# WHO'S AFRAID OF A LITTLE RISK? NEW EVIDENCE FOR GENERAL RISK AVERSION

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## Introduction

Triggered by the seminal work of Ward Edwards in the 1950s, the assumption of rationality in decision making as defined in the rational expectations model embraced by economics and other social sciences has come under scrutiny over the last fourty years. Closer inspection has frequently found it lacking in descriptive accuracy. As Edwards pointed out as early as 1954, "it is easy for a psychologist to [show] that an economic man... is very unlike a real man" (p. 382). The general public tends to agree and has not been surprised by the failure of this type of rationality to explain behavior. Thus the novelist Smiley (1995) has one of her characters describe a microeconomics lecture on the topic as "rollicking tales about an entirely alien planet, the Bizarro Planet, home of Bizarro Superman" (p. 141).

The behavioral conditions or axioms that a decision maker has to satisfy in order to qualify for the "rationality" stamp-of-approval all revolve around cross-situational consistency (see Keller, 1992, for a concise recent summary.) The particular situations under which people violate such consistency conditions (e.g., consistency between the pairwise choices of the Allais (1953) paradox required by expected utility (EU) theory) have been used as diagnostics to design alternative descriptive models of choice behavior. Risk attitudes, in particular, have been found to be notoriously inconsistent across situations (i.e., different problem contexts) and domains (i.e., gains versus

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losses). People have shown a tendency to be risk-averse in the gain domain, but risk-seeking in the loss domain (Payne, Laughhunn, & Crum, 1980; Schoemaker, 1990; Tversky & Kahneman, 1986). The empirical observation that variations in the framing of options (i.e., whether outcomes are perceived to be gains or losses) yield systematically different patterns of preference contributed to the formulation of prospect theory (Kahneman & Tversky, 1979) as a descriptive model of risky choice. Among other modifications of EU theory, prospect theory partitions the outcome space into a gain and a loss set and only requires certain choice consistencies (e.g., invariance of preference under addition of a constant to all outcomes) within each set, but not across sets.

In 1992, Edwards tried to put an end to the debate that he had helped spawn and to the ever increasing research literature on the descriptive failures of the rational-economic choice model in general, and of expected utility theory in particular. He declared the case closed, the issues settled, and rationally-consistent economic man dead as a descriptive model of human behavior. In most part I agree with this assessment. However, for reasons of fairness and to prevent the rash discard of any baby with the bathwater, I would like to play devil's advocate in this paper. I will argue that, on at least one dimension, economic man and his lesser-known counterpart, economic woman, seem to act in a more consistent fashion than they have been given credit for. In particular I will show that, if measured correctly, most people have attitudes towards risk that are constant across choices in different domains and situations. Furthermore, I will present evidence that the microeconomic assumption of general risk aversion may have more validity than recent psychological research has led us to believe. I will show that the majority of individuals, be they male or female or from cultures as different as China and the United States, have a tendency to choose those options that -- ceteris paribus -- they perceive to be less risky, i.e., are perceived-risk averse.

## Measuring Risk Attitude

The concept of risk attitude has a varied history. In the expected utility (EU) framework, the normative/prescriptive model of risky choice that most psychologists are familiar with, *risk attitude* is nothing more than a descriptive label for the shape of the utility function presumed to underlie a person's choices. Choice of a sure amount of money over a lottery with equal expected value is diagnostic of a risk-averse (concave) utility function, choice of the lottery is diagnostic of a risk-seeking (convex) utility function, and indifference points to a risk-neutral (linear) utility function. A person's risk attitude describes the shape of his or her utility function for the outcomes in question derived from a series of such choices. A commonly used measure of risk attitude is defined as $-u''(x)/u'(x)$, where $u'$ and $u''$ denote the first and second derivative of the utility function $u$, respectively (Arrow, 1971; Pratt, 1964). Technically, the terms risk aversion and risk seeking thus refer only to those formal properties of the utility function. However, as pointed out by von Winterfeldt and Edwards (1986, p. 256), "those who coined the term *risk aversion* had in mind the psychological interpretation that someone who prefers the EV of a gamble over playing the gamble *does not like to take risks*."

Von Winterfeldt and Edwards profess to be uncomfortable with this interpretation, but it is an interpretation with a wide degree of currency among both researchers and the general public. Risk preference, a person's standing on the continuum from risk aversion to risk seeking, is considered to be a stable personality trait by many and one that carries weight, for example, in personnel selection and placement decisions. Managerial folklore has it that greater risk-taking is associated with personal and corporate success, an assumption that has received at least some empirical support (MacCrimmon & Wehrung, 1990).

Two problems have marred the notion of risk preference as a personality trait. First, different methods of measuring risk preference have been shown to result in different classifications (Slovic, 1964; MacCrimmon & Wehrung, 1990). Second, even with the same assessment method, individuals have not shown themselved as consistently risk seeking or risk averse across different domains and situations, both in laboratory studies and in managerial contexts. MacCrimmon and Wehrung (1986, 1990) show, for example, that managers have different risk attitudes (i.e., different utility functions) when using personal versus company money or when evaluating financial versus recreational risks. Schoemaker (1990, 1993) provides within-subject evidence for the reflection of risk attitude from strong risk-aversion for gain lotteries to moderate risk-seeking for loss lotteries and argues that risk attitude as a stable individual-difference construct may not be detectable when looking at people's choices, because it is masked by a number of situational factors, for example, portfolio considerations or intertemporal effects. Despite these complications, there has been a reluctance to relinquish risk attitude as a stable individual difference variable, presumably because of the strong face-validity of the construct. The reader will probably have no difficulty thinking of a friend whom he or she considers a risk-seeker and of another friend who seems generally risk-averse.

In this paper, I argue that risk attitude is more naturally conceptualized in the risk--value framework of risky choice (see Sarin & M. Weber, 1993) that comes out of finance. This framework allows us to tease apart different ways in which situational variables such as outcome domain or gain-versus-loss framing may affect people's choices under risk and allows for the possibility that changes in choice are driven by changes in risk perception, while a person's attitude towards perceived risk may remain constant across situations.

## Risk--Value Models and Perceived-Risk Attitude

In the previous section we saw that the notions of risk perception and attitude towards risk play at most a minor and indirect role in the EU framework. In contrast, risk and risk attitude are central to the other major theoretical framework for decision making under risk, namely the risk-return or risk-value framework. The pioneering work of Markowitz (1959) in the theory of finance as well as the subsequent work of Coombs (1975) on the psychology of risky decision making conceptualized risky choice as a compromise between the riskiness and the value of options. Some theorists consider risk-return tradeoff models "more intuitively satisfying... than expected utility" (Bell, 1995, p. 3). Sarin and M. Weber (1993, p.148) describe the "intuitive appeal of risk-value models" as the fact that they require that "choice should depend on the riskiness of the gamble and its value." More specifically, Markowitz (1959) modelled

people's willingness to pay (WTP) for risky option X as a compromise between the option's return or value (V) and its risk (R) and assumed that decision makers seek to minimize the risk of a portfolio for a given level of expected return:

$$WTP(X) = f(V(X), R(X)) = V(X) - bR(X), \quad (1)$$

Traditional risk--return models in finance equate V(X) with the expected value of option X and R(X) with its variance, a formalization that is compatible with a quadratic utility function for money (Levy & Markovitz, 1979) and that is still widely used. Recent work (Bell, 1995; Jia & Dyer, 1996; Sarin & M. Weber, 1993) has shown that a broad range of utility functions have risk--return interpretations. Different utility functions imply different measures of risk under the assumption of risk aversion and the equation of return with expected value. These generalized risk--return models allow for the fact that the perception of the riskiness of risky options may differ between individuals or groups or may differ as a function of the decision domain or context.

Equation 1 implies that differences in preference, measured by willingness-to-pay for X, can come about in at least the following two ways. They may result either from differences in the perception of the riskiness of option X (i.e., from differences in the value of R(X)) or from differences in the risk--value tradeoff (i.e., from differences in coefficient b). Slovic (1964) made essentially the same theoretical distinction. The logic of the approach is similar to the logic behind Dyer and Sarin's (1982) measure of relative risk attitude, which was to remove differences in marginal value functions from utility functions, to see whether any remaining curvature (the relative risk attitude which reflected solely one's attitude towards uncertainty) was more consistent for a given individual across domains (unfortunately, it was not; see Keller, 1985). Instead of factoring differences in marginal value out of choice, the perceived risk attitude measure factors differences in perceived risk out of choice. If an individual's choices appear to be the risk-seeking when she is deciding between investment options but appear to be the risk-averse when she is deciding between recreational sports, it may well be that she has a positive attitude towards risk for money, but a negative attitude towards safety risks. On the other hand, it is also possible that her perception and definition of a risky investment option does not coincide with that implied by the expected-utility interpretation of her choices (e.g., risk equal to variance). Assuming, for example, that she needs to pay off a balloon mortgage next year and otherwise risks losing her house, a risky investment option may be one that does not provide her with any chance of earning that balloon payment by next year, which may very well describe the low-variance options. Thus it is at least possible that the woman in our example is consistently perceived-risk averse in both the financial and the recreational decision, that is, she is choosing the option that she perceives to be less risky in both domains. What is different in the two domains and hence affects the option that she chooses is her definition of what constitutes risk in the two domains.

A final advantage of the risk--value conceptualization of risky choice over the EU framework occurs in the prescriptive application of the model, that is, in decision aiding. As pointed out by Keller (1992), in the EU conceptualization and utility assessment procedure, risk attitude is a by-product of assessment judgments and thus not the result of a conscious decision. While both frameworks can accommodate one's conscious choice to be, for example, risk seeking over a certain range of outcomes, it

is conceptually easier to modify the value of coefficient b in Equation 1 in one's pricing of risky option than to modify the EU assessment procedure to guarantee a specific risk attitude.

## Risk Aversion as a Universal Trait?

The assumption of risk aversion as the dominant attitude towards risk in the population and its association with a decreasing marginal utility function for money has been around since Bernoulli in the 18th century. Risk aversion on the part of decision makers is an assumption so common in microeconomics and finance that it is frequently implicitly adopted throughout textbooks in these fields (e.g., Ingersoll, 1987, see p. 37). As discussed in the previous section, risk-aversion is an integral assumption of the risk-value models employed in finance, for example the Capital Asset Pricing Model (Sharpe, 1964), which equates risk with variance.

In contrast to the assumption pervasive in the theory of finance that people should and will strive to minimize risk, Coombs (1975) assumed that people have an ideal point for risk that may or may not be the zero point, and that -- ceteris paribus -- they will prefer options that come closest to this ideal point. He hypothesized that a risk order over a set of options and a given individual's ideal point for risk could be obtained by his or her preference order. Coombs' questioning of the assumption of the rationality of risk minimization was based on the following logic. In most formalizations, risk implies upside potential (i.e., the possibility of a gain or of a payoff greater than expected) at the cost of downside potential (i.e., the possibility of a loss or of a payoff smaller than expected). Whether risk -- ceteris paribus -- is considered desirable or something to be avoided will thus depend on the relative emphasis one places on the upside potential relative to the downside potential. Lopes (e.g., 1987) has provided ample evidence that people differ in the extent to which they weigh those two factors when making decisions under risk. This differential weighting of upside vs. downside may either be an individual difference characteristic, as argued by Lopes, or a function of the situation or role people find themselves in. Thus Birnbaum and Stegner (1979) found that participants assigned to a seller's role put greater weight on the upper values of a range of price estimates for a used car (presumably because the seller's role puts them into a situation where *under*estimates of the car's true value are costlier than overestimates) than those assigned to the buyer's role who put greater weight on the lower estimates (presumably because their role makes *over*estimates of the car's true value costlier than underestimates).

When upside and downside receive differential weight, they can do so in two logically distinct ways. The weights can affect people's perception of the riskiness of different options, such that options with a large downside potential seem proportionately more risky to individuals who put greater weight on the downside. Alternatively, the weights might affect perceived-risk attitude, rather than (or in addition to) risk perception. That is, keeping perceived risk constant, people who put greater weight on the downside of risky options will find them less acceptable. In other words, the choice between two risky prospects can be different in two different contexts either because people's perception of the relative riskiness of the two options differs (which means that the same perceived-risk attitude may hold; e.g., risk-averse in both contexts) or because people's attitude towards perceived-risk differs between contexts,

with one context inducing perceived-risk aversion and the other context inducing perceived-risk seeking.

The introduction of the perceived riskiness of risky options as a psychological variable that may vary between situations, framing conditions, and domains allows for the possibility that perceived-risk attitudes can, in fact, remain consistent across situations and domains even when choices change, but is no guarantee for such cross-situational consistency. The next section reviews the empirical evidence that speaks to this issue.

## Cross-Situational Consistency of Perceived-Risk Attitude

What success does a measure of perceived-risk attitude that unconfounds situational differences in risk perception from situational differences in attitude towards perceived risk have in bringing about greater cross-situational consistency in risk attitude? The answer is overwhelmingly positive. In the first investigation of this issue, Weber and Bottom (1989) asked respondents to choose between pairs of lotteries that either had only positive outcomes or had only negative outcomes and, at a later point in time, asked them to rate which lottery in each pair was riskier. They classified individuals as perceived-risk averse if they consistently chose that option that they had designated as less risky, and as perceived-risk seeking if they consistently chose that option that they had designated as more risky. Consistency was defined statistically by a sign-test across the set of lotteries, and those individuals who showed no significant relationship between perceived risk and preference were classified as perceived-risk neutral. Each individual's perceived-risk attitude for the set of positive outcome lotteries was compared to his or her perceived-risk attitude for the set of negative outcome lotteries. Even though choices reflected for most people in the direction predicted by prospect theory, perceived-risk attitudes were quite stable across the two domains. 76% of all participants were either perceived-risk averse or risk neutral for both sets of lotteries. Only one person with a negative perceived-risk attitude in the gain domain displayed perceived-risk seeking in the loss domain.

Mellers, Schwartz, and Weber (1997) explicitly examined the relationship between prospect theory's reflection effect and possible reflection of perceived-risk attitudes using monetary lotteries. In a within-subject design, they replicated the usual choice pattern (reflection from apparent risk-aversion in the gain domain to apparent risk-seeking in the loss domain) for a subset of respondents. However, for two-thirds of those individuals, perception of the relative riskiness of the lotteries also changed from the gain to the loss set, in such a way that, after factoring out differences in the perceived riskiness of choice options, people were perceived-risk averse in both the gain and loss domain.

In a study that substituted real-world risky choice options for abstract monetary lotteries, Weber and Milliman (1997) looked at the stability of three different definitions of risk attitude across decisions in the gain vs. the loss domain. Using commuter trains with risky arrival times as choice alternatives, they asked respondents to choose between pairs of trains that had either only positive arrival times (i.e., arrival times that were faster or equal to the stated status quo of a travel time of 60 minutes) or only negative arrival times (i.e., arrival times slower or equal to the status quo). The same pairs of trains were also shown again at a later point in time with the request to

judge which of those two trains was the riskier one. In addition, respondents answered questions that allowed for the construction of their utility functions for faster and slower commuting time as well as their marginal value functions for gains vs. losses in commuting time. Choices again reflected from pairs with faster arrival times (gains) to pairs with slower arrival times (losses), though in the direction opposite from the pattern commonly observed for monetary gambles. Consistent with this difference in choice pattern, there was little consistency in people's risk attitude across the gain and the loss domain, when risk attitude was defined by the shape of an individual's utility functions for gains and losses in commuting time. Only 22% of commuters had consistent utility function risk attitudes in both domains, about evenly divided between risk-seeking (convex utility functions) and risk-aversion (concave utility functions). Consistency improved some, but not dramatically, to 37% when differences in marginal value for gains vs. losses were factored out, and people's relative risk attitudes for gains vs. losses in commuting time were compared. However, consistency jumped to 87% when differences in the perceptions of the riskiness of gains vs. losses in commuting time were factored out, in other words, when perceived-risk attitudes for gains vs. losses were compared. About two-thirds of the individuals who showed a consistent perceived-risk attitude in the gain and the loss domain were consistently risk-averse, i.e., choosing trains that they perceived to be less risky; the other third was consistently perceived-risk seeking, i.e., prefering trains that they perceived to be riskier (expected values were approximately the same in each pair).

In a second study, Weber and Milliman (1997) tested MBA students with stockmarket experience in two sessions of an investment game where they had to pick one of six stocks (described by standard financial indicators) in each of ten investment periods. In one session of the game, participants lost money in most of the ten periods, whereas in the other session (with order of sessions, of course, counterbalanced) they made money in most of the ten periods. Choice patterns were quite different for the two sessions (with more switching in the failure session), as were the ratings of the riskiness of the six stocks, as mentioned earlier. When controlling for those changes in the perceived riskiness of the stocks from the successful to the unsucessful investment session, perceived-risk attitudes again showed remarkable consistency across sessions. Overall, 83% of the investors had the same perceived-risk attitude in both sessions, with three-quarter of them consistently investing in stocks that they perceived to be less risky and one-quarter consistently investing in stocks that they perceived to be more risky.

Taking the investigation into the cross-cultural domain, Weber and Hsee (1997) obtained risk judgments as well as minimum buying prices for risky options from respondents in four countries: the United States, Germany, the People's Republic of China, and Poland. This and other studies investigating group differences in risk perception and perceived-risk attitude typically employ between 50 and 100 respondents per group. In a within-subject design, people provided choices and risk judgments for options in two domains: the money domain (investments) and the time domain (time management plans that may save or cost working hours per week). The results for the risky investment options are reported in Weber and Hsee (1997); the comparison of the consistency of perceived-risk attitudes across the two content domains is reported only in this paper. While both risk judgments and buying prices for options in both domains showed significant between-country differences (with

Americans perceiving the most risk and the Chinese the least risk in both domains, and the Chinese paying the highest prices for the financial options and the Germans the highest prices for the time options), after differences in risk perception were factored out of the choices of every respondent, the proportion of individuals who were perceived-risk averse or perceived-risk seeking was not significantly different in either the countries nor the two domains (money vs. time). 73% of respondents across the four cultures tended to pay more for options perceived to be less risky (i.e., were perceived-risk averse), whereas only 11% tended to pay more for those options perceived to be riskier (i.e., were perceived-risk seeking). The remaining respondents were perceived-risk neutral. When perceived-risk attitudes of the same individual in the two domains were compared, 76% of respondents showed the same perceived-risk attitude (predominantly perceived-risk aversion) in this within-subject comparison.

## Cross-Cultural and Cross-Gender Similarity of Perceived-Risk Attitude

In addition to consistency of perceived-risk attitude across the two content domains, Weber and Hsee's (1997) cross-cultural data also showed a remarkable similarity of the distributions of perceived-risk attitudes across cultures: most respondents in all four cultures were perceived-risk averse. Men and women are sometimes characterized as belonging to different cultures (Tannen, 1990) and have been found to choose differently among risky options, for example in pension investment allocation decisions (Bajtelsmit, Bernasek, & Jianakoplos, 1997). Women's allocations tend to be more risk-averse, in the EU meaning of the phrase, and women also seem to display more EU risk-aversion in risky activities such as smoking, seat belt usage, and speeding (Hersch, 1997). At the same time, Slovic and collaborators (see Slovic, 1997, for a summary) have documented gender differences in the perception of the riskiness of such activities and risky choice options, with women perceiving the same risks to be greater than men perceive them. Thus it is at least possible that gender differences in choice are either partially or entirely the result of differences in the perception of the riskiness of the choice options and that perceived-risk attitude (i.e., the risk--value tradeoff coefficient b of Equation 1) may not differ as a function of gender. Brachinger, Schubert, Weber, Brown, and Gyser (1997) investigated this hypothesis. They collected data from both male and female respondents about their willingness-to-pay for a set of financial investment options and about their perception of the riskiness of these options and replicated previously reported gender differences on both judgments. They then obtained an estimate of the perceived-risk attitudes of men and women by fitting the regression model of Equation 1 to the data. There was no significant difference in the value of any of the regression coefficients, and particularly none for perceived-risk attitude coefficient b which was -3.11 for men and -3.95 for women. In other words, all gender differences in willingness-to-pay for the risky investment options were mediated by differences in the perception of the options' riskiness. Women perceived those risks to be higher than men and subsequently were willing to pay less for the options.

## Implications and Conclusions

In this paper I argued that, on at least one dimension, people may show more cross-situational consistency than they have been given credit for. I showed that, when operationalized and measured differently than within the EU framework, risk attitudes do *not* reflect between choices in the loss versus the gain domain and remain constant for risky choices in different content areas made by the same individual. Two decades of investigation of Kahneman and Tversky's (1979) reflection effect and its interpretation as a demonstration of risk-aversion in the gain domain and risk-seeking in the loss domain may not have born much fruit (see Schneider & Lopes, 1986) partly because of the following erroneous assumption: that people's perceptions of the riskiness of lotteries can be captured by the same algorithm in both the gain and the loss domain, for example the variance of outcomes of a lottery.

The demonstrated greater cross-situational consistency of perceived-risk attitude qualifies the assessment procedure as a measure of a stable personality trait. This gain comes at the price of having to assess or predict how specific individuals will perceive the riskiness of options in a specific content area and under a given set of framing and context conditions. Fortunately there is a large literature on subjective risk perception that allows us to describe and predict individual differences in perceived risk. For recent reviews see Brachinger and M. Weber, 1997; Bontempo, Bottom, and Weber, 1997; Holtgrave and Weber, 1993; Weber, 1988, 1997; Yates and Stone, 1992). This literature shows that, while individual differences in risk perception exist, group differences are even larger and sufficiently systematic to result in predictable group differences in risk perception as a function of gender, income, and cultural origin.

The result that most individual, situational, and group differences in risk-taking seem to derive from differences in the perception of the riskiness of the choice options rather than from differences in attitude (from liking to disliking) towards perceived risk has the following implications for decision prescription and decision aiding. In addition to assessing behavior (choices or willingness-to-pay for risky options), decision analysts ought to assess and pay attention to the way decision makers are defining and perceiving the riskiness of their choice options. Behavior that is too cautious (or risk-averse in the EU-sense of the phrase) relative to some normative benchmark is more likely the result of a non-normative definition of what constitutes risk than of a greater-than-average aversion towards perceived risk. Training people (e.g., managers) to adopt a different definition of risk that coincides with group (e.g., company) goals and policies (a cognitive intervention) may, fortunately, turn out to be an easier task than any attempts to modify people's affective reaction towards risk.

The empirical evidence reviewed in this paper showed that the majority of people, regardless of gender or culture, do not like to take risks as they see them. In a series of studies, we saw that most people were perceived-risk averse. Choices that appeared to be risk-seeking in the EU definition of the term (e.g., choices where an individual chose a higher-variance gamble over a lower-variance gamble with equal expected value) more often than not were made because the decision maker perceived the higher-variance gamble to have the lower risk. The reader may ask how such perceptions of riskiness that seem irrational from an economic perspective may come about and is referred to the literature on the effect of reference points and aspiration levels (e.g., March, 1988; March & Shapira, 1992; Thaler & Johnson, 1990).

While there is evidence that a small proportion actually like options that they perceive to have greater risk and are willing to pay more money for these options than for options of equal expected value but smaller perceived risk, this is not true for most people. Thus the long-standing microeconomic assumption of risk aversion on part of decision makers appears to reacquire considerable validity when we include individual, group, and situational differences in the perception of risk into the model. So let me finally return to the question posed in the title of this paper: Who is afraid of a little risk? The answer is: Most of us, most of the time.

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