Discussion

Looking under the hood: Exploring assumptions and finding behavioral economics

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Abstract

Cognitive scarcity is a fundamental economic fact, but the standard maximization assumption abstracts from this fact. Much of behavioral economics can be framed as “exploring the maximization assumption.” By applying the tools of behavioral economics to explore this important assumption, we can learn why presuming maximization works, when it works, even when we know the assumption is not accurately descriptive. We can also learn why theory fails when the assumption does not proximately hold.

In his essay, “Theory and Experiment: What are the questions,” Smith (this issue) asks, “When theory passes our tests, what are the questions?” He also asks, “When theory fails our tests, what premises might we question?” These questions ask us to look under the hood of our economic theory. They imply it is not enough for us to know the car works, or does not; we need to know why. By getting our hands dirty in this way, we often find ourselves doing behavioral economics, stretching the tradition. In particular, when we look under the hood, we often find cognitive scarcity, and are forced to consider how people cope with its associated deliberation cost.

1. Friedman and Simon on assumptions

Milton Friedman’s essay “The Methodology of Positive Economics” (1953) provides a useful lens through which to view Vernon Smith’s questions.

When theory has passed tests, Smith (this issue) asks, “How are decision makers who have not the academic knowledge of either the theorist or the experimentalist able to approximate the predictions of the theory?” In general, our behavioral assumptions often do not accurately describe the human subjects participating in an experiment, and Smith asks, “If not, why do we observe the predicted outcome?”

Friedman would likely not be too concerned, for he argues “the quest is to find the assumptions that are ‘analytically relevant’ for explaining observations, as opposed to seeking ‘descriptive accuracy’” (1953, p. 33). “Are the assumptions sufficiently good approximations [of reality] for the purpose at hand” (1953, p. 15). This he argues is the relevant theory building question. A “theory is to be judged by its predictive power for the class of phenomena which it is intended to explain” (1953, p. 8), not by the realism of its assumptions. If experimental evidence indicates human subjects behave “as if” they are knowledgeable academics in a given context, then the assumption they have this knowledge is a sufficiently good approximation.

Herbert Simon disagrees. “The expressed purpose of Friedman’s principle of unreality (or as-if hypothesis),” Herbert Simon said, “is to save Classical theory in the face of the patent invalidity of the assumption that people have the cognitive capacity to
find a maximum" (Archibald et al., 1963). He went on to say, “The unreality of premises is not a virtue in scientific theory but a necessary evil—a concession to the finite computing capacity of the scientist.” Simon proposed replacing the as-if hypothesis with the “principle of continuity of approximation,” which recognizes, “if the conditions of the real world approximate sufficiently well the assumptions of the ideal type, the derivations from these assumptions will be approximately correct.”

For Friedman, “assumptions are false” when “the theory does not work” (1953, p. 19), not when they are unrealistic, and there need not be a relationship between the usefulness of assumptions and their realism. Alternatively, Simon is not comfortable with a scientific philosophy that allows usefulness and realism to be disconnected. Smith, it seems, leans toward Simon’s point of view.

2. Exploring why assumptions work: doing behavioral economics

The following quote from Friedman illustrates why it can be fruitful for us to explore our assumptions, as Smith suggests.

> Let the apparent immediate determinant of business behavior be anything at all—habitat reaction, random chance, or what not. Whenever this determinant happens to lead to behavior consistent with the rational and informed maximization of returns, the business will prosper . . . ; whenever it does not, the business will tend to lose resources . . .

This process of natural selection thus helps to validate the hypothesis. (Friedman, 1953, p. 22)

The maximization assumption, Friedman recognizes, is unrealistic, but a process of exploring the assumption leads him to theory of why it works. The evolutionary “process of natural selection” he presents is actually a theory of bounded rationality, a theory that explains how it is possible for people with limited cognitive capacity to make near optimal choices without incurring significant deliberation cost.

In his Nobel Lecture, Becker (1993) describes the assumption that “individuals maximize welfare as they receive it” as fundamental to the “economic way of looking at behavior.” Rather than exploring how people maximize, the explanations provided by traditional economic theory are implications of the maximization assumption, and predictions are obtained by relating changes in the optimal choice to changes in the environment. Exploring why a set of economic assumptions works will often involve exploring why the maximization assumption works, moving beyond the bounds of economics, for example, into sociology or psychology.

Yet, because relaxing the maximization assumption involves recognizing scarcity, the research is still within economics. Indeed, one way to distinguish behavioral economics from traditional economics is to say that the former recognizes cognitive scarcity whereas the latter does not (Pingle, 2006). North (1994) gives Coase (1960) credit for extending traditional theory in the institutional direction by recognizing, “When it is costly to transact, then institutions matter.” Analogously, we can give Simon (1955) credit for extending traditional theory in the behavioral direction by recognizing, “When it is costly to deliberate, then decision processes matter.” A portion of behavioral economics involves exploring the implications of deliberation cost, just as a portion of institutional economics involves exploring the implications of transactions cost.

Friedman (1953, p. 14) describes a theory as “important” if it “explains much from little.” Here, our Smithian look under the hood at the maximization assumption helps us understand why traditional economic theory is important. While descriptively inaccurate, the maximization assumption greatly simplifies the analysis, for it allows one to ignore the process the decision maker uses to find the maximum. It is this simplification that allows us to “explain much from little.”

Behavioral economic theory will tend to be less important because it will tend to “explain little from much.” Simon (2000) recognized, “Once one introduces into the subjective expected utility maximization Eden the snake of boundedness, it becomes difficult to find a univocal meaning of rationality, hence a unique theory of how people will, or should, decide.” Theories of bounded rationality explain how people cope with deliberation cost. There are many ways a person can cope. The best way will tend to vary across people and be context dependent. Thus, it is not surprising that there is no a single “important” theory of bounded rationality.

3. Boundedly rational decision making

 Nonetheless, behavioral economic theory is useful because there are contexts in which the deliberation cost significantly binds the rationality of the decision maker. One explanation for why traditional theory may fail a test is that the maximization assumption is not a sufficiently good approximation. Behavioral theories, which effectively recognize how decision makers are coping with deliberation cost, can outperform traditional theories in these contexts.

The inaccuracy of the backward induction assumption is one explanation Smith offers for why a theory may fail a test. Generalizing, Smith (this issue) theorizes, “Cognitive limitations [explain] why full backward induction might be unnatural, and not be worth the trouble, as a general principle of life to internalize.” Simon (1955, p. 99) sought to address this concern, desiring to “replace the global rationality of economic man with a kind of rational behavior that is compatible with the access to information and computational capacities that are actually possessed.” Theories of bounded rationality hypothesize that people internalize cognitively inexpensive decision heuristics, more so than cognitively expensive optimization algorithms, so that they can cope with the deliberation cost that is common in real world decision making.

Simon concluded that real world decision processes would tend to be adaptive. From the theory of search (e.g., Wilde, 1964) we know that sequential search has a fitness advantage compared to simultaneous search that involves the evaluation of a set of sampled alternatives. A sequential search plan permits the location of the next alternative sampled to be based
upon the observed outcomes of the past samples. Simon’s (1955) bounded rationality model posits a sequential examination of alternatives and the use of a predetermined “satisficing” goal for deciding when to stop incurring deliberation cost and accept an alternative as a choice.

Real world economizing will also tend to be evolutionary, as Friedman suggests in the quote above. When the same choice is repeated, a decision rule can evolve toward a rule that suits the context. A simple habit relates a context to a choice: when in context A make choice B. A good habit provides a near optimal choice with zero deliberation cost, and one would expect good habits to evolve for stable contexts. We would expect more elaborate heuristics of varying forms to evolve for less stable contexts. Gigerenzer and Todd (1999) perceive the mind as being equipped with an adaptive toolbox of fast, frugal, and fit heuristics, and they emphasize that simple heuristics make us smart because they take less time, requiring less knowledge and less computation.

Smith (this issue) also recognizes “independence of history and future” and “context irrelevance” as questionable assumptions. Deliberation cost provides an explanation of why history and context may influence decisions. People know deliberation cost bounds them from what Simon (1978) called “substantive rationality” (i.e., optimality) and know that no assumptions. Deliberation cost bounds them from what Simon (1978) called “substantive rationality” (i.e., optimality) and know that no heuristic will perform well in all contexts. In the world of unbounded rationality, the only elements of the decision context that matter are those that shape the location of the optimal choice. However, in the world of bounded rationality, seemingly insignificant contextual features may influence choice because they have evolutionary value in selecting a heuristic to apply. History matters because it not only determines the heuristics we have available in our tool box, but it also determines where we are in the evolutionary process of matching heuristics to contexts.

When deliberation cost bounds rationality, all decision making is also uncertain. If an optimal choice is made in the presence of deliberation cost, the decision maker cannot know it, for knowing it requires that all choices be compared (Day and Pingle, 1991). After sampling an alternative, the decision maker cannot know whether the next alternative sampled will be better. Thus, accepting any sample is risky. Genuine uncertainty is more likely because it is unlikely that the decision maker even knows the value an optimal choice will provide, much less have in mind a probability distribution for the quality of the next sample. Because the distribution of outcomes is not typically known, and because successive samples would not typically be independent (for random search is generally inferior), one cannot prove that there is an optimal search strategy of the Lippman and McCall (1976) type.

Learning models provide a description of how people may cope with uncertainty and cognitive scarcity. The “reinforcement learning” of Erev and Roth (1995) models decision making as an adaptive process with low deliberation cost, where success is reinforced. “Belief learning” requires a higher cognitive capacity, for it involves constructing a probability distribution and then maximizing expected utility using the distribution. The “experience weighted attraction” or EWA model of Camerer and Ho (1999) combines these two types of learning.

Lastly, the presence of deliberation cost explains why decision making cannot be understood independent from social context. Social interaction enhances opportunities to reduce deliberation cost through imitation (Pingle, 1995) and though the submission to authority (Pingle, 1997). Fernandes and Simon (1999) find that “identification based on professional, ethnic or other characteristics can cause individuals to apply problem-solving strategies that match the goals or norms of the group identified with.” Organization and social relationships can preserve learning (Simon, 2000) and reduce decision inefficiencies associated with bureaucracy (Simon, 2002), thereby reducing deliberation cost.

4. Concluding remark

Cognitive scarcity is a fundamental economic fact. Because our cognitive power is limited, we incur a deliberation cost whenever we evaluate a set of alternatives, and “It is evident that the rational thing to do is to be irrational, where deliberation and estimation cost more than they are worth” (Knight, 1921, p. 67). As we respond to Vernon Smith’s call for us to get our hands dirty under the hood of our economic theory, exploring our assumptions, we will often find ourselves delineating how people cope with cognitive scarcity and its associated deliberation cost. When the coping mechanisms are very effective, then optimality will be approached and the maximization assumption of standard economic theory should be a sufficiently good approximation. When standard economic theory fails, a typical suspect should be deliberation cost, with which the decision maker cannot effectively cope.

References