# Experimental Economics

## Revision: concepts & terminology

Frieder Neunhoeffer

Lisbon School of Economics & Management
Universidade de Lisboa

U LISBOA | UNIVERSIDADE DE LISBOA

# Outline for today

- Concepts and terminology in experimental designs
- Qualtrics
- (Feedback)

➢No need to find a positive result → null result is also science

# Some terminology and technicalities

- **Treatment**: a particular condition of the experiment. Often a control treatment and a (main) treatment (or more).
- Everything else kept constant, only **one** change at a time.
- An experiment usually consists of several **sessions**. In a session a group of people takes part in the experiment at a particular date and place.
- In a session there are often a number of **blocks**.
- In a block there are often a number of **rounds**, or **periods**.

# Between- vs within-subject

- **Between-subject design**: **Subjects participate only in one treatment**
  - Avoids ‘contamination’ between treatments
  - Must trust the randomization procedure

- **Within-subject design**: **Subjects participate in more than one treatment**
  - Controls for individual fixed effects
  - Allows the use of more powerful statistical analysis
  - Does not work for some treatment variations (e.g., different frames)
  - Order effects: must control for sequence effects (e.g., due to learning)

# What are observations?

**Distinction between observation and statistically independent observation**

*Example: 5 sessions of a market experiment with 10 periods and 10 trades each*

How many observations of a trade?

→ 5 x 10 x 10 = 500

How many independent observations of a trade?

→ 5

# One shot vs. repeated observations?

## Pro one-shot

- Strong incentives for decision
- No strategic spillovers across periods
- Easy to perform and short

## Pro repetitions (“repeated one-shot”)

- Learning effects can be studied
- Possible to observe dynamics, e.g., convergence to predicted or behavioral equilibrium
- More observations

# Implementing repeated games (partner design)

## Finitely repeated games:

- If only rational and selfish types and *unique* NE in stage game: *backward induction*
- If stage game has multiple equilibria, “anything goes”: loss of a clear prediction (same for infinitely repeated games)

## “Infinitely” repeated games:

- Implementation with the help of a *termination probability*
- Problem: length of the experiment is *endogenous* – do you want to throw dice for five hours?

# Partner vs. Stranger Matching

**(Fixed) Partner:** *group of subjects stays together for several periods*

- within a group of partners you have 1 independent observation only
- allows analysis of strategic considerations

**Stranger:** *groups are recomposed randomly*

- similar behavior/prediction as one-shot
- but more (possibly) more independent observations

**Perfect stranger:** *zero-probability of being re-matched with same person*

- more independent observations

# Strategy method

First used by Reinhard Selten

**Idea**: Instead of just playing the game, subjects are asked to indicate an action for each information set

*Example*: In Prisoner's dilemma: What do you do (defect or cooperate) if first mover cooperates and what do you do if first mover defects?

# Strategy method

**Advantages:**

- More information about motivation/behavior of players

**Problems:**

- Incentives are weaker, since each information set is reached only with probability smaller than one
- Hot vs. cold emotions: people might feel and act differently knowing they have reached a particular information set, compared to potentially reaching it
- Explaining the SM to subjects is tricky (loss of control)

# Role reversal

*Subjects act in different roles:*

**Example:** in UG you are a proposer, then a responder

- Helps to put oneself in the shoes of the other person
- Same considerations as you have with within-subject design
- Don’t lose information about how people act in a given role

# Learning trials/periods

In complicated experiments (e.g., with difficult trading rules in markets) one might have subjects play the game without monetary consequences

**Advantage:**

- It guarantees subjects' understanding from the first paid period on

**However:**

- Subjects might develop expectations, strategies, or assumptions from the learning trials that were not intended by the experimenter
- You might lose information about the "true" first period

➢ Refrain from implementing strategic interactions between players

# Elicitation of beliefs

**Example:** In a PD, before they make their decision both players are asked what they think the other player will do (cooperate or defect?)

- Beliefs can be very informative to understand their motivation
- Beliefs are of particular importance to check the rationality of decisions

**Problems:**

- **Experimenter-demand-effect:** you may make people think about stuff they would not have thought about
- Directs focus on particular problems, e.g., guessing game
- Desire to be consistent: people state beliefs to match their actions or the other way around

# Pay for beliefs?

## Pros

- Subjects have an incentive to state correct beliefs

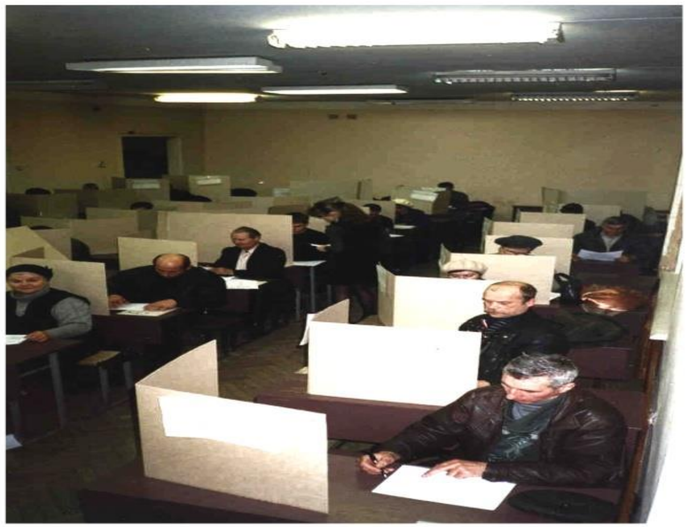
## Cons

- Is costly and given a budget – goes at the cost of incentives in the decision part
- Subjects have no incentive to state wrong beliefs anyway
- Can pollute incentives in the experiment if people hedge decisions

# Paper & Pencil vs. Computerized Experiments

## Paper & pencil

- Flexibility (quick development of new treatments)
- Low start up costs (not much hardware, no software coding)
- Natural environment: Procedures may be more visible and credible (use dice even in a computerized experiment!)



## Computerized experiment

- Better control
- Less interaction with experimenter
- Automatic data collection

# Deception

**NEVER cheat on subjects, even if it is tempting from a scientific point of view**

**Why?**

- There is a moral code among economic experimentalists not to do it
- You won't get past an ethics committee
- You will never publish a paper and people won't like your research
- You will lose your reputation towards your subjects: if you lie once they will never believe in the future. This blurs all incentives.

# Standard hypothesis

In your experiment you want to have a set of **predictions/hypotheses**

**Traditional assumptions in game theory:**

Rationality and Selfishness (money maximizing)

**Determine equilibria:** Often simple and unique prediction

**Use the standard prediction as a benchmark**

# Alternative hypothesis

There are many good reasons to question the standard prediction

## Bounded rationality

- cognitive limits
- rules of thumb – heuristics
- imitation

## Social Motives

- altruism
- fairness
- preference for efficiency
- reciprocity

## Emotions

- anger
- guilt
- happiness
- fear
- joy
- arousal

# Deriving alternative predictions

- Intuition
- Observations from every-day life
- Previous experimental results (economics, psychology)

**Game theoretic analysis under alternative assumptions:**

- Prospect theory (probability overweighting, loss aversion)
- Fairness theories
- “Statistical” game theory, quantal response (errors depend on cost of error)
- Emotions: visceral factor perspective

# Writing instructions

- **Simple language**
  - Simple, short and unambiguous sentences
  - Redundancies if issues are complicated
  - Consistent/uniform, descriptions and framing
  - Avoid suggestive terms
- **Concrete framing (goods markets, labor market)**
  - Easy to understand through associations from real life
- **Abstract framing**
  - Avoids every-day association (does it really?)
  - Harder to understand the rules of the game
  - No control about what subjects really think

# Writing instructions

- **Complete description of the rules of the game**
  - Sequence off decisions
  - Interaction
  - Payoff consequences
- **Different ways to explain the payoff function:**
  - Formula
  - Verbal explanation
  - Table
  - Figure
- **Control questions**
  - Check understanding
  - Knowing who is done with instructions

# Recruiting subjects

- **Students**

  + Easy access

  + Relatively low opportunity costs (low costs of conducting experiments)

  + quick learning

  +/-not much experience with the object of interest

  + analytical skills, quick understanding of instructions

- **Non-students**

  - parallelism

  - opportunity cost

  - risk of unknown confounds

# How many subjects do you need?

- Pilot test → estimate effect sizes
- Power analysis (statistical approach)
  - Power analysis helps you determine the minimum sample size required to detect an effect of a given size with a specified level of confidence
  - Key inputs
    - Effect size
    - Significance level (α, usually 0.05)
    - Power (1 - β, typically 0.8 or 0.9)

# How to recruit?

- Always invite **20% more** than you need

***Recruiting subjects is key!***

- Manual recruitment
- Computer-assisted recruitment (→ e.g., used at XLab)
  - https://orsee.krannert.purdue.edu/orsee/public/rules.php
  - http://ben.orsee.org/papers/orsee_billing.pdf

# Recruiting: what to tell people when you invite them?

**It is not:**

- A medical experiment or an intelligence test
- Marketing research

**It is an economic experiment:**

- Study human behavior
- Important for understanding economic problems

**Why should you take part?**

- You can earn money (don’t mention concrete amounts, creates expectations and may pollute behavior)
- Learn about an interesting method in social sciences

# Registration

Print a list of subjects for that session for registration

# Start the experiment

- Welcome statement
- If more people turn up than needed:
  1. Ask for volunteer to leave and pay the show-up fee
  2. If no volunteers, do a random draw (prepare lab IDs for randomization with some blank ones)

# End of the experiment

- Post-experimental questionnaire
- Pay subjects in **cash**
- No direct information about the payments of others (be discrete)
- Data Recording
- Analysis…