), even more if this valuation is coherent or is not at all. The first experiment showed to the participants (all students) 6 products for them to buy (cordless trackball, cordless keyboard, average wine, rare wine, design book and Belgian chocolate). After showed them they asked if that want to buy the product equally to the last two digits of their social number, then they asked the maximum price they were willing to pay for the product. They find that the WTP is higher when the social security number is higher. For example for the first quantile of the distribution of social number they would like to pay on average 11 dollars for the rare wine, however the last quantil would pay 37 dollars. The social security number was an anchor and the anchor was a reference point that affected the valuations of the price of every product. Nevertheless there is stability of relative preferences, for example the vast majority (more than 95 % valued more the cordless keyboard than the trackball). Subjects do not know how to valuated the items but understood the ordering within categories.

The autors claims that WTP is not a single point but a range, and this range can be affected by anchor values. In a take or leave scenario if the price is lower that the first price on his range the consumer will buy, if is higher than the last one the consumer will not buy, but what happens on the range? The authors assume that the consumer uses the previous information to make the choice. For example suppose a subject with a social security number 25 has a priori WTP range of 5 to 30 to the regular wine, and 10 to 50 to the rare wine. Both wines might or might not be purchased by 25. Suppose the subject says yes to the regular wine for 25, then if you ask her later for the rare wine she must say yes. If a regular wine is 25 the rare wine must be more expensive, then if the subject is answered to reveal the WTP both wines must be more expensive than that. We then have these implications

First: in the situations when valuations are not constrained by prior precedents, choices will be highly sensitive to anchoring

Second:because decisions at the earlier stages are used as inputs for future decisions, an initial choice will exert a normatively inappropriate influence over subsequent choices and values.

Third:if we look at a series of choices by a single individual, they will exhibit an orderly pattern (coherence) with respect to numerical parameters like price, quantity, quality, and so on

Then in marketplaces the axiom of revealed preferences might be satisfied, however from this we cannot infer that the person reveals her true preferences.

In the experiment II all the subjects listened for 30 seconds an annoying sound. There were two treatments in the first one the anchor was 10 cents, the second one was 50 cents and in the last one no anchor. Then the computer asked to pick the minimum price the subject will accept (WTA) for hearing the sound the amount of time presented on the screen, this procedure was repeated nine times. After that the computer random select a payment if the payment was above the WTA the subjects heard the sound and were payed and if was below the students will not hear anything nor paid. Results: The high anchor 59.60 , low anchor 39.82, no anchor 43.87. Over time in the experiment there was no convergence on the treatments, and no learning about the experience. However there was coherence on the time and price assignation.

Experiment III, now the authors were looking if the market forces had and important impact in the anchor or price. The experiment was now a market of annoying sounds. The students were told that they would bid for the opportunity to listen an annoying sound and being paid. All subjects first experienced 30 seconds of the annoying sound, then each trial the announcer will tell the duration of the sound, then the students write down their bid and the lowest three bids will listen to the sound. In the low-anchor condition, the average bids were 24¢, 38¢, and 67¢ for the 10, 30, and 60 seconds, and in the high-anchor condition, the corresponding average bids were 47¢, \$1.32, and \$2.11. Overall, mean WTA in the low-anchor condition was significantly lower than WTA in the high-anchor condition. No converge was found at all even with market forces.

3.3 Evidence of the Endowment Effect in Stock Market Order Placement

The class of today concentrated in two main parts, the endowment effect and the anchor effects on decision making. These two phenomena has been well documented on experiments, however does in real life these effects occur?. The anchor effects are quite observable in super markets, markets camping etc, nevertheless the endowment effect is harder to find. The paper of Furche and Johnstone provides an important finding in the financial markets. The literature to date suggests that the endowment effect exists on average, but does not affect all traders equally. It may be virtually non-existent among the most seasoned traders. On average, buy orders will be "closer to the market" than sell orders.

Assuming that quotes placed through institutional brokers are generally more sophisticated than those placed through retail brokers. The asymmetry between buy orders and sell orders relative to "the market" is more pronounced in private client trading than in institutional trading

In a rising market, the endowment effect might be seen as part of rational rather than irrational trading. That is, a trader asking a significantly higher price than the lowest current ask may be merely waiting for an anticipated price increase and using a high ask quote as a means to time (postpone) the moment of sale. To control for market trends. On average, buy orders will be closer to the market than sell orders in both rising and falling markets.

The data comes from the Australian Stock Exchange (ASX). The data contains all orders placed on the Australian stock exchange during the five-year period between July 1, 1998 and June 30, 2003

Results: Asks were placed on average 23.4% further away from the market than bids. Retail traders placed their sell orders 77.3% further away from the market than their buy orders. Institutional traders sell orders were placed on average 6.7% further away from the market when value-weighted. The difference in results indicates that, for institutional trading, order size affects the extent, but not the existence, of the endowment effect asymmetry

Chapter 4

Guessing Games: Individual Rationality

4.1 Unraveling Guessing Games

Consider the following game: a large number of players have to choose simultaneously a number in the closed interval [0 100]. The winner is the player whose number is closest to the mean of all chosen number multiplied by a parameter p, where p is a predetermined parameter of the game; p is of common knowledge. The payoff is a fixed amount of money independent of the size of the numbers of the game. If there is a tie players split the winning prize in equal parts.

Note that the Nash equilibrium of this game with $0 < p < 1$ is to choose 0 for all the players. This can be found with the criteria of weak dominant strategies. If the game is repeated four times, the equilibrium of the super game is also to choose 0. This can be found by checking one period deviations, and observing that that no deviation gives better results.

The author of this paper wants to understand how the individuals form their beliefs about the other players and how their rationality lead them to pick a number. This process is known as depth of reasoning. The simplest case a player selects at random a number without forming beliefs or pick a number salient to him (zero order belief). A more sophisticated player forms first orders beliefs on the behavior of the other players. He thinks that the rest of the players will pick a random number and chooses his best response for that. Or there can be second order beliefs, of the other players that have first order beliefs; in particular there can be a payer with n order beliefs about the $(n-1)$ beliefs of the other players.

4.1.1 The model

We know that with $0 < p < 1$ the equilibrium is to pick zero. For $p = 1$ the game is a coordination game and multiple equilibrium may occur. For $p > 1$ and $2p < M$ where M is the number of the players the equilibrium points are to pick 0 or to pick 100. This is true for the repeated game. In the first period the player has no information about other players. In the next periods he gains information about the actions of the other players and his success in the past period.

In the first period:

A player is strategic of degree 0 if he chooses 50 (the expected choice of a player who chooses randomly in a uniform distribution). A player is strategic of degree n if he chooses the number $50p^n$. For example if he is $n = 1$ then he will choose a naive response to random behavior $50p$. However if he believes that others use this behavior he will pick a small number $50p^2$. A higher level of n indicates a higher level of strategic behavior, but also a believe of others behaving more strategically.

The periods 2-4:

The initial reasoning can be changed by changing the point of reference $r = 50$ by what is the learned in the previous periods. A natural candidate is the mean of the numbers chosen in the previous period. It can also be that in the next period the agents change their degree of strategic response. For example pass from $n = 0$ to $n = 1$.

4.1.2 The Experiment

There were conducted three sessions (1-3) with $p = 1/2$, four sessions(4-7) with $p = 2/3$, and three sessions (8-10) with $p = 4/3$. A subject could only participate in one session. The design is the same for all sessions: 15-18 subjects were sited far away from each other in a classroom. Each session played the game for four periods. Each player pick a number and write it down on a sheet, then at the end of each period the numbers and the mean were written on a board.

4.1.3 Results

In the first period for all session no one choose 0 for $p = 1/2, 2/3$ and only 6 percent choose below 10. In the sessions of $p = 4/3$ only 10 percent choose 0 or 100. Also the weakly dominate strategy were chosen infrequently (above $100p$). $p = 1/2$ 6 percent chose above 50 and 8 percent chose 50. In the $p = 2/3$ 6 percent chose above 67 and and 6 percent were 66 or 67. The difference that in general higher values of p imply higher values of the number picked. This is statistical significant at .0001. In general the numbers are not equal to the description of the model, but they are quite close. However she shows that the data is concentrated around this numbers. She specified neighborhoods of intervals of 50^p for $p = 1, 2, 3....$ She defined interim intervals the numbers between 50^p and 50^{p+1}. She finds that in $p = 1/2$ $2/3$ almost 50 percent of the choices are in the neighborhood of $n = 1, 2$ and there are few observations between them. In all sessions only 6 percent are in $n = 3$ or higher. She also tested that there are more persons in the neighborhood intervals that in the interim intervals. In session $p = 1/2$ the optimal choice given the data is 13.5, which correspond to the $n = 2$. The greatest number of players are located here, thus many players behave optimally given the behavior of the others.

In the rest of the periods, the author shows that 133 out of 144 lowered their value ($p = 1/2$), and 166 out of 201 also lowered their value ($P = 2/3$) . In the $P = 3/4$ the values increased. In every session the chosen numbers move towards the equilibrium. In the fourth session of $p = 1/2$ more than half were below 1. Nevertheless in the $p = 3/4$ only four out of 48 chose 0 and only one below 1 . In the $p = 3/4$ 100 was on the second round the optimal chose to 16 percent, and in the fourth 68 percent. In that session the behavior is the best response to the average of the last session. The author concludes that the rate of speed the agents converge to equilibrium depend on p. Even if the reference point is changed through sessions, 80 percent of all sessions lie between $n = 0, 1, 2, 3$. For almost all sessions $n = 2$ was the optimum response, and the author concludes that there is no growth in the depth of rationality.

4.2 Rational Reasoning or Adaptive Behavior? Evidence from Two-Person Beauty Contest Games

Nash equilibrium is the most prevalent solution concept in game theory. However, many experiments have shown that human subjects do not necessarily behave in accordance with standard equilibrium predictions. There are many possible reasons for this. For example, a fully rational player might in the equilibrium, however he might doubt that all players will choose equilibrium strategies. Or, alternatively, players can be boundedly rational, maybe because of computational limits and therefore do not realize what the equilibrium behavior is. We do not review this paper in class however I told you that the author finds that most of the times the players do not behave strategically because they have limited rationality not because they believe the others have limitations too. If you are interested in this topic you should read the full paper.