

## A PORTFOLIO OF RISK MEASURES

**ABSTRACT.** A comprehensive set of sixteen measures of willingness to take risks has been developed. This set includes measures from three categories: measures from standardized risky situations having an underlying theory of risk, measures inferred from revealed choices in financial decisions, and measures derived from attitudes. A study of over 500 top-level business executives shows significant relationships within categories, but relatively little relationship across categories. Context differences, especially personal versus business situations and opportunities versus threats, underlie the responses.

### 1. INTRODUCTION

Risk-taking has two components: the riskiness of situations and the willingness of people to take risks. In recent years considerable attention has been paid to assessing the riskiness of situations (Fischhoff *et al.*, 1981; Kunreuther *et al.*, 1983). Relatively little attention has been devoted to the equally important topic of the risk propensity of decision makers. Our research aims to redress that balance.

Different disciplines have developed different ways to determine risk propensity. For a utility theorist the procedure seems clear. Choices among gambles are used to ascertain the person's utility function and then a measure of risk propensity is derived from the utility function. Arrow (1971) and Pratt (1964) have provided the theoretically correct measure.<sup>1</sup> While this measure provides a single number for any given level of wealth (i.e., any point on the utility function), the measure will generally be different at different wealth levels. Thus, even with this well-defined risk measure, we cannot obtain a single number to represent a person's risk propensity.

The problem is further complicated when we consider how utility functions are obtained. The basic risk paradigm requires two alternatives, one of which is a sure payoff while the other is a gamble having two possible outcomes. Note that there are four parameters in this simple situation: three monetary payoffs (i.e., the sure payoff as well as the

'winning' and the 'losing' payoffs in the gamble) and one probability (the probability of winning is one minus the probability of losing). The standard ways of obtaining utility functions are to present a person with the two alternatives and to ask the person to provide either (a) a monetary equivalence (by adjusting one of the payoffs so that the person is indifferent between the alternatives) or (b) a probability equivalence (by adjusting the probability in the gamble so that the person is indifferent between the alternatives). From a theoretical point of view, either of the two equivalence methods is correct. Unfortunately these two methods often lead to different utility functions and hence to different measures of risk propensity (Bassler, MacCrimmon, and Stanbury, 1973; Hershey, Kunreuther, and Schoemaker, 1982; Hershey and Schoemaker, 1985; Wehrung, MacCrimmon, and Brothers, 1984).

Thus even within the most highly developed theory of risk, expected utility theory, the determination of a person's risk propensity is not clearcut. When we consider other concepts of risk, we are likely to obtain even wider divergencies.

In economics there has been a tradition of avoiding direct questioning of people. If you want to ascertain a person's preferences, you study the choices he has had made in naturally-occurring risks and attempt to determine the preferences that are revealed by the choices. It seems desirable, then, to try to assess risk propensity through revealed behavior. Presumably a person reveals his risk propensity by how much insurance he buys (e.g., Hammond, Houston, and Melander, 1967), what investments he makes (e.g., Cohn *et al.*, 1975), how much debt he incurs (e.g., Watts and Tobin, 1967), and so forth.

In psychology there have been many studies of attitudes. Often these studies involve asking a person to select one response from a set of two or more matched responses. By categorizing the possible responses and by aggregating the series of responses a person makes, a person is deemed to be introverted, authoritarian, etc. Some of the attitude scales purport to deal with willingness to take risks, so they should be considered in a broad study of risk propensity.

Thus we see that there are numerous bases to draw upon when trying to develop a measure of risk propensity. However, we should pause at this point to ask whether it is meaningful to try to ascertain a person's risk