

Experimental Design: Ten Basic Principles

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Basic Principles of Experimental Design

1. Control, Measure, or Assume
2. Instructions
3. Anonymity
4. Matching Protocols and Reputation Building
5. Incentives
6. Order Effects
7. Controlling Risk Tastes
8. Within-Subject and Between-Subject Design
9. Experimentics
10. No Deception

Reference: BGT, A1.2

Control, Measure, or Assume

- Control
 - Taking an action to affect a variable's value
 - "Induced" value
- Measurement
 - Measure the value of a variable via various methods (see below)
- Assumption
 - Pseudo-control to accept a maintain hypothesis about the value of a variable

Control, Measure, or Assume

- Methods of Measurement:
- Psychometric measures (survey questions)
- Risk-aversion measures (certainty equivalents)
- Probability judgments (scoring rules)
- Information acquisition (mouse/eye-tracking)
- Psychophysiological measures
 - fMRI, GSR, PDR, EEG, etc.

Instructions

- Tell subjects what they need to know
- Public Knowledge:
 - Established by reading instructions out loud
- How much to reveal?
 - Entire payoff structure (default)
 - Since we're not sure if subjects would guess correctly what they are not told
- Withhold some information: Study how people/markets learn under limited information

Anonymity

- Who's Who? Subject behavior can change knowing opponent's identity due to
 - Appearance, gender,
 - Fear of retaliation, etc.
- Use the anonymity case as a benchmark
 - Measure opponent characteristics (appearance) and compare to benchmark

Matching Protocol and Reputation

- Random matching (random switch)
 - Empirically kills repeated game effects
- Mean-matching (play with everyone)
- Other more strict matching protocols:
- Non-repeat matching (meet only once)
- Non-contagion matching (no “chain-of-influence”)

Incentives

- Hypothetical vs. Real Money Decisions
 - This distinguishes economic and psychological experiments
- Assumption behind money payments:
 - “Everybody likes having more money and nobody gets tired of having more of it.”
- Cost of deviation without real money is 0
- Paying money reduces variation & outliers

Incentives

- Pay Less vs. Pay More
 - Comparison studies not done often enough
 - Expensive to double/triple the payments
- Some experiments done in poor countries
 - Vietnam
 - Few results that disconfirm theory have been overturned by paying more money

Incentives

- Flat Maximum Critique
 - Is it worthwhile (high stakes) to think hard?
 - EX: deviating from (1/3, 1/3, 1/3) in rock-paper-scissors is “costless”
- No ideal solution yet...
 - Design steep marginal incentives
 - Modest effect on high stakes anyway

Order Effects

- AB: A came first; B came second
 - Is this why we see different behavior?
- Try BA and include order dummies in the data analysis

Controlling Risk Tastes

- Binary Lottery Procedure: Controls risk taste
 - Widely used
 - Not much evidence that it works
- Alternatives:
- Assume risk neutrality
- Measure risk preferences
 - Holt and Laury (2001) or Tanaka et al. (2006)

Within-subject vs. Between-subjects

- Within-subjects Design
 - Same subject observed in various treatments
 - Pro: More statistically powerful
 - Con: Possible demand effect
- Between-subjects Design
 - Different subjects observed in each treatment
 - Norm in experimental economics
 - Con: “Impossible” for fMRI or eyetracking

Experimetrics

- Econometrics customized for experiments
- Just like Econometrics is
 - Statistics customized for economics
- Use all econometrics feasible to get the most out of your (experimental) data
- Experimental Design and Experimetrics are sometimes substitutes
 - But complement each other in a good paper!

Experimetrics

- Signed Rank-sum test (non-parametric t-test)
- Regressions (with random effects)
- Maximum Likelihood Estimations
 - Initial Responses: Level-k, Cognitive Hierarchy
 - Learning: EWA, Reinforcement
 - Quantal Response Equilibrium
 - Simulate and Estimate
- Out-of-sample Predictions
- Markov Switching (Eyetracking) and SPM2 (fMRI)

No Deception

- Experimental Economists do not deceive their subjects
- This creates credibility
 - Makes monetary payments “real”
- And avoids anticipation/strategic responses
 - Differs from psychologists
- Can achieve most goals with better design
- How can we study the effect of deception?

Conclusion: The Gold Standards

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8. Within-Subject and Between-Subject Design
9. Experimetrics
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