

Referee's Report on:

A Review of the Certainty Effect and Influence of Information Processing, by *Patrick A. Ramirez and Daniel S. Levine*

The paper presents a review of the literature on the certainty effect in individual decision making. It also presents a review of related effects and theories which have been developed in the literature to explain the effect. I find the survey unsatisfactory for two main reasons.

1) The certainty effect is one of the many contradictions of the expected utility theory for choice under risk. The effects was predicted and demonstrated by Maurice Allais about 60 years ago (Allais 1953). In the eighties psychologists Tversky and Kahneman published several articles on major scientific journals proposing a descriptive model for choice under risk known as Prospect Theory, in which the certainty effect and other violations to expected utility were used as illustrative examples (Kahneman and Tverky 1979, Tverky and Kahneman 1981). Since then, the literature on non-expected utility models has grown enormously. Models have been proposed, qualified, developed, and applied in several contexts. Prospect theory itself has changed substantially from the earlier formulation of the eighties (Tverky and Kahneman 1992, Wakker 2010). Several surveys are available for the literature (Starmer 2000).

A first major problem with this survey is that the many developments are ignored. In fact, more strongly a reader not acquainted with the literature could be induced to believe that many developments never occurred. Even very critical refinements of Prospect theory are ignored. For example, the probability weighting function in Figure 1 is a very old one, having in fact several problems. Some statements are very misleading. For example, what do the authors mean with the following (p. 18): "... As a result of these findings, questions have arisen about the universal application of prospect theory outside of single gamble scenarios". Do the authors mean that Prospect Theory cannot be used outside the single gamble scenario? This is false.

2) A second major problem of the survey is that it is difficult to understand. Statements are often too vague and so are descriptions of theories. Even very simple points may be difficult to understand for readers not familiar with the literature. For example, in which way does the Allais paradox violate the cancellation axiom (at page 5)? The violation is not immediately apparent: even Savage (1954) took a couple of pages of his book to explain the violation. Even more recent developments are presented in a way which readers may find difficult to understand. Theories are described in rather general terms, but implications and explanations of how they work in practice are never given. Which are the set of alternatives in the theories? Which are the rules of choices among alternatives? For example, how does Fuzzy trace theory work in practice? The long description of the theory between 26-30 pages is not satisfactory and it is useless for a reader who may want to check what the theory predicts in a given example.

There is also another problem that I have to mention with the survey. I have found various inaccuracies in the way in which the material is presented in the text. This is important for a survey. Here an example of what I mean for "inaccuracy". At page 6 the authors write. "As with the Allais paradox, there is a violation of one of the axioms of expected utility theory, in this case the axiom of invariance, which states that the manner that options are presented should not influence a decision-maker's choice (Plous, 1993; Von Neumann & Morgenstern, 1964)". Reading the paragraph, a reader may be induced to believe that there is an axiom of expected utility called "invariance" used by, inter alia, Von Neumann & Morgenstern in 1964. But this is not true. First of all, "invariance" is not a formal axiom of expected utility, but it is a general principle assumed by several theories developed by economists (not only by expected utility). In this sense, it has a different status with respect to cancellation. The term was introduced by Tversky and Kahneman in their papers written in the eighties (for example, Tverky and Kahneman 1986), and never used by Von Neumann & Morgenstern. The book by Von Neumann and Morgenstern quoted in the survey is *Theory of Games and Economic Behavior*. It was one of the most important book in Economics. It was written in 1943 and the first edition was published in 1944. A second edition came in 1947 and a third in 1953. There was no new edition in 1964. It is possible that John Wiley Science Editions published the book in 1964 (as reported in the references to the survey). But this is not normally the way in which books are quoted.

References not in the submission:

- Savage, L.J. (1954). *The Foundations of Statistics*. New York: Wiley.
- Starmer, Chris. 2000. "Developments in Non-expected Utility Theory: The Hunt for a Descriptive Theory of Choice under Risk." *Journal of Economic Literature*, 38(2): 332-382.
- Tversky, A., & Kahneman, D. (1986). Rational Choice and the Framing of Decisions. *The Journal of Business*, 59(4), S251-S278.
- Tversky, A., & Kahneman, D. (1992). Advances in prospect theory: Cumulative representation of uncertainty. *Journal of Risk and Uncertainty*, 5(4), 297–323.
- Wakker, P. P. (2010). *Prospect theory: For risk and ambiguity*. Cambridge, UK: Cambridge University Press