

Non-Expected Utility Theory and Behavioral Findings

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ABSTRACT

For many decades, the glory of von Neumann-Morgenstern framework has resisted all contradicting evidence collected by behaviorists. A major reason is simple: lack of a coherent mathematical apparatus to replace the formal rationality analysis. While proponents of rational analysis emphasized the importance of final outcome of action, behaviorists insisted to focus on the process of choice. In this paper, we review the findings that led to questioning many accepted facts in the study of mainstream economics. We explore proposed alternatives and pose intriguing questions. Our goal is to promote and draw attention to behavioral findings pertaining to the economic theory of decision making.

Keywords: Expected Utility Theory, Behavioral Economics, Psychology.

INTRODUCTION

A thorough and unbiased study of (even economic) decision-making takes us inevitably beyond economics and to other disciplines. There is now a vast literature on the topic. In psychology alone, there are more than one hundred books, about 3500 research articles, two major journals and a chapter every three to five years in the Annual Review of Psychology. There are sizable literatures in biology and anthropology as well. The literature clearly shows that economics has been built on profoundly false assumptions about human behavior and preferences, and indicates what economics might become if its practitioners would read beyond their discipline.

Experimental economists show increasing interest in incorporating findings from other disciplines into economics. However, they mostly remain faithful to standard probability theory and the fundamental assumptions traditionally imposed on decision-making. At most, they develop formalizations of bounded rationality through partial modifications of the standard expected utility Framework.

In this paper, we review some famous alternatives to the expected utility theory, and present contradicting evidence from observational studies as well as paradoxes developed by theorists that hint at the flawed set of assumption on which the EUT is built. The goal is to encourage incorporation of behaviorist findings in the mainstream practice of economics.

ALTERNATIVES TO EXPECTED UTILITY THEORY

An enormous amount of theoretical effort has been devoted to developing alternatives to the expected utility theory (EUT), and this has worked hand-in-hand with an ongoing experimental program aimed at testing those theories. The experiments in the economic laboratories show that the standard theory does not fit the facts. Therefore, developing a better understanding of the determinants of individual choice

behavior seems a natural research priority. Now the intriguing question is whether economic experiments have been generating a serious competitor for replacing EUT, at least for certain purposes.

Using non-expected utility models to explain real behavior is an interesting and active field in economics. Experimental economics plays a key role in investigations that provide evidence for valid and more realistic modeling of behavior. Expected utility theory has a fair number of deficiencies. Many economists have worked on some alternatives that can operate better at least for certain purposes. Experimental research provided this field with a rich ground of controlled observations that could both shed a light on the shortcomings of this model and provide theorists with ideas to develop alternatives and improvements. Optimization theory, as defined broadly, provides a rich theoretical framework that is capable of accommodating the anomalies within EUT as presented below.

Among the alternative to EUT is non-transitive preference theory. In this theory of choice, we are able to talk about people maximizing their utilities without transitive preferences. Bell, Fishburn, and Loomes & Sudgen all proposed this theory independently in 1982. Loomes and Sudgen (1987) present a version of this theory called regret theory. Despite a conventional theory that assigns value independently of individual prospects, regret theory allows comparisons between the consequences of alternative choice options. They introduce the “regret aversion” assumption which implies that a large difference between what you get from a chosen action and what you might have gotten from an alternative gives rise to a disproportionately large regret, so people prefer greater certainty in the distribution of regret. Consequently, regret theory could explain the standard violations of the independence axiom for statistically independent prospects.

Weighted Utility theory is a special case of regret theory, used by Segal and Spivak (1990) to resolve counter-intuitive implications of EUT that are carried through to non-expected utility theories, which have similar smoothness properties. The fact that risk averse behavior can be generated by nonlinear probability weighting, even when the utility function has a linear form, is the reason why models with probability transformations do not imply approximate risk neutrality for small risks. Therefore, aversion to probabilistic insurance could be explained by over weighting of the small probability of non-payment. Weighted utility theory could be used to explain insurance purchasing behavior that violates the expected utility theorem axiom of transitivity. An experiment performed by Wakker, Thaler and Tversky.

PSYCHOLOGICAL FINDINGS RELEVANT TO ECONOMICS

Economics conventionally assumes an individual with coherent preferences, who rationally maximizes a utility function, given a set of options and probabilistic beliefs. In what follows, we will look at experimental evidence that can be explained by slight modifications of the standard economic framework, as well as empirical cases, which increasingly challenge standard economics. This section heavily draws on Rabin (1998) that calls the relevant psychological evidence to economists’ attention. He suggests that “a blooming [of] understanding would come out of an active exchange between the two disciplines.” He deliberately avoids arguments that question the relevance of behavioral research to economics, because he finds no intellectual benefit in such a discussion. He simply holds that incorporating psychological findings into economics is doable and embodies no methodological complication. He invites economists to treat relevant psychological claims as presumptively plausible: Claims such as irrational investment as a result of reading too much into the short term performance of stock market, or the resentfulness of employees who feel they are mistreated. He further says that “the methodological illicitness of departing from habitual assumptions is rooted in lack of awareness of empirical findings and that this prejudice should be abandoned in favor of empowering the economics framework.” The emphasis should be put on “what we learn from experience not how to conduct one.”

MODIFICATIONS TO THE RATIONAL CONCEPTION OF HUMAN CHOICE IN PSYCHOLOGY

Economics and psychology are nonbearing disciplines that do not have a long history of communication. In this section, we heavily draw on Rabin's classic work [4] to present a profile of where these two fields meet. Changes in outcomes relative to preferences will change the preference structure and ordering. And thus the preference ordering does not depend merely on the absolute levels of outcome but on the changes according to the status quo. People have a directed preference for gains and losses; they dislike loss significantly more than they like a gain of the same amount. Furthermore, people depart from self-interest in favor of goals such as fairness, reciprocal altruism, and revenge. Mild modifications could capture this phenomenon to some extent. These modified frameworks are faithful to standard economics. A method for considering the effect of reference points (the primary status) is to incorporate habitual levels of consumption into utility analysis. Traditionally we consider the utility at time t , $u(t)$ as a function of consumption at time t , $c(t)$. In addition to that, we can define a preference level at time t , $r(t)$, which depends on consumption before t or at the expectation of future consumption or both. Then $u = u(r, c)$ at any time t , will be a more general function that accounts for reference point influence on behavior.

The displeasure of loss being greater than the pleasure of same size gain is implied by the regular concave utility function that holds for familiar explanation of risk aversion. But loss aversion says more than this. Tversky and Kahneman (1991) show that people value modest losses almost twice as much as gains of the same magnitude. This suggests an abrupt change in the slope of the value function at the reference level. Mehra and Prescott (1985) and Epstein and Zin (1990) observed that according to macro data, expected utility theory cannot provide us with an explanation for the attitudes toward large-scale risks and small-scale risks at the same time. Rabin (1997, "calibration theorem") shows that no concave utility function can do so. Rabin then captures both risk attitudes in an expected utility framework by introducing a reference-based kink in the utility function. Segal and Spivak (1990) develop a non-expected utility theory to explain the same thing. Kahneman, Knetsch, and Thaler (1990) identify and illustrate the endowment effect as a phenomenon related to loss aversion. People value a thing higher after possessing it.

Two other related observations are as follows: a status quo bias, where people choose not to trade when different goods of the same monetary value have been allocated to them randomly (see Knetsch, 1989); and diminishing sensitivity, meaning they move from risk-aversion over gains to risk-loving over small losses (see Kahneman and Tversky, 1979). Raymond Hartman, Michael Doane, and Chi-Keung Woo (1991) report empirical evidence for a status quo bias in consumer demand for electricity. Loss aversion has been investigated and supported by John Shea (1995) through observing a smaller increase in consumption level in response to good news than the decrease in consumption in response to bad news.

An example of a model that takes the above considerations into account is given by economists Ryder and Heal (1973). They develop the idea of a parameter a that measures the speed with which reference points are adjusted, which is correlated with the weight that people put on the past consumption. For a long run utility maximizer, the current reference level $r(t)$ is calculated as a weighted average of the past reference level $r(t-1)$ and past consumption level $c(t-1)$. Evidence is sparse for the two ideas that this model rests on: that reference levels exist, and that changes in reference levels affect people's preferences.

Experimental research reveals many instances of subjects' behavior that cannot be explained by pure self-interest: big contributions to public goods, sharing money voluntarily, sacrificing money to punish unjust behavior by other subjects. Hence, realism suggests that economists should depart from the presumption of naïve self interest and move toward models that permit human considerations such as equity, fairness, and status-seeking. The last has been shown to play an important role in employee behavior. It is worth

mentioning that some market structures such as double-auction generate self-interested behavior in the laboratory. However, the fact that self-interest explains behavior in some cases should not lead us to ignore institutional and environmental effects on behavior in other cases. Nor should it be used to argue that a completely different framework is needed to explain all economic phenomena. From a pragmatic point of view, any model could be good as long as it achieved the objective of our inquiry, namely, explaining consumers' behavior.

CONCLUDING REMARKS

Mainstream economics employs a powerful combination of methods: methodological individualism, mathematical formalization of assumptions, and sophisticated empirical field-testing. Rabin says that in the light of these methods we can understand psychological findings. He further suggests that we integrate and incorporate these findings into economics, to enrich our field and expand the scope of choices that economics can explain.

Economists usually place a high premium on mathematical and logical accuracy, thereby ignoring important details of human behavior. The intriguing question remains unresolved: is there a meaningful trade-off between mathematical accuracy and detailed quantification on one side and describing the details of real human behavior on the other hand? Or this is just another version of the prominent dualistic approach, like "tractability" and "parsimony" versus "integrating realistic evidence into our research"? Can we avoid all the dualistic tradeoffs by employing an integrative new framework for our understanding of human behavior? These remain to be open questions to be explored.

We looked at the results of studies of the human behavior in experimental labs and when faced with gambles and tried to learn something outside traditional economics. It is amazing that behavior observed by the researchers in many different fields suggests a fundamental revision of the economic theory of choice, yet economists keep developing their ideas within the traditional framework. Mainstream economists are interested in "non-psychological" models of bounded rationality. Some of those have been formulated based on intuition, computer science, or artificial intelligence. These models are meant to capture cognitive limits of economic actors but do not invoke research on the specific patterns of errors that human beings make. Economic theories that can only calculate cannot comprehend economic deliberation; hence, they can benefit from incorporating findings of actual human behavior from many neighboring disciplines, especially psychology.

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