

**Decision Making Under Risk:  
Applications to Insurance Purchasing**

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## Abstract

The purpose of this paper is to provide an overview of psychological research on decision making under risk, with an emphasis on insurance behavior. This research approach has supplied many insights into how humans react to risk and uncertainty. These insights may help explain why people buy insurance in some circumstances and not others. For instance, decision research has shown that humans:

- have limited cognitive capacity to process low probabilities,
- focus more on loss probability than the magnitude of loss,
- are risk averse for gains but risk seeking for losses,
- misperceive randomness of runs – the “gambler's fallacy,”
- seek an optimal level of risk, i.e., “risk homeostasis,”
- show wide individual differences in risky decision making,
- are resistant to changing attitudes and beliefs about risks,
- exaggerate their decision making ability – overconfidence,
- are influenced by subtle shifts in problem wording, and
- cannot conceptualize losses they haven't experienced.

To examine these findings, a small pilot study was conducted which investigated decisions about flood and drought insurance. These and other results imply: (1) expected utility is inadequate to describe insurance decisions, (2) the monetary value of insurance has little relevance to purchasing, (3) insurance is viewed as an investment, instead of protection, (4) people want to “trade dollars” with insurance companies, and (5) there is a risk threshold, which limits desire to buy insurance.

## Introduction

This paper is intended to provide an introduction to research on risky decision making and how it relates to insurance buying behavior. The focus will be on using insights about decisions under uncertainty to account for willingness to purchase insurance.

### Background.

Behavioral decision research began in the 1950's with analyses of how people make choices between gambles (Edwards, 1954). In the 1960's, the emphasis was on investigating probability revision and probability learning (Slovic & Lichtenstein, 1971). The decade of the 1970's produced research on risk heuristics (mental rules of thumb) and biases (Kahneman, Slovic, & Tversky, 1982). The 1980's have seen analyses of framing effects and comparisons between experts and novices (Shanteau, 1987).

Today, the field of judgment and decision making, or behavioral decision analysis, is rapidly expanding. The Society for Research on Judgment/Decision Making has over 900 members worldwide. There are two journals devoted to the area: Organizational Behavior and Human Decision Processes and Journal of Behavioral Decision Making, with many other periodicals publishing relevant material. Numerous books have appeared at all levels, ranging from introductory (e.g., Huber, 1980) to intermediate (e.g., Hogarth, 1987) and advanced (Arkes & Hammond, 1986). Although initially dominated by psychologists, decision researchers now represent a variety of disciplines including management, engineering, statistics, political science, medicine, economics, geography, law, and accounting.

This paper is concerned with describing how the findings from decision research can be applied to explain insurance behavior. The

description will be divided into four parts. First, some general principles of risk behavior will be outlined. Second, specific findings will be described from a pilot study of decisions about flood and drought insurance. Third, the implications of these and other results for insurance behavior will be discussed. Lastly, the paper ends with some suggestions for the application of behavioral concepts to insurance decision making.

## Principles of Risk Behavior

As noted by Slovic (1984, p. 4), "it is extremely hard (for people) to think about...uncertainty, probability, and risk." Indeed, repeated demonstrations have shown most people lack an adequate understanding of probability and risk concepts (e.g., Kahneman & Tversky, 1984). A number of principles have been uncovered which describe how people think about probability and risk. A few of these will be described here.

*Misperception of Small Probabilities.* Obviously, people can only respond to the risks they perceive. "If their perceptions are faulty, efforts at personal, public, and environmental protection are likely to be misdirected" (Slovic, Fischhoff, & Lichtenstein, 1982, p. 463). One persistently reported misperception is an inability to react logically to low-probability events (Anderson, 1974). People either ignore low probabilities or make irrational decisions involving low probabilities (Schoemaker, 1980).

In part, this misperception arises from a limited capacity people have for processing risk information. Simon's (1957) concept of "bounded rationality" contends that cognitive limitations force people to construct simplified models of the world. According to Simon (1957, p. 198), the decision maker "behaves rationally with respect to this model, (but) such behavior is not even approximately optimal with respect to the real

world." Thus, people's limited processing capacity restricts attention for rare events.

*Focus on Probability of Loss.* Obviously, people don't like to lose money. This aversion to losing, however, focuses more on the probability than the amount of loss: "It is not the magnitude of a potential loss that inspires people to buy insurance voluntarily – it is the frequency with which a loss is likely to occur" (Kunreuther, 1979, p. 2). The criminologist Sir Robert Mark (1976) argues, the "best deterrent to...crime is not so much the severity of punishment as the likelihood of being caught."

Focusing on the likelihood of losing, of course, can lead to irrational behavior. In studies of choice behavior, for instance, subjects preferred unfavorable gambles to accepting a sure loss (Hershey & Schoemaker, 1980). Other studies have reported that people choose a sure gain over a gamble, but reverse their preference when the same options are presented as losses. In short, attention is "captured" by loss probability.

*Risk Averse vs Risk Seeking.* It is commonly assumed a person's propensity to seek or avoid risk is consistent over gains and losses. A risk-averse individual, therefore, should avoid nearly all types of risk. Empirical evidence, however, suggests most people are risk averse for gains and risk seeking for losses (Kahneman & Tversky, 1979).

"People are often risk seeking when it comes to losses; they are willing to chance a loss even when they can insure against it....Many even decline to buy government-subsidized insurance in which the premiums are so low that buyers are effectively in a 'can't lose' position" (Schwartz & Griffin, 1986, p. 141). This tendency reflects the distaste people have for sure losses.

*Gambler's Fallacy.* Many people have a strong, but false, belief that random events

are self-correcting. If a couple has a series of girls, then a boy is viewed as likelier (Anderson, et al., 1981). Another example is the belief that a previously hitless batter is somehow “due” to get a hit.

The inability to appreciate the independence of random events also shows up in low probability situations (Hogarth, 1987). If an unlikely event occurs once, people believe that it is less likely to occur again – ‘lightning can't strike twice.’ Thus, the perceived likelihood of future events changes because of prior outcomes.

*Risk Homeostasis.* A general principle of behavior is that people want to remain at equilibrium levels, e.g., of motivation. This concept of homeostasis has been extended by Slovic (1984) to risk settings: There is ‘an optimal level of risk that people are comfortable in accepting (p. 9).’ Efforts to decrease risk, therefore, may be met by riskier behavior.

For example, when improved design made farm tractors more stable, farmers used them on steeper slopes and the accident rate remained constant. This suggests that risk-reduction measures may be offset by riskier subsequent behavior (Slovic, 1984).

*Individual Differences.* A common finding is the presence of widespread individual differences in how people respond to risky situations (Slovic & Lichtenstein, 1971). Johnson, et al. (1961) studied over 1,000 Midwestern farmers and found a relationship between willingness to accept risk and the types of farm crops grown. High risk takers were in cash crops and stock feeding; those intermediate in accepting risk were in dairy and tobacco farming; the least risk takers were in general farming.

Such behavior can be self-limiting, since unwillingness to accept risks can keep farmers from engaging in more profitable efforts.

As Kunreuther & Wright (1979) note, those who practice “safety-first farming” may be trapped by their own risk aversion.

*Resistance to Change.* Perceptions of risk are quite stable and resistant to change. Reliance on ‘personal experience may promote a false sense of security....People's beliefs often change slowly and show extraordinary persistence in the face of contrary evidence’ (Slovic, et al. 1982, p. 478).

One of the difficulties is that we seldom receive feedback about the appropriateness, or inappropriateness, of our perceptions of risk. Consequently, people have a tendency to deceive themselves about how well they can handle risk. Through hindsight, for instance, we can “post-dict” almost any outcome (Fischhoff, 1975).

*Overconfidence.* Humans often operate under what has been labeled a “certainty illusion” – a belief in their own infallibility (Fischhoff, et al., 1977). ‘Even when people are wrong...they are tremendously confident in their opinions....People generally tend to underestimate their own vulnerability to certain sorts of risks’ (Slovic, 1984, p. 5).

A related phenomenon is that we tend to view ourselves as invulnerable to hazards (Kunreuther & Slovic, 1978). Most believe they are better than average drivers, more likely to live past 80, and less likely to be harmed by consumer products (Slovic, et al., 1982). Given such expectations, it shouldn't be surprising that many people refuse to take personal actions to reduce risk.

*Context Effects.* Psychologists have long been aware of the prevalence of context effects in judgments. One class of such effects has been labeled “framing” by Kahneman & Tversky (1984). They found that people respond more positively to losses labeled as

“cost of protection” than as “uncompensated losses.”

Researchers have reported that slight shifts in problem wording can have a pronounced effect on choice behavior: “Subtle differences in how risks are presented can have marked effects on how they are perceived” (Slovic, et al., 1982, p. 483). That means context effects can be used to change (i.e., manipulate) risk perceptions.

*Inability to Conceptualize Losses.* A major limitation to our capacity react to low-probability risks is the inability to imagine hazards, which have not occurred. “Men on flood plains appear to be very much prisoners of their experience” (Kates, 1962, p. 140). Much of the difficulty in improving flood planning can be attributed to the “inability of individuals to conceptualize floods that have never occurred” (p. 92).

People are influenced, often inappropriately, by prior events (Arkes & Blumer, 1985; Shanteau & Harrison, 1991). They “are strongly conditioned by their immediate past and limit their extrapolation to simplified constructs, seeing the future as a mirror of that past” (Kates, 1962, p. 88).

### **Pilot Study of Farm Insurance**

To examine the applicability of some of these concepts, I conducted a small pilot study on hazard risk perception and insurance decision making.

*Methods.* A group of 48 undergraduates were told that “a major disastrous event has occurred in the past year.” They were asked to judge the likelihood of recurrence in the coming year and to indicate whether they would be willing to pay more for insurance. Four events were described: drought, natural flood, car theft, and man-caused flood; the former two hazards are “acts of nature” and

the latter two are “man-made.” The probability for each was described as alternately “1-in-20” years or “1-in-100” years.

*Results.* There were four findings of interest: First for natural hazards, there was a uniform trend to estimate the chances of a recurrence as less likely in the coming year. Thus, 75% of the subjects said that a 1 in 100 year drought is less likely to occur again in the coming year. This suggests a belief in the gambler’s fallacy—people believe it improbable that an unlikely event will recur. Second, the preceding effect is roughly 20% less in the 1-in-20 year condition than in the 1-in-100 condition. For example, 55% of subjects said that a 1 in 20 year drought is less likely in the coming year. The shift, therefore, appears to be more pronounced with lower probabilities.

Third, natural hazards led to about a 10% greater effect than man-made hazards. 83% of subjects said that a 1-in-100 year natural flood is less likely to recur, whereas 73% said that 1-in-100 man-caused flood would recur in the coming year. This suggests a context effect, by which natural events are viewed differently than man-caused events. Lastly, the amount of insurance subjects were willing to buy changed little across conditions. Roughly two-thirds of subjects were willing to pay the same premium as before, despite being told they had a major loss. Apparently, their beliefs about insurance rates are unaffected by events in the preceding year.

*Discussion.* In all, these findings show that people tend to feel that once a low-probability event happens, they are “inoculated” against a repetition in the coming year. Such an inoculation effect would make it difficult to convince people of the need to reduce risks by buying insurance. This may explain why many residents in flood-prone areas are willing to move back, without in-

insurance, following a major flood (Kunreuther, et al., 1978).

## Observations

Let me now offer some comments about insurance-buying behavior. First, it is clear that economic theory is not adequate to account for insurance behavior (Pashigian, Schkade, & Menefee, 1966). ‘Utility maximization is neither a necessary nor a sufficient condition for deducing who will buy insurance’ (Simon, 1987, P. 32). As an alternative, Simon argues ‘if we wish to understand the insurance-buying behavior, then we must determine... the circumstances that attract the attention of a property owner’ (also see Hogarth & Kunreuther, 1985; Kunreuther, 1983).

Second, the monetary value of insurance appears to play little role in whether consumers purchase it. Eisner and Strotz (1961) observed that flight insurance is less attractive economically than life insurance, yet consumers have a stronger desire for the former than the latter. Apparently, the relationship between expected return and premium is unimportant for many insurance decisions (Simon, 1987).

Third, people tend to view insurance as an investment, rather than as protection. A policy is viewed ‘as an investment aimed at maximizing claim payments in case the hazard should occur’ (Schoemaker, 1980, p. 79). Because low-probability events are unlikely to happen, there is in fact little chance of getting a payback. Hence, most people prefer to insure against higher-probability, low-loss hazards (Kunreuther & Slovic, 1978).

Fourth, by viewing insurance as an investment, consumers want to see some return on their premiums. This leads to a desire to ‘trade dollars with the insurance company even though it is very costly’ (Slovic, 1984).

Thus, people appear to have distorted ideas about the function of insurance.

Finally, there appears to be a risk threshold, below which people ignore the threat of a loss (Slovic, Fischhoff, & Lichtenstein, 1977). When very low probabilities are involved, the premium amount is irrelevant. That means people illogically will buy insurance against common hazards and avoid policies for unlikely catastrophic events (Hogarth, 1987).

## Conclusions

I have three final thoughts: (1) It is likely that efforts to increase protection of the public paradoxically may have the opposite effect. By eliminating minor losses, e.g., resulting from floods, people are denied an opportunity to experience their own vulnerability. Successes in civil engineering are therefore limited by failures in social engineering (Burton, et al., 1978).

(2) By working together, decision researchers and consumer researchers may be able to offer new understandings of insurance behavior (Kunreuther & Slovic, 1978). Although the two disciplines of psychology and marketing often failed to communicate in the past, there is some evidence of breaking down the barriers.

(3) Despite the problems people have in coping with risk, humans are capable of adapting and improving their decision making (Clark, 1977). One suggestion by Kunreuther (1979) is to lengthen the time horizon for risk communication – a 1 in 100 year flood becomes a ‘more than 5 to 1 chance of flood damage in 25 years.’ To get around beliefs in the gambler’s fallacy, my suggestion is to educate people about the potential for hazards to repeat themselves – lightning can strike twice. Finally, policy makers should make a greater effort to understand

how consumers think and react to risk and uncertainty.

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