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**IDENTIFYING LONG RUN AGRICULTURAL RISKS AND EVALUATING
FARMER RESPONSES TO RISK**

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SIMILARITY OF RISKY CHOICES: A REVIEW

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The Buschena and Zilberman (BZ) paper reviews several sets of literature, and offers regression procedures to assess violations of the expected utility theory. This seems to be an operational alternative to generalized expected utility models, and the method appears promising for understanding subjective assessments of decision makers in various settings. However, the method depends upon responses to hypothetical questions, the estimation equations are not derived from an optimization or other behavioral framework and other questions such as negative expected returns are left unanswered.

Non-Expected Utility by Economists and Psychologists

Violations of expected utility theory axioms have been experimentally validated in classrooms with questions giving money rewards and hypothetical questions. Kahneman and Tversky and other psychologists have shown that 60 to 80 percent of respondents violate the independence axiom for some difficult to compare risky choices. One response offered by Machina and other economic theorists is that expected utility axioms can be expanded in terms of nonlinear probabilities. One way to conceptualize this is that the expected utility model implies parallel preference curves in the probability simplex, whereas, those for generalized expected utility (GEU) models are non-parallel or "fan out." However, as BZ point out the GEU models are difficult to implement and "real

world" examples of expected utility violations are not very prevalent (Smith).

A second response by economists is to describe probabilistic choice sets that are "very similar." This line of literature began with psychologists Simon and Page and modern versions by economists are those of Viscusi, Rubenstein and Leland. This might be called expected utility with "costs or bounds on evaluation effort." The authors define these as Similarity Models. The intuitive notion is that when risky choices are dissimilar decision makers use conventional expected utility, procedures, but when the differences between the outcomes are small or the probability distributions are complex, then decision makers resort to "rules of thumb." Psychologists describe this with Change of Process theories (Payne). If choice pairs are very similar and net returns from consistent choices are low, then we would expect respondents to resort to heuristic methods which may often violate expected utility axioms.

One version of similarity theory would be

$$\text{Max } [E(U) + EU(B) - EU(C)],$$

where the choice is made that maximizes expected utility $E(U)$ (using rules such as mean and variance) when choices are dissimilar, but rules of thumb are used when the net benefits from the last two terms is small relative to that in the first. $EU(B)$ is the direct expected utility of benefits from the choice effort and $EU(C)$ is the expected utility of the direct costs of making the choice effort. The important empirical question is when are actual

risky choices similar enough that all three terms must be used in a behavioral model.

Summary of Reduced Form Similarity Model

Buschena and Zilberman provide a service by showing how powerful experimental economics can be in testing models of hypothetical choice under risk. They duplicate the Kaneman and Tversky questions, they fix probabilities and vary outcomes, fix outcomes and vary probabilities, introduce a third outcome, introduce zero probability events, narrow expected payoffs, and compile subjective assessments of respondents about the "similarity" of choices. These various risky choices can be conveniently displayed in the three event probability simplex (Machina).

The data set assembled by the authors relies heavily on students in college classes, but also includes faculty members and "members of the general population." One hundred sixty-two (162) responses to the risk questionnaire makes this a large experiment compared with those usually compiled by experimental psychologists. An important addition of this structured questionnaire is asking respondents to give a rating on a 0-9 scale of dissimilarity on about one-fourth of the risky choice questions. The overall procedure is to use objective characteristics of questions plus an individual respondent dummy variable in an OLS regression to explain "dissimilarity ratings." These fitted dissimilarities plus other variables are then used in logistic regression equations to

explain choices among the various 33 risky choices asked of each person.

The major results of the analysis are:

- (1) The respondents violate the independence axiom of expected utility with about the same frequency as that found by Kahneman and Tversky.
- (2) The respondents also violate various versions of generalized expected utility models.
- (3) Either CDF or metric measures plus the presence of zero probability events, and two measures of expected value are statistically significant in explaining "dissimilarity ratings."
- (4) Question characteristics, estimated dissimilarity rating, a base expected value, sixteen personal characteristics and ten interaction variables give 68 percent correct predictions of actual choices among the risky alternatives.
- (5) Positive income effects, consistency with expected utility, negative effect of dissimilarity and negative effects of expected value differences are found.
- (6) It may be important that the non-academic respondents have a lower coefficient on risk aversion.
- (7) Patterns of intransitivity were found in a significant proportion of the population.

Implications for Risky Choice Research in Agriculture

What does this effort in assembling and statistically evaluating the responses to over 5,000 hypothetical questions mean to applied economists interested in risk? The research raises questions on several broad fronts: (a) Can responses to hypothetical choices without monetary or other stated rewards, but with time costs of completion give results that allow inferences to actual risky choices for these or other people? (b) Are the risky choices faced by agriculturalists ones in which similarity models may apply? (c) What improvements can be suggested from other elicitation methods?

Economists have often criticized responses to hypothetical questions as a source of data for predicting actual behavior (Binswanger). Some evaluators claim respondents may bias responses to give outcomes that may help them financially if policy outcomes are implied by study results. A more common claim is that there is no reward for answering hypothetical questions and the effort used will not be comparable to that used for the same type of risky choices given real payoffs. Additionally, many studies have shown that the manner in which questions are asked can influence responses. Framing effects, and reference point effects are often significant in measurement of non-monetary resource values, subjective probabilities and time preference rates. BF have made efforts to reduce these questioning effects.

The overall critique of this and other direct questioning techniques remains an open question. At a minimum responses from

structured questionnaires may be better than those from theories or assertions with no data. Direct questions of actual decision makers will be better than those from academics or people not in the assessment environment. Clearly, we know from this study that similarity judgments are critical in determining when individuals use rules of thumb to answer hypothetical questions involving risky alternatives.

Are conditions in agriculture likely to cause decision makers to resort to rules of thumb? Risky choices that involve rare events, skewed probability distributions and small outcomes relative to direct calculation costs are likely decision characteristics leading to the use of rules of thumb. These can occur frequently if there is scarce probabilistic information. We would expect those decision makers with high time costs, lower levels of experience and less familiarity with probability calculations to resort to heuristic methods. The Buschena and Zilberman idea of using simple graphical methods to assess similarity may be a useful tool to direct risky public research efforts. Directing research funds to determine probabilistic or other information for alternatives that are very similar may give a higher marginal return than non-targeted research.

Finally, there seem to be natural extensions of this research that should be investigated. All the outcomes of the choices had positive or zero values. How would the responses change for negative values? Researchers in the contingent valuation (CVM) area usually ask only one question of each person for assessing a

particular parameter value, but a recent effort by Hanneman et al. has argued this is inefficient and that a second question contingent on the answer to the first one can improve assessments. Analysis of framing bias, starting point bias, and other results from CVM studies need investigation in assessing risky events. Several S-232 individuals who responded to the questionnaire indicated that they felt badgered or overwhelmed by the very large number of very similar and difficult questions. In making inferences from hypothetical to actual choices it may be critical to evaluate the optimal size of the questionnaire that helps this inference process. Lastly, there is no analytical optimization or other behavioral model that gives rise to the regression models used in this study. It would be helpful to incorporate time and effort constraints in deriving reduced form equations to be estimated (Conlisk). Perhaps some of the personal characteristic variables used indirectly reflect time and effort expended by respondents. Merely asking respondents how much time they used, and whether they received consumption benefits from completing the questionnaire could help.

Overall this is a study that should be helpful to risk researchers. It partially reconciles the expected utility theory and its violations. It surveys literature and demonstrates how experimental economics can be used. It raises the possibility that economists and psychologists may be able to understand risky choices in the "real world" if they can first evaluate them in experimental settings with respect to similarity.

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