Mark Machina's Primary Research Agenda

My research has primarily focused on the economic theory of individual choice under risk and uncertainty – in particular, on generalizations and extensions of the classical theories of attitudes toward risk and beliefs under uncertainty.

The classical theory of attitudes toward risk, proposed by Daniel Bernoulli in 1738 and formalized by John von Neumann and Oscar Morgenstern in 1944, hypothesizes that an individual's preferences over uncertain prospects can be represented by the mathematical expectation of the "utility" levels assigned to their alternative possible outcomes, and that properties of such preferences – such as an individual's degree of aversion to or preference for risk – are derived from mathematical properties of their utility function over money. The probabilities used to calculate such expectations may either be well-defined "objective probabilities" such as those arising from fair coins, dice or roulette wheels, or "subjective probabilities" reflecting individuals' likelihood beliefs over sports events, the weather, asset prices, etc., in which case they may legitimately differ from individual to individual.

The classical theory of subjective beliefs under uncertainty, formalized by Leonard Savage in 1954, hypothesizes that an individual's beliefs over the likelihoods of subjectively uncertain events can indeed be represented by standard additive probabilities, which again, may legitimately differ across individuals.

As with all scientific theories, the classical theories of preferences over uncertain prospects and beliefs over subjective events have testable predictions. Except for casinos, racetracks and sports betting venues, the real-world offers little opportunity to directly observe or measure individuals' preferences or beliefs, but researchers – both economists and psychologists – have conducted innumerable laboratory experiments testing such predictions. They have almost universally found that individuals' preferences and beliefs *systematically* violate the predictions of the classical theories, most notably (though not exclusively) in the so-called "paradoxes" of Maurice Allais (1953) and Daniel Ellsberg (1961). (See my web page for Professor Allais' rather cantankerous comments on my own research.)

Such findings have led to the development and analysis of alternatives to or generalizations of the classical models, and my research lies in this field. More specifically, I have tried to explore the extent to which the formal mathematical analytics of the classical models can be extended to the analysis of preferences and beliefs which are general enough to admit such systematic departures from the classical models – a process I term "robustification" of the classical analytics – and the subsequent further analysis of such more general preferences and beliefs. The different branches of this work are categorized on my web page.

It is important to note that I have not been the only researcher in this area. The field is rife with theoretical and experimental economists and psychologists who have made extensive and indispensable contributions, as described in the several surveys, discussions and encyclopedia articles listed on my web page.

I have also published a few papers outside this field, co-authored with former colleague Clive Granger and former professor Evsey Domar.