IS EXPECTED UTILITY A DESCRIPTIVE MODEL
OF CONSUMER DECISION MAKING UNDER UNCERTAINTY?

Dan Sarel, University of Connecticut

Abstract

Recently, marketing researchers have recognized the importance of incorporating consumer-perceived attribute uncertainty in consumer multiattribute evaluation models. However, marketing researchers have overlooked an important theory—the expected model—that has received extensive discussion in related disciplines. The study reported in this paper examines the applicability of the expected utility theory as a descriptive model in a marketing context.

Introduction

Recognizing that marketing efforts should address consumer needs, marketing practitioners and researchers have sought to understand better how consumers make purchasing decisions. Since in many situations consumers must choose between several multiattribute options, researchers have increasingly focused on developing and testing compensatory and noncompensatory multiattribute models (Einhorn 1971, Russ 1971, Tversky 1972, Wilkie and Penemner 1973, Wright 1975, Pras and Summers 1975, Park 1976). Though the various models vary considerably, marketing studies generally have involved the implicit assumption that the consumer knows with certainty the values of each attribute of the various considered options. In reality, however, many situations involve product evaluations and decision making under uncertainty. In many instances a brand's attribute level (belief component) is not known to the consumer with certainty either because of lack of sufficient information (imperfect information) or because of the uncertain nature of the product. In spite of the recognition that attribute uncertainty can exist, consumers are usually asked to provide a brand's attribute evaluation on a scale by circling a number without specification of uncertainty.

Recently, however, marketing researchers have become aware of this problem and tried to focus on the development of models that incorporate attribute uncertainty (Ahtola 1975, 1977, Müller 1977, Pras and Summers 1978). Though this topic is new to marketing, it has received much attention in related disciplines. In particular, the theory of expected utility has been extensively researched both from a normative and a descriptive perspective. Thus, the objective of this paper is to examine the applicability of the expected utility theory in a marketing context. First a brief review of the theory is provided, second an empirical study testing the theory is presented.

Expected Utility

The most naïve modelling of risky decision consists of ignoring all features of the distribution other than the mean. The expected values (EV) is:

\[ EV = \sum_{i=1}^{n} P_i V_i \]  

(1)

where \( P_i \) is the probability of the \( i \)th consequence and \( V_i \) the value of the \( i \)th consequence, measured in most cases in monetary terms. The model implies that people should be indifferent between alternatives with equal EV, and should choose the alternative with the highest EV irrespectively to the shape of the probability distribution. In technical terms the model assumes that decision makers are risk neutral. In reality, however, in many instances human behavior clearly contradicts these implications of the EV models (Coombs et al., 1970).

Recognizing the deficiencies of the EV model, mainly the assumption that decision makers are risk neutral, Bernoulli (1738) proposed a model in which a utility function was substituted for monetary values. The expected utility (EU) is:

\[ EU = \sum_{i=1}^{n} P_i U(V_i) \]  

(2)

where \( U(V_i) \) is the utility of the \( i \)th consequence. The major advantage of this approach is the personal valuation of potential consequences. A person's utility function expresses the relative value to him/her of different amounts of gain or loss, and by the EU theorem, enables utility indices to be associated with alternative risky prospects. The final decision is based on maximization of expected utility. This approach allows individuals to have different utilities for consequences and hence different preferences among risky alternatives.

While as a normative model, the EU is very appealing, its acceptance as a descriptive model was not universal. Edwards (1955) made the observation that, "If it is reasonable to assume that subjective values of money should be substituted for objective values . . . it is equally reasonable to make the same assumption about probabilities" (p. 201). This assumption is met in the subjective expected utility model (SEU), originally developed by Savage (1954).

The basic notion is that people choose among risky alternatives, so as to maximize subjectively expected utility. The SEU formulation is:

\[ SEU = \sum_{i=1}^{n} S(P_i) U(V_i) \]  

(3)

where \( S(P_i) \) is the subjective probability corresponding to the objective probability of the \( i \)th consequence. An extensive presentation of the model has been provided by Savage (1954), and Luce and Krantz (1971). Tversky (1967) provided an intensive analysis of one special case of this model showing that a fundamental condition for this model is that utility and subjective probability contribute independently to the overall "worth" of a gamble. Early studies of the model's descriptive adequacy produced conflicting results. Situational and task parameters were found to have strong effects, leading Rapoport and Wallsten (1972) to observe that a researcher might accept SEU in some cases and reject it in others.
Though the controversy is still going on, the theory is regarded as one of the most important approaches for modeling decision making under uncertainty.

Objective
To test the performance of the (subjective) expected utility model in a marketing context. Since the literature indicates that the performance of the model can be situation dependent, this study aims at comparing the performance of the model under two risk situations.

Research Design
Since the objective of the study was to test respondents' evaluations of brands involving uncertain attributes under more than one situation, it was necessary to make sure that the evaluation tasks would involve perceived uncertain attributes. Because of this, the desire to control some intervening factors and the exploratory nature of the study it was decided to employ an experimental design.

In this design two factors have been manipulated. First, the uncertainty associated with brands' attribute levels (belief component) — by designing a task in which respondents had to evaluate brands only on the basis of the uncertain attribute information provided in the study — and second, the situation — by developing two simulated situations varying in degree of associated risk.

Theoretically, the situation can affect both the uncertainty and the consequences components. However, in this study the uncertainty component was kept constant across the simulated situations while the importance or significance of the consequences was expected to vary as a function of the situation. Relaxing only one component makes the comparative analysis of models' performances under different situations more manageable. Thus, the basic idea in the research design was to ask respondents to evaluate the same set of brands (all having uncertain attributes) under two different situations.

The product chosen for the study was restaurants. Respondents were asked to evaluate a set of fourteen restaurants under two different situations, only on the basis of restaurants' attribute profiles provided in the study. The information on the attribute, quality of food, came from an imaginary survey of "dining out" experts in a form of frequency distributions of the experts' opinions. Since respondents were unfamiliar with the restaurants and did not have any additional information, the frequency distributions created for them an evaluation task that involved uncertain attributes.

Respondents' major task was to evaluate the fourteen restaurants under the two different simulated situations. In the first situation, they were going out to dinner with two very important customers ("high" risk). In the second, they were going out to dinner with two casual friends ("low" risk).

Respondents were also asked to provide additional information on the evaluative aspects of the attribute levels in the two different situations, their situation risk-taking behavior (certainty equivalent tests), and their situational risk perceptions.

The group of respondents selected for the study consisted of 103 adults enrolled in a night MBA program in a local university. The group represented a diverse ethical, occupational and educational backgrounds, and had a wide age distribution ranging from 22 to over 40. All respondents have had several years of full-time working experience.

Measurement Instruments
Marketing studies have traditionally measured attitude rather than actual choices. Though this study could not have measured actual choices, an attempt was made to go beyond the traditional attitude measure. Thus for measuring the evaluation scores, two scales were used, an affect measure and likelihood of choice (behavioral intention) measure. This procedure enabled the comparison of the two measures. Ideally, each respondent should have used both measures in the two simulated situations. However, the pretests indicated that using both measures would increase respondents' cognitive strain and could also lead to a significant halo effect that may bias the results.

Since the design required each respondent to evaluate all restaurants under both risk situations, it was decided to divide the sample into two groups, asking one group to use the affect measure and the second to use the behavioral intention measure.

In order to be able to measure the expected utility model, respondents' utilities in the two risk situations had to be assessed. The certainty equivalent approach was used to derive these individual utilities.

The traditional certainty equivalent approach tries to find the sure prospect that a respondent perceives to be equivalent to a given uncertain prospect. It can also be employed to find the levels of uncertainty for a given prospect that will lead a respondent to perceive that prospect as an equivalent to another sure prospect. The latter approach has been used in this study. Thus respondents had to evaluate three sets, each consisting of two restaurants. Within each set, the quality of food was a sure attribute in one restaurant and uncertain attribute in the second restaurant. For example, the food quality in restaurant A was certain to be "Fair" while in restaurant B it could have been either "Poor" or "Excellent."

Respondents' task was to indicate for each set, under what uncertainty conditions they liked both restaurants just the same. This procedure was administered for both risk situations.

The method used in this study is based on the standard reference contract (Dillon 1971). In this method, if outcome $L_j$ (a given food quality level) is preferred to $L_i$, and $L_j^*$ is preferred to $L_j$, then there exists a probability $p$ such that:

$$p U(L_j^*) + (1-p) U(L_j) = U(L_i)$$  (4)

The procedure discussed above enables us to find that value of $p$ at which $L_2$ is the certainty equivalent.