

DECISION ANALYSIS NEWSLETTER

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Editor's Note

Just a reminder that we are eager to publish abstracts of all papers in the area of Decision Analysis, broadly conceived. The only requirements for our publishing an abstract of your work are:

1) *That the paper itself be available for distribution upon request; and (2) that the abstract not exceed 200 words by much.*

If there is a charge, please so indicate when you send your complete paper to the editor:

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Please phone or write in any changes in your activities or employment that could be of interest to our membership.

Please Note: Inform the ORSA business office of address changes; we get mailing labels from them! Thanks!

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Ward Edwards Awarded Ramsey Medal

On Monday, April 25, 1988, Ward Edwards was awarded the Frank P. Ramsey medal. Chairperson Ralph Keeney's presentation was as follows:

"The Operations Research Society Special Interest Group on Decision Analysis has established the Frank P. Ramsey Medal to honor people who have made distinguished contributions to the field of Decision Analysis. In addition to the medal, the (cont'd page 2)

Ramsey Medalists to Speak at Denver Meeting

On Monday afternoon, October 24, 1988 at the Denver ORSA/TIMS Meeting, there will be a special double session titled "Perspectives on Decision Analysis" presented by the Frank P. Ramsey Medal recipients. These recipients are Professor Howard Raiffa of Harvard University, Professor Ronald A. Howard of Stanford University, Dr. Peter. C. (cont'd page 2)

First Applications Award to Keeney and Merkhofer and to North, Balson, and Colville.

By Ronald A. Howard

The first Decision Analysis Application Competition was held on April 25, 1988 at the Washington, D.C. Joint National Meeting of TIMS/ORSA. The judging panel that selected the presentations for the meeting was chaired by Ronald A. Howard, who selected Ward Edwards and Stephen M. Pollock as fellow members. As the result (cont'd page 3)

Literature-Scan Update

Ben Isselhardt of Rochester Institute of Technology has volunteered to abstract the Medical decision-making literature; Tammy Tengs of EES at Stanford will do Engineering and Consulting; and Irv LaValle will do mathematical economics. Anticipate publication of very brief abstracts of relevant articles very shortly.

Software Available -

In addition to the relatively well-known "Supertree" and "Arborist" packages, many decision-analytic programs and packages appear to be under development or available for distribution. Three known to the editor are: (1) a LOTUS worksheet containing macros, created by Robert F. Nau, Fuqua School of Business, Duke University, Durham NC 27706; (2) Three packages developed by Craig Kirkwood; and (3) Ross Shachter's DAVID package for influence-diagramming.

Craig provides the following information: Craig Kirkwood has three software packages available for IBM compatible computers (with at least 192K memory and any display). The first package analyzes decision trees using linear or exponential single attribute utility functions. It will conduct standard tree evaluations (rollbacks) and some sensitivity analysis. It does not provide capabilities for graphical displays or the use of variables or equations. However, it will rollback a tree with a thousand endpoints using an exponential utility function on a standard IBM PC in less than thirty seconds.

The second package evaluates multiobjective decision problems under uncertainty using additive or multiplicative utility functions. Exponential single attribute utility functions are supported, and probability distributions are evaluated using the extended Pearson-Tukey approximation. Decision trees are not supported.

The third package is a variation on the second package which uses power-additive, rather than multiplicative, utility functions. All three packages are written in Turbo Pascal and source code is included. (cont'd. page 3)

"Dr. Logic"

Our own Rex Brown graced the cover of the October 1987 issue of The Illustrated London News and was the subject of a feature article therein with the same title as this. After reporting many of Rex's fascinating experiences and observations, it concludes as follows: "Although [British industry and government] may not welcome decision analysis with the alacrity of the Americans, it seems certain that it will eventually be accepted. There are very real concerns about the ways in which decision analysis may become an authoritarian tool. And there is also some anxiety about the development of computerized decision-takers. But clearly Dr. Brown is a responsible man and there is little to worry about. Were he slightly less benign it would be quite easy to endow him with all the evil qualities of Dr. Strangelove."

Ramsey Medalists (cont'd)

Fishburn of AT&T Bell laboratories, and Professor Ward Edwards of the University of Southern California. These speakers will present selected general comments on any aspects of the decision analysis of their choice. These aspects may include the philosophy, theory, methodology, applications, and future directions of decision analysis.

Ward Edwards (cont'd)

recipient receives a check for \$1,000, which this year has been generously provided by funds from Applied Decision Analysis, Inc.; Decision Focus, Inc.; Decision Sciences Consortium, Inc.; and the Strategic Decisions Group, Inc.; as well as from SIG funds.

"With the recommendation of the SIG Council, the Frank P. Ramsey Medal is awarded this year to Professor Ward Edwards of the University of Southern California.

"Ward Edwards can truly be called a founding father of Decision Analysis. He is a pioneer of behavioral decision analysis, and an educator who has trained many of the best decision analysts.

(cont'd page 3)

Software (cont'd)

Permission is given to copy the programs for standard classroom instruction. The cost is \$20.00 for any one package or \$40.00 for all three. Make checks payable to "DIS Department Gifts and Grants Account." (Sorry, no credit cards or purchase orders.) Indicate if you need 3.5" diskettes. Order from, Craig W. Kirkwood, Dept. of Decision and Information Systems, College of Business, Arizona State University, Tempe, AZ 85287-4206.

Concerning the DAVID software, Ross submits the following: Ross Shachter (Engineering-Economic Systems Department at Stanford, visiting the Center for Health Policy at Duke) has released an influence diagram processing system for the Macintosh computer (Macintosh Plus, SE or II). It has the standard Macintosh user interface and allows you to structure, assess and evaluate decision analysis models within the influence diagram representation. The system is available through the Center for Academic Computing at Duke University, North Building, Research Drive, Durham, NC 27706-7756, (919)684-3695. There is a fifty per cent discount from the \$600 list price for academic purchases, and site licenses are available.

Anyone else with software packages should inform the editor and send complete descriptive materials, preferably with IBM PC/AT software.

Applications Award (cont'd)

of a scheduling conflict at the meeting, Ward Edwards could not attend the presentation. Detlof von Winterfeldt graciously agreed to serve in his place. The five presentations were; (1) R. L. Keeney & M. W. Merkhofer, "A Multiattribute Utility Analysis of Alternative Sites for the Disposal of Nuclear Waste"; (2) J. S. Pliskin, J. H. M. Zwetsloot-Schonk, and J. W. H. Leer, "Subjective Assessment of Relative Burdens Associated with Diagnostic-Therapeutic Strategies for Prostatic Carcinoma"; (3) D. Warner North, W. E. Balson, & Glenn Colville, "Representing Uncertainty Explicitly in Environmental Risk Management: An Example from Acid Deposition (cont'd page 4)

Ward Edwards (cont'd)

"In 1954, Ward introduced the study of decision making to psychologists in his seminal review of the history and developments of behavioral research in economics and decision making. His research on the subjective expected utility model and his 1961 review of behavioral decision theory introduced a wider audience of economists and operations researchers to the psychology of decision making. The classical 1963 paper "Bayesian Statistical Inference From Psychological Research" written jointly with Leonard J. Savage and Harold Lindman, introduced psychologists to the concepts and techniques of Bayesian statistics.

"Ward has also been keenly interested in the application of decision analysis to real world problems. In the late 60's he worked on the development of Bayesian inference systems that would help overcome the conservatism bias in human probability judgment. Incidentally, conservatism was discovered by Edwards and his students as the first of many biases in human judgment and decision making. In the early 70's he developed SMART, the simple multiattribute rating technique, as a simplification of the then emerging multiattribute utility model, and he and his students carried out a series of validation studies of simple versions of multiattribute utility procedures.

"Ward's influence as an educator is significant, which is demonstrated by the impressive list of researchers and appliers of decision analysis that once were his students. There is virtually no one in decision analysis who has not been influenced one way or another by Ward's thinking. In addition, his 1986 book with Detlof von Winterfeldt titled Decision Analysis and Behavioral Research will continue to influence decision analysts for a long time to come.

"As an indication of our respect and gratitude, it is my pleasure Ward to present you with the Ramsey Medal on behalf of the Special Interest Group on Decision Analysis."

In the next issue we shall publish Ward's statement of acceptance.

Applications Award (cont'd)

Policy Analysis"; (4) W. B. Roush, "A Decision Analysis Approach to the Determination of Population Density in Laying Cages"; and (5) M. A. Mazeed, "A Nonlinear Multicriterion Optimization Method and Its Application to Metal Cutting Problem".

After hearing the presentations, the

(cont'd.)

judging panel selected two as meriting the award: the presentation by Keeney and Merkhofer, and the presentation by North, Balson, and Colville. On behalf of the judging panel, I wish to thank all those who made presentations. On my own behalf, I wish to thank Ward, Stephen, and Detlof for their service to our Group.

Ronald A. Howard

Elections:

The SIG membership this Spring elected Robert L. Winkler Vice Chairperson/Chairperson Elect, Dennis M. Buede Secretary/Treasurer, and Adam B. Borison and Irving H. LaValle members of the Council. They assumed these duties as of the TIMS/ORSA meeting in Washington, D.C., at which point Samuel E. Bodily moved up to Chairperson. The SIG is indebted to outgoing Chairperson Ralph L. Keeney for many contributions, among which is compilation of the following history of officers and council, which he prepared as an expression of appreciation for their contributions:

Chairperson

- Irving H. LaValle (81-82)
- Peter A. Morris (82-84)
- David E. Bell (84-86)
- Ralph L. Keeney (86-88)
- Samuel E. Bodily (88-90)
- Robert L. Winkler (90-92)

Newsletter Editor

- Irving H. LaValle (81-date)

Cluster Chairs

- Irving H. LaValle (San Diego, F82)
- Rex Brown (Chicago, S83)
- Jim Dyer (Orlando, F83)
- Lee Merkhofer (San Francisco, S84)
- Irving H. LaValle (Dallas, F84)
- Peter Farquhar (Boston, S85)
- Robin Hogarth (Atlanta, F85)
- Charles Harvey (Los Angeles, S86)
- Samuel E. Bodily (Miami, F86)
- Irving H. LaValle (New Orleans, S87)
- Bob Bordley (St. Louis, F87)
- Greg Fischer (Washington, S88)
- Detlof von Winterfeldt (Denver, F88)
- Robin Keller (Vancouver, S89)

Secretary/Treasurer

- Craig W. Kirkwood (80-82)
- Lee Merkhofer (82-84)
- Irving H. LaValle (84-88)
- Dennis M. Buede (88-90)

Council Members

- Rex. V. Brown (81-82)
- Ward Edwards (81-82)
- Peter H. Farquhar (81-84)
- Ralph L. Keeney (81-82)
- James E. Matheson (81-83)
- Richard D. Smallwood (81-82)
- Robert L. Winkler (81-83)
- Robin Hogarth (82-85)
- John Lathrop (82-85)
- Jim Dyer (83-86)
- Peter Fishburn (83-86)
- D. Warner North (84-87)
- Rakesh Sarin (84-87)
- Elisabeth Pate-Cornell (85-88)
- Randy Simpson (85-88)
- Bob Clemen (86-89)
- Robin Keller (86-90)
- Robert Bordley (87-90)
- Bruce Judd (87-90)
- Adam B. Borison (88-91)
- Irving H. LaValle (88-91)

Abstract Reviews

From **Ralph L. Keeney**, Systems Science Department, University of Southern California, Los Angeles, CA 90089-0021:

Facts to Guide Thinking about Life-Threatening Risks.

Modern science, medicine, and improving prosperity have brought many benefits to our society, but not without costs. One significant concern is that we are imposing new and perhaps greater life-threatening risks to individuals with some of the resulting technological innovations and activities. In decision problems involving life-threatening risks, it is difficult to distinguish alternatives that on balance are worth the effort in reducing risks from alternatives that are not worth the price that must be paid. The intent of this paper is to clarify some of the inherent complexity in these public and private risk decision problems. We present a number of "facts" to guide constructive thinking about decisions involving life-threatening risks. Our intent in stating these facts is to reduce the likelihood that they are forgotten or pushed aside in analyzing or appraising alternatives for specific risk problems.

Building Models of Values.

To achieve a set of objective, whether they are made explicit or not, is the entire intent of decision making. When they are explicitly stated, the objectives are often quantified with an objective function. Because of its critical role for decision making, the objective function should be developed from first principles, sound logic, reasoned judgments, and carefully acquired consistent data. Unfortunately, in practice many objective functions are hastily chosen from a process that can at best be described as arbitrary. This paper presents a better alternative for developing the objective function, namely to construct it from a quality modelling effort.

From **Robert F. Nau**, Fuqua School of Business, Duke University, Durham, NC 27706:

Decision Analysis with Indeterminate or Incoherent Probabilities.

This paper presents a new method of coping with indeterminate and incoherent probability judgments in decision analysis problems. The decision maker's degree of belief in the occurrence of an event is represented by a unimodal (in fact, concave) function on the unit interval, whose parameters are elicited in terms of lower and upper probabilities with attached confidence weights. This is shown to provide a unified framework for performing sensitivity analysis, reconciling incoherence, and combining expert judgments.

From **Robert F. Nau and Kevin F. McCardle**, Fuqua School of Business, Duke University, Durham, NC 27706:

Coherent Behavior in Noncooperative Games

This paper joins the controversy regarding the modeling of uncertainty about the actions of rational human opponents in noncooperative games of strategy by introducing and exploring the implications of a new concept of mutually expected rationality in such games: joint coherence. This concept is an extension of the "Dutch book" argument of subjective probability theory. As such, it bridges a long-standing philosophical gap between subjective probability theory and game theory, and sheds light on the dispute over what sort of equilibrium (i.e., self-enforcing) strategies can reasonably be recommended to Bayesian rational players. The relationship of joint coherence to other recently-proposed

solution concepts for noncooperative games is analyzed, and qualified support is mustered for Aumann's (1987) conjecture that objective correlated equilibrium is the appropriate expression of Bayesian rationality in games.

From **D. Samson**, **A Wirth**, and **J. Rickard**, The Graduate School of Management, The University of Melbourne, Parkville, Victoria 3052, Australia (address requests to Dr. Samson):

The Value of Information from Multiple Sources of Uncertainty in Decision Analysis.

In decision analysis, the expected value of information is a well known and used concept, where the values of information about sources of uncertainty are normally considered one at a time. When information is potentially available for more than one source of uncertainty in a decision problem and the decision maker must choose which sets of information to acquire, the nonlinearities and discontinuities which are inherent to the problem result in general non-additivity of information values. Additivity of the expected value of perfect information (EVPI) occurs only under certain conditions, and for a large proportion of decision problems, EVPIs are not even approximately additive. This paper presents an analysis of this class of problem, some fundamental results, practical implications and delineates a number of useful directions for further research.

From **D. Samson**, The Graduate School of Management, The University of Melbourne, Parkville, Victoria 3052, Australia:

A Decision Analysis Based DSS for Formulating Manufacturing Strategy.

Although a substantial number of decision and management science models of production management decisions have been developed, these models have not generally addressed the strategic framework of manufacturing, considered as an integrated pattern of decisions. They have usually been concerned with only one aspect of manufacturing strategy such as capacity or technology choice and framed that choice using a single dimension of value such as cost. This study develops a comprehensive decision analysis model base which can be implemented as a DSS, to gain insight about the broader manufacturing strategy set. Decision trees, influence diagrams, Monte Carlo risk analysis and multiple criteria utility functions can contribute to a better understanding of, and to decision support for manufacturing strategy formulation.

From **Peter H. Farquhar**, Center for Decision Technology and Strategy Research, Carnegie-Mellon University Pittsburgh, PA 15213, and **Anthony R. Pratkanis**, Board of Psychology, University of California, Santa Cruz, CA 95064:

Decision Structuring with Phantom Alternatives.

A phantom alternative is a choice option that looks real but is unavailable at the time a decision is made. Although traditional decision theories suggest that unavailable alternatives are not essential and should be deleted from the choice set, empirical evidence suggests otherwise. We show that phantom alternatives can both help and hinder the structuring of decision problems. On the one hand, phantoms can provide useful information on the boundaries of a decision problem help generate new options through a restructuring of the problem. On the other hand, phantoms can result in suboptimal decisions, deceptive manipulation, and biases in both perception and choice behavior. We discuss three basic types of phantoms and their effects on decision making. We then recommend procedures for decision structuring that preserve the helpful contributions of phantoms and at the same time minimize their harmful aspects.

From **David E. Bell**, Harvard Business School, Soldiers Field, Boston, MA 02163:

One-Switch Utility Functions and a Measure of Risk.

Consider the relative attractiveness to a decision maker of two financial gambles as the wealth of that individual varies. It may seem reasonable that either one alternative should be preferred for all wealth levels for that there exists a unique critical wealth level at which the decision maker switches from preferring one alternative to the other. Decreasing risk aversion is not sufficient for this property to hold: we identify the small class of utility functions for which it does. We show how the property leads naturally to a measure of risk.

The results of this paper apply equally well to discounting functions for cash flows: one-switch discount functions permit at most one change in preference between cash flows as all payoffs are deferred in time.

From **R. Duncan Luce**, Department of Psychology, Harvard University, Cambridge, MA 02138

Rank-Dependent, Subjective Expected-Utility Representations.

Gambles are recursively generated from pure payoffs, events, and other gambles, and a preference order over them is assumed. Weighted average utility representations are studied that are strictly increasing in each payoff and for which the weights depend both on the events underlying the gamble and the preference ranking of the several component payoffs. Basically two results are derived: a characterization of monotonicity in terms of the weights, and an axiomatization of the representation. The latter rests on two important conditions: a decomposition of gambles into binary ones and a necessary commutativity condition on events in a particular class of binary gambles. A number of unsolved problems are cited.

From **Yutaka Nakamura**, Department of Precision Engineering, Osaka University, 2-1 Yamada-Oka, Suita, Osaka 565, Japan:

Bilinear Utility and a Threshold Structure for Nontransitive Preferences.

This paper develops a generalization of Fishburn's SSB utility theory. Let P be a set of probability measures. A new representational form yields a bilinear functional u on P for which $u(p,q) > 0$ if and only if p is preferred to q , where $u(p,p) \leq 0$, and $u(q,p) < 0$ whenever $u(p,q) > 0$. Since u is not necessarily skew-symmetric, i.e., $u(p,q) \neq -u(q,p)$, it provides imprecise preference discriminability. It is also discussed that u is related to SSB utility with a threshold structure.

From **Rex V. Brown**, Decision Science Consortium, Inc., 1895 Preston White Drive, Suite 300, Reston, VA 22091:

Handling Second-Order Assessment Uncertainty: A Prescriptive Decision-Aiding Approach.

Assessment Uncertainty is the recognition that probabilistic assessments are not "firm". It is a widespread problem for professional decision makers, and one which management science has not offered much help with. Normative concepts of second-order probability and Bayesian preposterior analysis have not yet proved useful -- or used. This paper adapts these concepts into a prescriptive methodology, i.e., one designed to be behaviorally and institutionally realistic, as well as logically sound.

It addresses how to represent, report and derive assessment uncertainties of various kinds, independent of their use; and use them as a defensible basis for action and

information gathering, without formal decision analysis. Distinctive features include communication devices for input, output and linking argument a non-frequentist interpretation of "true" (impersonal) probability. The methodology is illustrated from a case in nuclear regulation.

From **Kathryn Blackmond Laskey**, Decision Science Consortium, Inc., 1895 Preston White Drive, Suite 300, Reston, VA 22901:

Adapting Connectionist Learning to Bayes Networks.

A clear need exists within artificial intelligence for flexible systems capable of modifying their own knowledge bases. This paper shows that a common formalism can be used to describe two very different models: the Boltzmann machine connectionist learning model and the Bayes network model for probabilistic reasoning. The learning algorithm for Boltzmann machines can be adapted to a general algorithm for adjusting conditional probabilities on the links in a Bayes network. We hypothesize that the formal approach outlined here holds promise for unifying symbolic and subsymbolic levels of reasoning.

From **Kathryn B. Laskey**, **Marvin S. Cohen**, and **Anne W. Martin**, Decision Science Consortium, Inc., 1895 Preston White Drive, Suite 300, Reston, VA 22901:

Representing and Eliciting Knowledge about Uncertain Evidence and Its Implications.

Increasing attention is being given to formalisms for representing and processing uncertainty in automated reasoning systems. These formal algorithms rely on obtaining judgments from experts of degrees of uncertainty, or the strength of evidential relationships. This paper describes a reasoning system and associated assessment methodology built upon a natural schema for an evidential argument. This argument schema is based on the underlying causal chains linking conclusions and evidence. The framework couples a probabilistic calculus with qualitative approaches to evidential reasoning. The resulting knowledge structure leads to a natural assessment methodology in which the expert first specifies a qualitative argument from evidence to conclusion. Next the expert specifies a series of premises on which the argument is based. Invalidating any of these premises would disrupt the causal link between evidence and conclusion. The final step is the assessment of the strength of the argument in the form of degrees of belief for the premises underlying the argument. The expert may also explicitly adopt assumptions affecting the strength of evidential arguments. The paper describes a higher level "metareasoning" process in which assumptions underlying the strength and direction of evidential arguments may be revised in response to conflict.

From **Kathryn Blackmond Laskey**, Decision Science Consortium, Inc., 1895 Preston White Drive, Suite 300, Reston, VA 22901, and **Paul E. Lehner**, Decision consortium, Inc. and George Mason University, 4400 University Drive, Fairfax, VA 22030:

Assumptions, Beliefs and Probabilities.

The relationship between assumption-based reasoning and numerical uncertainty management is explored. It is shown how inference networks with attached numerical uncertainty measures can be represented by a probabilistic model on the assumptions in an assumption-based truth maintenance system. The same formalism gives rise to either a Shafer-Dempster model or a probabilistic model, depending on the rules in the system. An advantage of this approach is that non-independencies between nodes are automatically and correctly handled when calculating either beliefs or probabilities.

Belief Maintenance: An Integrated Approach to Uncertainty Management.

Belief maintenance represents a unified approach to assumption-based and numerical uncertainty management. A formal equivalence is demonstrated between Shafer-Dempster belief theory and assumption-based truth maintenance extended to incorporate a probability calculus on assumptions. Belief propagation through truth maintenance automatically and correctly accounts for non-independencies among propositions due to shared antecedents. Belief maintenance also incorporates an ability to represent and reason with defaults. The result is a framework for non-monotonic reasoning about the application of a quantitative uncertainty calculus.

From **J. Greg Byrd, Richard de Neufville, and Philippe Delquie**, Technology and Policy Program, Rm 1-138, Massachusetts Institute of Technology, Cambridge, MA 02139 (address requests to Dr. de Neufville):

The Difference Between Probability and Certainty Equivalents Methods of Utility Assessment.

Hershey and Shoemaker demonstrated the non-equivalence of the certainty and probability equivalent methods of utility assessment. Johnson and Schkade believe that the Hershey and Shoemaker's results can be partially explained by the anchoring and adjustment phenomena. The experiment has been repeated using an interactive computer program that does not allow a subject to anchor on a particular value. Our study confirms the non-equivalence of the two utility elicitation techniques and eliminates anchoring as an explanation. It also demonstrates the superior efficiency of the computer interview to questionnaires.

From **Philippe Delquie, Richard de Neufville, and Herve Mangnan**, Technology and Policy Program, Rm 1-138, Massachusetts Institute of Technology, Cambridge, MA 02139 (address requests to Dr. de Neufville):

Response-Mode Effects in Preference Elicitation.

A study was conducted to investigate response-mode effects in eliciting indifference among simple gambles. Subjects had to establish their indifference over pairs of gambles by adjusting either the amount to win, or the probability of winning in one of the lotteries. These experiments extend earlier work. The results show that indifference relations among gambles greatly depend upon the response variable used for eliciting them. This response-mode effect is not compatible with the explanation previously proposed for the discrepancy between CE and PE responses. It also contradicts an earlier interpretation for the dependence of utility functions on probability.

From **Charles M. Harvey**, Dept. of Mathematical Sciences, Dickinson College, Carlisle, PA 17013:

A Systematic Approach for the Prescriptive Modeling of Risk Attitudes.

This paper provides a systematic approach to simple prescriptive conditions on risk attitudes that imply special types of expected utility functions. Each condition corresponds to a choice of an arithmetic operation that measures the importance of changes in the amounts of the consequences. Constant risk aversion and constant proportional risk aversion are shown to be examples of one family of these conditions. In the same manner, risk neutrality is shown to be an example of another family of these conditions. Two procedures are described for using a condition from either family to model the attitude toward risk of a public or private decision making group without performing the detailed preference assessments that are needed to determine a general utility function.

Prescriptive Models of Psychological Effects on Risk Attitudes.

This paper discusses models of a person's risk attitude toward financial changes when his preferences depend on psychological effects of the changes, for example, effects on how the person is judged by himself and by others. These models represent the risk attitude of a person who due to these effects is risk averse for outcomes involving gains or the status quo but is risk prone for outcomes involving losses or the status quo. The models are prescriptive in that they exclude the heuristic biases that are studied in behavioral decision theory. They are examined from the descriptive, prescriptive, and normative perspectives. In particular, they are shown to satisfy the principles of expected utility but to violate several other normative principles.

From **Irving H. LaValle**, A. B. Freeman School of Business, Tulane University, New Orleans, LA 70118:

On Neutrality of Acts with Respect to Use of Proxy Outcomes.

Construing acts as functions on a set of states to the set of lotteries on ultimate outcomes, this partly expository paper cautions that, in non-Savage choice theories, the popular technique of replacing multiattributed ultimate outcomes by equally desirable and crisper proxies may misguide the choice of act, in that preferences between the induced proxy acts may not mirror preferences between their original counterparts. When this pathology cannot occur, preferences and the associated choice theory are said to be neutral as regards proxy substitution. Sufficient conditions for neutrality include Monotone Dominance, Transitivity, and a restricted form of Linearity. The Linearity property can be circumvented by direct assignment of proxy "certainty equivalents" to outcome lotteries rather than to ultimate outcomes; then preferences are said to be semineutral if the corresponding proxy acts mirror preferences between their original counterparts. Relationships of these problem transformations are noted and certain normative choice theories are examined as to neutrality of preference with respect to use of arbitrary proxies.

Caution! Pricing out Variation in Nonmonetary Attributes is Dangerous to Your Optimality.

A popular technique for sidestepping direct assessment of a multiattribute utility function is first to price out the variation in nonmonetary attributes (assuming a fixed, base nonmonetary profile) and then to assess a utility function for money (assumed to be accompanied by the base nonmonetary profile). We show that this technique, while valid for solving the original decision, can lead to seriously incorrect results when subsequently evaluating opportunities involving financial transactions, e.g. whether to acquire costly information. Only if preferences satisfy the strong condition of tradeoffs independence (Harvey, 1987) is one assured of obtaining correct evaluations subsequent to the pricing out.

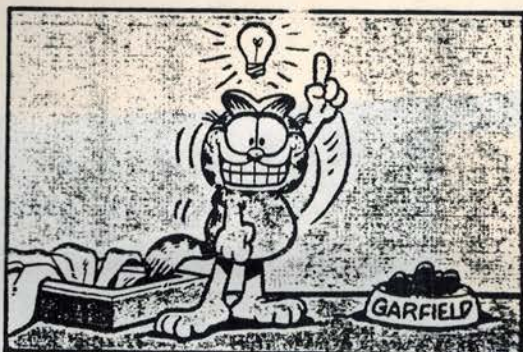
Appeared Elsewhere

Rousch, William B., [College of Agriculture, Pennsylvania State University, University Park, PA 16802], "A Decision Analysis Approach to the Determination of Population Density in Laying Cages", World Poultry Science Association 42 (Feb. 1986), pp. 26-31.

Population density of hens in laying cages is formulated as a decision-analytic problem including egg and feed prices, pullet costs, and biological response of hens to cage density as variables.

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