Varying Risk Confidence

V.R. Cappelli, S. Cerreia-Vioglio, F.A. Maccheroni, M. Marinacci

Università Bocconi

EXTENDED ABSTRACT

July 2015

There is by now solid empirical evidence of the dependence of choice behavior of decision makers on the *source of uncertainty* they are facing.

Examples of different sources of uncertainty are: colors of balls drawn from a given urn, prices on a given market, temperatures in a given location, outcomes of a given political election.

The thought experiment that sparked the economic interest on *source dependence* of preferences is the Ellberg paradox (1961).

In a version of this experiment (run by Fox and Tversky, 1995) subjects are confronted with two urns, I and II, both urns contain 2 balls and each ball can be either red or green. The subjects can verify that Urn I contains exactly 1 red and 1 green ball, while the composition of Urn II is completely unknown to them. A ball is drawn at random from one of the urns and the subjects receive $20 or nothing depending on whether or not they predict correctly the color of the ball. Most subjects seem indifferent between betting on red or on green from either urn, yet they strictly prefer to bet on the urn of known composition (Urn I) rather than on the urn of unknown composition (Urn II). For example, Fox and Tversky (1995) find that, on average, subjects are indifferent between $9.74 for sure and a bet on any color from Urn I, or $8.53 for sure and the same bet on Urn II.

More formally, a *source of uncertainty* is a set of states (colors in the Ellsberg paradox) that are generated by the same mechanism of uncertainty (one of the urns), and *source preference* is the assertion that between two prospects (bets) yielding the same distribution of rewards, but depending on different sources (urns), decision makers may have a strict preference for one over the other.

Source preference generates a 'paradox' in the Ellsberg experiment because indifference between betting on red or on green from either urn suggest that the subjects considers the two states equally likely, but now, if we suppose that subjects assign the same *von Neumann-Morgenstern utilities* to the same consequences generated by different sources (Ellsberg 1961, page 661), the certainty equivalents of all the bets involved in the experiment must be the same. This is of course inconsistent with a preference for betting on the known urn, and *a fortiori* with the difference of more than 12% in certainty equivalents found by Fox and Tversky.

In this paper, we provide a simple axiomatic model of expected utility preferences that account for source preferences by allowing the "*von Neumann-Morgenstern utilities*" to depend on the source.

The intuition of our approach is in line with some of the initial discussion of the Ellsberg paradox (notably Roberts, 1963 and Smith, 1969), with the "competence hypothesis" of Heath and Tversky (1991), and the recent literature on domain dependence of risk aversion (Dohmen et alii, 2011). On the other hand, our formal approach is alternative relative to the dominant one in the theoretical literature that, starting with the seminal papers of Kahneman and Tversky (1979) and Schmeidler (1989), rather than considering source dependent utilities (— weighting of consequences that depends on sources), focussed on source dependent probability distortions (— weighting of probabilities that depends on sources).

References

[1] T. Dohmen, A. Falk, D. Huffman, U. Sunde, J. Schupp, G.G. Wagner, Individual risk attitudes: measurement, determinants, and behavioral consequences, J. European Econom. Association 9 (2011) 522–550.

[2] D. Ellsberg, Risk, ambiguity, the Savage axioms, Quart. J. Econom. 75 (1961) 643–669.

[3] C.R. Fox, A. Tversky, Ambiguity aversion and comparative ignorance, Quart. J. Econom. 110 (1995) 585–603.

[4] C. Heath, A. Tversky, Preference and belief: ambiguity and competence in choice under uncertainty, J. Risk Uncertainty 4 (1991) 5–28.

[5] D. Kahneman and A. Tversky, Prospect theory: an analysis of decision under risk, Econometrica 47 (1979) 263–291.

[6] H. Roberts, Risk, ambiguity, and the Savage axioms: comment, Quart. J. Econom. 75 (1963) 327–336.

[7] D. Schmeidler, Subjective probability and expected utility without additivity, Econometrica 57 (1989) 571–587.

[8] V.L. Smith, Measuring monmonetary utilities in uncertain choices: the Ellsberg urn, Quart. J. Econom. 83 (1969) 324–329.