Risky Curves: On the Empirical Failure of Expected Utility

Synopsis

Seven decades ago, Von Neumann and Morgenstern proposed curved utility functions for explaining choice under risk, generalizing a suggestion two centuries earlier by Daniel Bernoulli. That proposal continues to dominate the field, as theorists continue to devise new parameterized curves (e.g., for value from gains and losses, and for cumulative probability) while experimenters devise new protocols to elicit data and report estimates of parameters. From intensive interest and large volume of this literature, it is easy to get the impression of scientific progress.

In this book we show that the empirical harvest so far has, in fact, been quite meager. Estimated parameters (e.g., risk-aversion coefficients) exhibit remarkably little stability outside the context in which they are fitted. Their power to predict out-of-sample is in the poor-to-nonexistent range, and we have seen no convincing victories over naïve alternatives. Outside the laboratory, expected utility theory and its generalizations have provided surprisingly little insight into economic phenomena such as securities, real estate or labor markets, insurance, gambling, or business cycles. It is perhaps time to ask whether the failure to find stable replicable results is the result.

Although our main purpose is to raise doubt about the current approach, we do offer some positive suggestions. We reconsider the meaning and measures of risk and of risk aversion; we recommend using simple expected value criterion, while looking for explanatory power in the constraints and the real options that decision makers face; and we note recent work in evolution, learning, and physiology that someday might lead to a better understanding of, and ability to predict, decisions in an uncertain world.

Chapter Abstracts

Chapter 1

In spite of long and intensive search, an empirically validated theory of choice under risk with significant predictive power has eluded economists. Attempts to identify curved utility functions whose expected value may help predict out-of-sample choice have not succeeded. Nor have such functions helped to explain industry-level behavior in various aspects of social and economic life. Economists sometimes conflate two very different meanings of risk itself: the possibility of harm or loss and dispersion of outcomes. Later chapters will document the current unsatisfactory state of affairs and offer some modest suggestions.
Chapter 2

The foundation of the contemporary orthodox theory of choice in the face of risk was laid by 18th-century mathematical Daniel Bernoulli, who introduced the idea of choice based upon the expected value of a concave utility function. Largely ignored for two centuries, Bernoulli’s approach was reinvigorated by von Neuman and Morgenstern. After the 1944 publication of their seminal work, *Games and Economic Behavior*, there was a veritable explosion of both theoretical and empirical work incorporating expected utility and associated concepts of innate individual attitudes towards risk.

Chapter 3

Estimates of a given individual’s risk preferences often vary over time, across settings, and especially across elicitation institutions. Indeed, the institution influences choice more reliably than does individual identity. Such extreme context dependence – even on details of payment method, feedback, visual cues, etc – raises doubts about whether any conceivable institution could reliably elicit intrinsic individual risk preferences.

Chapter 4

Since attributes of a complex system and its individual elements can diverge, we cannot, a priori, rule out the possibility that curved Bernoulli functions may help us better understand and predict aggregate or macro-level phenomenon, even if they do not help at the micro-level. As it turns out, however, propositions about attitudes to dispersion-of-outcomes risk have contributed little to our understanding of health, medicine, sports, illicit drugs, gambling, or engineering. Insurance and credit markets focus on the loss/harm interpretation of risk, and the concept of dispersion risk is inserted only as an ex post plug to explain purchase of insurance. The degree of risk aversion in the population implied by economic theories of social insurance, real estate, corporate equity, foreign exchange, and labor markets ranges too widely and capriciously—by more than an order of magnitude—to sustain the concept of innate risk preferences as a scientifically useful concept.

Chapter 5

This chapter is a bridge between earlier chapters that criticize standard choice theory and later chapters that suggest different approaches. It tells the story of phlogiston, an episode in the history of science, and discusses some currently popular variations on expected utility theory. Then it reconsiders the nature of personal utility for money and the role of revealed preference. The rest of the chapter presents differing perceptions of risk and alternative ways to measure them.
Chapter 6

This chapter argues that personal circumstances and constraints are not necessarily an obstacle, but are instead a potential source of regularity that could yield a better understanding and prediction of risky choice. It finds hints of that approach in classic studies by Grayson and by Smith and Stulz, and in ecological models of risky foraging. It makes a connection to Stigler and Becker’s famous “De Gustibus…” paper. The chapter then offers specific examples of how revealed risk preferences are shaped by gaps between gross and net monetary payoffs, and by embedded real options, even when the decision maker’s intrinsic preferences are risk neutral.

Chapter 7

The chapter reviews the limitations of the approach proposed in Chapter 6 as well as the limitations of existing theory. It then touches on approaches that range beyond the neoclassical, arising from evolutionary biology, psychology and neuroscience. We do not know where a better theory of risky choice will come from, but we urge economists to keep their minds open to these and other sources of ideas.