Emotional Realities and Economic Modeling: Some First Principles

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Choice-Based Testing of Psychological Models

- Non-standard choice theories incorporate psychological intuitions
  - Simon [1955]: satisficing as "plausible" process
  - Strotz [1956]: Restricting future choices and self control
  - Kahneman and Tversky [1977]: Heuristics and biases
  - Kahneman and Tversky [1979]: Prospect theory
  - Loewenstein [1987]: Delay and anticipatory feelings
- The challenge of how to test is general

Choice-Based Testing of Psychological Models

- Bounded rationality a warning
  - 1,000 procedures posited: satisficing; other heuristics; shallow then deep; etc.
- What is the empirical counterpart?
  - May be very little that can be said about standard choice data
  - Actual testing based on choice extremely limited
  - Only very recently has this link been addressed even in theory

Choice-Based Testing of Psychological Models

- PEU illustrates difficulties of using standard choice data.
- Model a surprise party: Outcome A is party, B is no party,
- The prior belief that a party will be thrown is π.
- Opposite psychology from anxiety: pessimistic beliefs make the party more enjoyable if thrown, lower disappointment otherwise.
- In terms of beliefs and states, $(0, A)$ is best: good news and very surprising. Similarly, $(1, B)$ is worst since no party and disappointment.

$$u^{SURP}(0, A) = 1; u^{SURP}(1, B) = 0.$$

Choice-Based Testing of Psychological Models

- Fill in the remainder of the function, capturing benefit of pessimism in simple linear form,

$$\begin{aligned} u^{SURP}(p, A) &= 1 - \alpha^{SURP} p; \\ u^{SURP}(p, B) &= (1 - p)\beta^{SURP}, \end{aligned}$$

  with $\alpha^{SURP}, \beta^{SURP} \in (0, 1)$.
- To assess interest is signal, mirror anxiet and compute $K^{SURP}(p)$ as,

$$K^{SURP}(p) \equiv (\beta^{SURP} - \alpha^{SURP})p^2 + (1 - 2\beta^{SURP})p + \beta^{SURP}.$$

Choice-Based Testing of Psychological Models

- Consider the following set of values:

$$\beta^{SURP} = 0.15; \alpha^{SURP} = 0.35; \alpha^{ANX} = 0.1; \beta^{ANX} = 0.5.$$

  In this case,

$$\begin{aligned} K^{ANX}(p) &\equiv -0.4p^2 + 1.4p. \\ K^{SURP}(p) &\equiv -0.2p^2 + 0.7p. \end{aligned}$$

- Two entirely psychologies cannot be differentiated in terms of choice of information
- In this case, anxiety and surprise look identical in standard data

Psychological Data

- The possible value of non-standard data is general
  - Payne, Bettman and Johnson [1988] use Mouselab to understand heuristics
  - Kahneman and Krueger [2006] uses surveys to measure happiness
- Now neuroeconomics adds even richer data
  - McClure, Laibson, Loewenstein, and Cohen [2005] use brain scans to study self control
  - Glimcher & Kable on discounting
  - Bayer & Glimcher, Daw and others on dopamine, learning and utility
  - Camerer on levels of processing
  - Phelps & Schotter on auctions

Psychological Data

- This raises deep questions
  - Few of the models of choice tested by PBJ are rich enough to predict mouse clicks
  - No economic models extend directly to the neuroscientific evidence
- Is there even a common language to describe these data?
- If not part of the theory, how can they support the theory?
- How can specific brain activation support a theory of self control?
- Note PEU is better than most in this respect, but:
  - What are most important psychological states?
  - Are they really susceptible to measurement?

Mindless

- G & P argue "structuralism" important to prevent unified field turning into prior-based fiefdoms
- G & P propose reviving spirit of revealed preference:
  - Phrase psychological theories in terms of choice alone
  - Implicit support for axiomatic methods
  - Implicit support for optimization

Mindless

- There is great virtue in the RP method of modeling.
- The labor theory of value said prices not related to utility "diamond-water paradox"
- Paradox disappears if one looks at the margin.
- DMU explains low prices of commodities in high supply.
- The hunt was on for U, and to confirm DMU
- The ordinal revolution killed the search for utility
- Pareto recognized that logic of choice depends only on ordering, not on the scale

Mindless

- Revealed preference reverses standard logic
- Samuelson [1938] posed the question: what is the class of "as if" theories that can be supported by a particular pattern of observed choices?
- Most basic theorem characterizes choices from all subsets of a finite list of objects that can result from maximizing a CT order, or equivalently utility maximization
- Technically a small change but philosophically huge
- Connects observable choice with a theoretical construct that has clear intuitive content
- If the predicted behavior is rarely violated, then choice data per se cannot force the rejection of the theory
- Argues against "intuitive" decision procedures in favor of those that connect tightly with observable counterparts

Mindless

- So why did economics and psychology start with intuitions?
- Follows loss of RP focus with asymmetric information and game theory
- How do I know who has what information in a game with asymmetric information?
- How do I know your out-of-equilibrium strategy?
- Is equal and immediate division a rule or the outcome of a sophisticated implicit shared understanding of the consequences of long hierarchies of alternative behaviors?
- A small step to modeling internal decision procedures

Mindless

- Virtues and flexibility of RP theory neglected
- Focus on domain a virtue
- EU theory already illustrates psychological possibilities of this principle, as does KP
- The domain of choice sets allows rich psych.
- Kreps for flexibility
- G & P for temptation and self control
- Makes other behavioral theories look at best inelegant, at worst dangerous

Mindless

- GP illustrate method with Kreps and Porteus RP model of non-instrumental information choice
  - Can model in prize-state structure of last lecture
  - Connects tightly with "lotteries over lotteries"- space $L^2 \subset X$ from last lecture
- This domain exhausts private choice possibilities
- PEU domain contains fantasies, e.g. a guarantee that a currently uncertain future will turn out well
- The larger domain accounts for ambiguity of interpretation of PEU: there is none in KP

Mindless

- KP capture behavioral effect of psychology without any explicit modeling of psychology
- For GP fact that psychological measurement irrelevant in KP is virtue
- G&P propose "ring-fencing" new non-choice "psychological data" that is flooding in
- Use for inspiration not model fit

Bridging the Gap

- GP proposal seems limited in modeling emotions:
  - Misses any production function,
  - Comparative statics etc
  - strategic interactions
  - I believe methods in economics will be revolutionized over coming decades
- But the tension is real:
  - Undisciplined use of new data would fracture field
- Not all measurements will enter the evidentiary base that drives our common theories forward
- Explains importance of method

Bridging the Gap

- My approach: must be open to all data
- But must discipline the modeling of the data
- There are profound externalities of common language
- See research as random graph, key is to leave possibility for communication
- Really important as chances arise to cross previous social science - natural science boundaries
- Methodology is needed to improve social endeavor
- In coming period methodology will drive content

Bridging the Gap

- I am sympathetic to the GP theoretical proposal, but there is a crucial gap in their reasoning
- But their actual proposal is meaningless, since it is based on "standard choice data".
  - GP rely on "folk" concept of choice
  - A little thought shows this to be meaningless
- In the context of a debate on behaviorism in psychology, Ericsson and Simon focused on words as chosen, not as true
- "We see verbal behavior as one type of recordable behavior, which should be observed and analyzed like any other behavior.."
- "The report 'X' need not be used to infer that X is true"

Bridging the Gap

- The economic conception of choice is a broken link in the GP proposal
- Rely on "I know choice when I do it"
- Consciousness is therefore a key, but no clear line separates human activities into mechanistic and chosen
- Many apparently conscious choices are made routinely
- Goal of decision theory is to produce a mechanistic model of "choice"!

Bridging the Gap

- Reinhard Selten made similar observations in a paper prepared for the Dahlem Conference May 1999
- "Much of human behavior is automatized in the sense that it is not connected to any conscious deliberation. In the process of walking one does not decide after each step which leg to move next and by how much. . . . .One might want to distinguish between bounded rationality and automatized routine. However, it is difficult to do this. Conscious attention is not a good criterion. Even thinking is based on automatized routine.... "

Bridging the Gap

- All human activities can be modeled as having been chosen from a feasible set
  - Even our pulse rate
- Minimalism is axiomatic modeling of human outputs of interest, likely including "standard" choice.
- In next two talks, collaborative examples of such research with richer data (many in the union, Mark Dean also in the intersection)
- Provisional Choices in Pre-Decision Period
- Dopaminergic firing rates

Bridging the Gap

:

- Unanswered questions:
- How to extend to more classical psychological phenomena and to emotional truths?
- To what extent can this ideal methodology guide a pragmatic agenda?
- What other principle can provide agreed methodological underpinnings for “emotion-based” research?