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Satisficing and (un)bounded rationality—A formal definition and its experimental validity

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ABSTRACT

Based on exogenously given or idiosyncratically expected scenarios satisficing is formally defined and shown to include rationality as an unlikely border case. Our approach suggests new ways of defining risk attitudes and has been applied to risky choice problems and (stochastic) market games. Contrary to revealed preferences where one infers goals from observed choices, the experimental tests do not only elicit choice behavior but also aspirations and, if necessary, idiosyncratic expectations.

1. Introduction

Traditionally economic theory has relied on the rational choice approach when trying to explain individual choice behavior. That this has been quite successful is demonstrated by the neighboring social sciences which lately also rely on rational choice explanations. So why do we propose a bounded rationality approach which does not necessarily exclude rationality, e.g. for simple tasks, but renders it an unlikely border case?

Reasons are, of course, that we – members of homo sapiens rather than homo oeconomicus – are cognitively constrained and that we may prefer to ignore certain information or rely on simple routines or heuristics (see Berg and Hoffrage, 2008). This questions whether we can develop well behaved preferences, engage in Bayesian belief updating, are analytically unconstrained, and able to process and store all relevant information. We simply do not have the capabilities, presupposed by rational choice explanations. More often than not attempts to improve our decision behavior by learning how to choose

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rationally or by advice, based on rational choice assumptions, therefore will fail. Realizing this, it is natural to develop a concept of bounded rationality where one acknowledges the cognitive limitations as well as the emotional and habitual aspects of human decision making (Simon, 1955; Sauermann and Selten, 1962) and especially of the decision processes in corporate firms (Cyert and March, 1963).

A more specific challenge for rational choice proponents has been to explain experimental findings contradicting opportunism (in the sense of own monetary payoff maximization), Bayesian updating, etc. (see Kagel and Roth, 1995, for surveys of experimental results).

One reaction to such findings can be described as neoclassical repairing (Güth, 1995) or game fitting. Rather than questioning the rationality assumption, it is maintained but applied to a modified decision task or game, e.g. by allowing for risk attitudes, other regarding concerns, intentionality, procedural concerns and even for probability transformation (Kahneman and Tversky, 1992). Why do we object to such rationalization of experimentally observed behavior?

One reason is that such repairing and fitting usually complicates the decision problem. We are simply unable to rationally solve such more complex decision tasks. Another reason is that such a rational choice explanation is an explanandum rather than an explanans. It essentially transforms the question "why such behavior?" in asking "why such motives, beliefs,. . .?" Such "explanations" provide no basis for improving decision behavior by teaching, learning, or consulting since they neglect the limitations of human cognition and deliberation. Although a lot may be learnt from systematic repairing and fitting (e.g. Bolton and Ockenfels, 2000; Fehr and Schmidt, 1999), the need to develop the theory of bounded rationality persists. Finally, there are studies claiming that bounded rationality may imply socially and even individually more beneficial outcomes (Berg and Lien, 2005, and, more generally, Berg, 2003).

If by repairing or fitting nearly all behavior can be rationalized, the rational choice approach degenerates to a language, the Lingua Franca of economists, by which we describe what we observe. There exists a similar risk for the theory of bounded rationality. More often than not (an exception is Zwick et al., 2003), the intuitive terminology (Simon, 1955) of aspiration formation, satisficing when searching the action space, and aspiration adjustment (Sauermann and Selten, 1962) has only been used to explain in vague terms how individuals or firms actually do make their choices, a terminology understandable by its addressees. To render bounded rationality theory more informative, it is necessary to define it formally and to develop it in the light of empirical, e.g. experimental findings.

When formally defining bounded rationality, one encounters a difficulty similar to rational choice analysis where one hardly can predict anything without knowing the preferences. This is avoided here since not only choices are elicited but also the aspirations, formed by the decision making agents. With such data, the formal definition of satisficing is obvious. It can be shown that satisficing does not exclude optimality but contains it as an unrealistic border case where we rely on a more basic, in fact prior-free concept of optimality. The basic idea is that decision makers face exogenously given or idiosyncratically expected scenarios for which they form scenario-specific payoff aspirations. By comparing aspirations and considered choices, one thus can check satisficing and actually inform participants whether or not they are satisficing. Several experiments have been performed to test the satisficing hypothesis and, if so, whether satisficing is optimal.

In Section 2 we introduce and illustrate the satisficing concept. Section 3 discusses experimental procedures for testing the satisficing hypothesis and rendering aspiration formation payoff relevant. It also reports a few experimental findings. Section 4 concludes.

2. Satisficing

In the following, we first describe what we mean by scenarios in risky choice and strategic interaction tasks and then define satisficing as well as optimal satisficing.

2.1. Scenarios

Let us begin with a stochastic decision task

$$T = (C, Z)$$

where $C \neq \varnothing$ is the set of choices $c \in C$ with the cardinality (number of different elements) $\#C \geq 2$, i.e., there exist at least two alternatives, and $Z \neq \varnothing$ is the set of chance events. If Z is a rather large set, the decision maker may consider[1] only $\widehat{Z} \subset Z$ with $\widehat{Z} \neq \varnothing$ rather than Z. We then would consider only chance events $z \in \widehat{Z}$ as idiosyncratically expected scenarios. Cognitively, a decision maker may directly neglect some chance events by expecting $\widehat{Z} \neq Z$ or forming the same payoff aspiration for various $z \in Z$, i.e., by not distinguishing them in aspiration formation.

For strategic games we focus only on stochastic normal form games

$$G = (S_1, \ldots, S_n; u_1(\cdot), \ldots, u_n(\cdot); Z)$$

[1] A referee indicated that the decision maker may also expect an impossible event, i.e., $z \in \widehat{Z}$ but $z \notin Z$. Here this is excluded since $u_i(s,z)$ would not be defined for such an event z. One, of course, could include such a case by postulating an idiosyncratically generated payoff function $\widehat{u_i}(s, z)$ which would specify payoffs even for such impossible but idiosyncratically expected events z.