Experimental Design: Ten Basic Principles
實驗設計原理

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Principles of Experimental Design 實驗設計原理

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. Experimetrics
10. No Deception

Reference: BGT, A1.2

Control, Measure, or Assume
控制、測量或假設

- Control (控制)
  - Taking an action to affect a variable's value
  - "Induced" value theory
- Measurement (測量)
  - Measure the value of a variable
  - Via various methods (see below)
- Assumption (假設)
  - Pseudo-control
  - Accept a maintain hypothesis about the value of a variable

Control, Measure, or Assume
控制、測量或假設

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

Instructions
實驗說明

- 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
匿名性

- 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 & Reputation
配對方式與受試者信譽

- 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
真實誘因

- 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
真實誘因

- 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
真實誘因

- 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
不同實驗的先後次序

- AB: A came first; B came second
  - Is this why we see different behavior?

- Try BA and include order dummies in the data analysis

- What if ABC?
- ACB/BAC/BCA/CBA/CAB or simplify design

Controlling Risk Tastes
控制風險偏好

- 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)
  - Choi, Fisman, Gale and Kariv (2007)

Within-subject vs. Between-subjects
比較同一受試者vs. 比較不同受試者

- 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
實驗計量

- 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!

List of Experimetrics
實驗計量方法列表

- Mann-Witney-Wilcoxon Test: Signed rank-sum test
  - Non-parametric test similar to the t-test
- Regression (with random effects)
- Maximum Likelihood Estimations (最大概似估計)
  - Initial Response (初始反應): Level-k, Cognitive Hierarchy
  - Learning (學習理論): EWA, Reinforcement
  - Quantal Response Equilibrium (手滑反應均衡)
  - Simulate (模擬) and Estimate (估計)
- Out-of-sample Predictions (預測新的資料)
- Markov Switching (Eyetracking) and SPM2 (fMRI)

No Deception
不欺騙受試者

- Experimental Economists do not deceive their subjects
- This creates credibility (「徙木立信」)
  - 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
結論：實驗設計者的十誡

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