

DECISION ANALYSIS NEWSLETTER

Published by the ORSA Special Interest Group on Decision Analysis

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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:

Irving H. LaValle
A. B. Freeman School of Business
Tulane University
New Orleans, LA 70118
(O) (504) 865-5484
(H) (504) 899-8110

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 at Mount Royal and Guilford Avenues, Baltimore MD 21202 of address change; we get our mailing labels from them! Thanks!

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Nominations Solicited for Decision Analysis Publication Award

The ORSA Special Interest Group on Decision Analysis is instituting a Decision Analysis Publication Award and is soliciting nominations for the first such award. The award will be given annually to the publication (e.g., article, book, chapter, monograph) judged to be the best publication in decision analysis, broadly defined, during the calendar year two years prior to the time the award is given. The
(*cont. page 2*)

Jayant Kalagnanam wins 1989 Decision Analysis Special Interest Group Student Paper Competition

by Robert T. Clemen

Mr. Jayant Kalagnanam won the fourth annual ORSA Decision Analysis Special Interest Group's Student paper Competition with his paper, "A Comparison of Decision Analysis and Expert Rules for Sequential Diagnosis," coauthored with Professor Max Henrion of Carnegie Mellon University. Mr. Kalagnanam is a PhD student in the Department of Engineering and Public Policy at Carnegie Mellon. His dissertation
(*cont. page 2*)

From the Chairperson - Samuel E. Bodily
(804)924-4813; Box 6550, Charlottesville, VA 22906

At the New York meeting in October, the council finalized plans for the Decision Analysis Publication Award. The first award will be in Fall 1990, based on publications that appeared in calendar year 1988. Bob Winkler will chair the selection committee for the first award. Please send him your nominations.
(*cont. page 2*)

Peter Wakker at Duke

Peter P. Wakker is spending this academic year at the Fuqua School of Business, Duke University, Durham, NC 27706. Tel:(919)684-2553 (Office); (919)490-6577 (Private). e-mail: WAKKER@DUKEFSB.

Chairman. cont.

The student competition for the Fall of 1990 will be chaired by Dennis Buede.

We appreciate the efforts of Don Kleinmuntz in putting together the worthwhile sessions at the New York meeting. Don Keefer has organized sessions for the Las Vegas meeting, May 7-9, 1989; Howard Kunreuther and Colin Camerer are now organizing sessions for Philadelphia, October 28-31, 1990, and Ross Shachter will be responsible for the cluster of sessions at the Nashville meeting in the Spring of 1991.

Nominations. cont.

purpose of the time lag is to allow for publications to be disseminated and read and their impact felt. This is an opportunity for recognition of first-rate work in decision analysis.

To be eligible for the first award, a publication must have been published in 1988. Authors cannot nominate their own work. Nominations, with a copy of the publication (if at all possible), should be sent to: Professor Robert L. Winkler; Fuqua School of Business; Duke University; Durham, NC 27706. Nominations must be received by May 15, 1990. The award will be given at the Fall 1990 ORSA/TIMS Meeting in Philadelphia.

Anyone with questions concerning the award should contact Bob Winkler (phone 919-684-5375), bitnet winkler at dukefsb).

Call for Nominations. or: DeFinetti's Bayesian 21st Century Draws near: What Will the Shape of this Future Be?

The Decision Analysis SIG will certainly play a role in guiding this future. We need nominees for president and the SIG Council. Since meetings are held at each TIMS/ORSA meeting, every nominee should expect to attend most of the meetings held during his/her tenure. Councilmembers and President are responsible for arranging Best Student Paper Award, Best Publication Award, and the Ramsey-Medal Competitions. Other meeting topics include authorization of funds for special programs, responding to invitations from other societies, etc.

Please send nominations and/or self-nominations to: Bob Bordley; Operating Sciences Department; General Motors Research Labs; Warren, Michigan 49080-9055. Nominations should be send in no later than one month after the mailing date of this Newsletter. The candidates for election will be announced in the Following Newsletter. Thanks for all your help!

Jayant Kalagnanam. cont.

advisor is Professor Henrion.

Professor Robert T. Clemen was the Chair of the 1987 Student Paper Competition. The winner was announced at the ORSA/TIMS meeting in New York, October 16-18, 1989. Inquiries about the competition may be addressed to Professor Clemen at the Fuqua School of Business, Duke University, Durham, NC 27706 (919)684-2493.

ANNOUNCEMENT AND CALL FOR PAPERS
**Fifth International Conference on the Foundations
and Applications of Utility, Risk and Decision Theory**
Duke University, U.S.A., June 10 - 13, 1990

Continuing a very successful series of meetings, the Conference will convene for the first time in North America. This is a cross-disciplinary meeting, devoted to new developments in the foundations and applications of utility, risk, and decision theory. It provides a unique opportunity to meet those in other disciplines and from other countries whose research addresses behavior under uncertainty. Participants will include:

Maurice Allais, École Nationale Supérieure, Paris; Attila Chikán, International Society for Inventory Research; Peter Fishburn, AT&T Bell Laboratories; Ole Hagen, Norwegian School of Management; John Harsanyi, University of California - Berkeley; Daniel Kahneman, University of California - Berkeley; Howard Kunreuther, University of Pennsylvania; Lester Lave, Carnegie-Mellon University; Werner Leinfellner, University of Vienna; R. Duncan Luce, University of California - Irvine; Mark Machina, University of California - San Diego; Aldo Montesano, Università Commerciale Luigi Bocconi; Hervé Moulin, Duke University; Bertrand Munier, University of Paris; Charles Plott, California Institute of Technology; David Schmeidler, Tel-Aviv University; Vernon Smith, University of Arizona; W. Kip Viscusi, Duke University; Robert Winkler, Duke University; Richard Zeckhauser, Harvard University.

National Organizing Committee:

J. Geweke, W. Magat, K. McCardle, R. Nau, W.K. Viscusi, Duke University; M. Machina, University of California - San Diego

Papers will be published in a conference volume, by Kluwer Academic Publishers. Papers may also be submitted to *Theory and Decision* and *The Journal of Risk and Uncertainty* for refereed publication in special conference volumes. Those wishing to contribute a paper at the meeting should submit an abstract (and, if available, the paper) before February 10, 1990 to:

National Organizing Committee, F.U.R. V
Institute of Statistics and Decision Sciences
Duke University
Durham, North Carolina 27706
U.S.A.

Those interested in participating in the meeting, whether presenting a paper or not, should request details from the same address. Conference registration, including six meals, will be less than \$200. Grants for registration, subsistence and travel for recent Ph.D.'s may be available.

The 4th BEHAVIORAL DECISION RESEARCH IN MANAGEMENT Conference will be held at the Wharton School, University of Pennsylvania from Friday, June 1, to Sunday, June 3, 1990. This conference is intended to continue the series of meetings held at Cornell, Texas, and Chicago. The emphasis is on original research in decision making and its application to business disciplines, including managerial economics, marketing, accounting, finance, decision support, organization behavior, and business strategy.

The conference begins with a cocktail reception Friday night (June 1st), four sessions and a conference dinner on Saturday (June 2), and concludes by 3 pm on Sunday (June 3). Our intention is to have a mixture of special interest sessions, dedicated to particular interests, and plenary sessions which will present topics of general interest to the Behavioral Decision Research community.

Hotels:

Blocks of rooms have been arranged at two nearby hotels, both within walking distance of all conference events. The University City Sheraton has arranged room rates of \$80 for a single and \$90 for a double. The Penn Towers has quoted a rate of \$95 dollars for all rooms. Please contact the hotels directly (or use the mailing card we will include in a subsequent mailing to interested people).

Registration:

Registration for the conference will be \$125 which will cover all social events, including a conference banquet which will be held in the University of Pennsylvania Museum. (Make checks payable to "Trustees of the University of Pennsylvania".)

Call for Abstracts

Speakers are invited to submit abstracts of 200 words or less by March 1, 1990, to either of the conference organizers, Colin Camerer and Eric Johnson. Selections will be made by the organizers and an ad hoc program committee. Speakers will be notified whether their abstracts have been selected by April 1, 1990. Please include a name, address, and phone number on the abstract.

Colin Camerer
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camerer@wharton.upenn.edu
Department of Decision Sciences

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Department of Marketing

The Wharton School
University of Pennsylvania
Philadelphia PA 19104 USA

PAPERS RECEIVED

Please request copies directly from the author, not the Newsletter Editor

From **Nicholas Baigent** and **Yongsheng Xu**, Department of Economics, Tulane University, New Orleans, LA 70118:

Independent Necessary and Sufficient Conditions for Plurality Rule

A choice aggregation procedure assigns an aggregate choice function to sets of individual choice functions. Four axioms: Unrestricted Domain, Neutrality, Independence of Symmetric Substitutions, and Positive Response are independent necessary and sufficient conditions for a choice aggregation procedure to be the Plurality Rule.

From **Jonathan F. Bard** and **Michael Wambganss**, Operations Research Group, the University of Texas, Austin, TX 78712:

A Matching-Based Interactive method for MCDM

This paper presents a new approach to interactive MCDM that has proven extremely effective in reducing a large set of alternatives down to a handful of good candidates. To begin, the alternatives are grouped, or clustered, via a matching heuristic that sequentially divides the data points into sets of equal size. Using the Euclidean distance as the measure of similarity, an exchange procedure is called to find locally better partitions. The decision maker is then asked to compare in a pairwise fashion, the vector means of the resulting clusters. The preferred group is retained, while all elements of the inferior groups are temporarily eliminated. Two-point convex preference cones are used at each step of the algorithm to implicitly eliminate some groups. Next, the complete set of alternatives is subjected to a value function assessment procedure designed to reduce the error introduced during clustering. Here, a subset of the discarded alternatives are retrieved for further consideration.

From **Jonathan F. Bard** (address above) and **Stephen F. Souk**, Belvoir RD&E Center, Logistics Equipment Directorate, Fort Belvoir, VA 22060:

A Comparison of the Analytic Hierarchy Process with Multiattribute Utility Theory: A Case Study

A Case study designed to select the next generation of rough terrain cargo handlers for the U.S. Army provided the backdrop for comparing the AHP with MAUT. Three alternatives were identified and ultimately ranked using the two methodologies. The intent was to determine the strengths and weaknesses of each, and to characterize the conditions under which one might be more appropriate than the other. In general, we found the AHP to be more accessible and conducive to consensus building. Once the attributes were defined, the decision makers had little difficulty in furnishing the necessary data and discussing the intermediate results. The same could not be said for the MAUT analysis. The need to juggle twelve attributes at a time produced a considerable amount of frustration among the participants. In addition, the lottery questions posed during the data collection phase had an unsettling effect that was never satisfactorily resolved.

From **P. George Benson**, Carlson School of Management, University of Minnesota, 271 19th Avenue South, Minneapolis, MN 55455, and **Dilek Yeldan**, Dept. of Management, Bilkent University, P.O.B. 8, 06572 Maltepe, Ankara, Turkey:

The Effects of Feedback and Training on the Performance of Probability Forecasters

Little is known about the effects of performance feedback on probability forecasters. The goal of the present study is to expand our knowledge in this area. An experiment was conducted that examined the effects of four different kinds of feedback -- outcome feedback, calibration feedback, resolution feedback, and Yates's covariance feedback -- and associated training on various aspects of the performances of probability forecasters. It was found that the provision of calibration feedback was effective in improving both the calibration and overforecasting of probability forecasters. Simple outcome feedback was not. Neither resolution nor covariance feedback affected forecasters' performances much differently than simple outcome feedback. In general, however, the provision of performance feedback of any kind affected forecasters' usage of the probability scale: forecasters tended to switch from two digit probabilities to one digit probabilities. In addition, forecasters receiving calibration and resolution feedback used fewer different probabilities than prior to receiving feedback.

From **Colin F. Camerer**, Dept. of Decision Sciences, The Wharton School, University of Pennsylvania, Philadelphia, PA 19104:

Recent Tests of Generalizations of Expected Utility Theory

Many theories have been developed in which the expected utility (EU) axioms are weakened, or replaced, to accommodate patterns of preference that violate EU. Most theories are constructed to explain the paradoxes of Allais (1953, 1979) and other familiar violations. Now we need higher empirical hurdles for alternative theories to jump.

I will review some studies which raise such hurdles, using a wide range of choices and techniques. The picture which emerges from these data is clear, but not simple. No single theory can explain all the data. My view is that prospect theory survives best. Some of its elements, like existence of a reference point and reflection of risk attitudes around it, are required for any adequate empirical theory.

From **S. H. Chew** and **L. F. Herk**, Department of Economics, Tulane University, New Orleans, LA 70118:

Risk Spreading Under Generalized Preferences

The Arrow-Lind (1972) theorem asserts that for any project risk, the aggregate risk premium becomes arbitrarily small as the number of risk averse investors with equal shares of the project increases. This theorem was proved for homogeneous investor populations having expected utility preferences. In the same setting, Foldes and Rees (1977) showed that the Arrow-Lind property is equivalent to the logically weaker property of consensus risk neutrality: for any project risk with positive expected return, there is a sufficiently large pool of investors for whom equal shares of the project risk would be unanimously preferred to the status quo.

For homogeneous investor populations, we find that the equivalence between the Arrow-Lind property and consensus risk neutrality extends to a broad class of preferences including but not limited to expected utility. We investigate the further extension of this equivalence to heterogeneous investor populations.

From **S. H. Chew**, Dept. of Economics and A. B. Freeman School of Business, Tulane University, New Orleans, LA 70118, and **N. Nishimura**, Dept. of Economics, Shinshu University, Matsumoto, Japan:

Differentiability, Comparative Statics and Nonexpected Utility Preferences

We investigate the role of differentiability of non-expected utility functionals for comparative statics behavior in the context of the earlier works of Rothschild and Stiglitz (1971) and Diamond and Stiglitz (1974). We provide a theorem which translates comparative statics results under expected utility theory for partial orders, including various orders of stochastic dominance, to the class of Gateaux differentiable utility functionals. The extension of the Diamond-Stiglitz result is accomplished via Hadamard differentiability which provides a natural tool for the derivation of comparative statics results when the changes in the underlying distribution are 'smooth' relative to changes in the exogenous variables. Our comparative statics extends the work of Machina (1989) for Frechet smooth preferences.

Necessary and sufficient conditions for Gateaux differentiability of several classes of axiomatic non-expected utility functionals are derived and shown to also be necessary and sufficient for the stronger definition of Hadamard differentiability. Sufficient conditions for Frechet smoothness are also derived.

From **Peter C. Fishburn**, Rm 2C-354, AT&T Bell Laboratories, Murray Hill, NJ 07974, and **Bernard Monjardet**, Université Paris V et Centre de' Analyse et de Mathématiques Soriales [Address requests to Dr. Fishburn]:

Norbert Wiener on the Theory of Measurement (1914, 1915, 1921)

In conclusion, let us consider what bearing all this work of ours can have on experimental psychology (Wiener, 1921, p. 204)

These words, written by Norbert Wiener in 1919 when he was 24 years old, appear near the end of the third of three extraordinary papers on the theory of relations and measurement that he began before his twentieth birthday. The papers use the notation of *Principia Mathematica*, which is fairly inaccessible to modern readers. However, Wiener's contributions to measurement theory deserve to be remembered because they include important concepts that were rediscovered by others and now have a central place in the representational theory of measurement and in graph theory. Our purpose is to recount in modern terms Wiener's work in these areas.

From **Wael Hamadeh**, **Benjamin F. Hobbs**, **Vira Chankong**, Crawford Hall, Case Western Reserve University, Cleveland, OH 44106, and **Eugene Z. Stakhiv**, Institute for Water Resources, U. S. Army Corps of Engineers, Ft. Belvoir, VA:

Does Choice of Multiobjective Method Matter? An Experiment

Many multiobjective methods for evaluating water projects have been developed. The wide variety of methods available bewilders potential users, resulting in inappropriate matching of methods and problems and unnecessary user dissatisfaction. Experiments in which decision makers apply several multiobjective methods to realistic problems can help dispel this confusion. This paper summarizes one such experiment in which Army Corps of Engineers planners used several methods to screen urban water supply projects. The methods evaluated are goal programming, ELECTRE I, additive value functions, multiplicative utility functions, and three techniques for choosing weights (direct rating,

indifference tradeoff, and the Analytical Hierarchy Process). The appropriateness, ease of use, validity, and results of these methods are compared. A major conclusion is that decisions may be as or more sensitive to the method used as to which person applies it. Therefore, if *who* chooses is important, then so too is *how* a choice is made.

From Donald L. Keefer, Dept of DS & IS, College of Business, Arizona State University, Tempe, AZ 85287-4206:

Resource Allocation Models with Risk Aversion and Probabilistic Dependence: Offshore Oil and Gas Bidding

Bidding for offshore U.S. oil and gas leases is a major corporate resource allocation problem involving enormous uncertainties and very high stakes. This paper presents two new operationally useful decision analysis models to aid in bidding for oil and gas leases. They are unique in that they consider risk aversion and probabilistic dependence among the values of the leases, with both bid levels and partnership shares as (continuous) decision variables. They are suitable for use in evaluating proposed bidding policies or as objective functions in optimization formulations. Practicality of their data requirements is evidenced by use of one of the models for several years in a major oil company. Comparison of optimal solutions to these models on a small example using actual oil-company data demonstrates the importance of taking risk aversion and probabilistic dependence into account and provides insight into the adequacy of independence and conditional dependence as approximations for dependence. These results are pertinent to other real-world allocation problems, such as R&D funds allocation, that share many of the characteristics of bidding problems.

From Ralph L. Keeney, 101 Lombard St., Suite 704W, San Francisco, CA 94111:

On the Prescriptive Foundations of Decision Analysis

In the recent past, there has been significant interest in the interactions among normative, descriptive, and prescriptive theories of decision making. An important aspect of such research has focused on sets of axioms for normative decision making which increasingly attempt to account for descriptively observed aspects of human decision making. Such work rarely focuses separately on the axioms appropriate for a prescriptive view of decision making: helping people make informed, and hopefully better, decisions. A major thesis of this paper is that the choice of axioms for prescriptive decision making is itself a decision problem; namely, one which confronts the analyst.

From L. Robin Keller, DRMS Program, National Science Foundation, Room 336, 1800 G Street, NW, Washington, DC 20550:

The Role of Generalized Utility Theories in Descriptive, Prescriptive, and Normative Decision Analysis

A number of new theories for decision making under risk have been proposed which relax some properties required by von Neumann-Morgenstern expected utility theory. This paper provides a framework for exploring the usefulness of these theories in the domains of descriptive, prescriptive, and normative decision analysis.

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

↓ p-rr title on next page

Small Worlds and Sure Things: Consequentialism by the Back Door

The nonseparable choice theories proffered normatively during the past decade almost by definition treat decision 'consequences' differently than they do lotteries with consequences as prizes, thus begging the question of how to set the horizon of a decision model. It is shown that horizon flexibility, existence of preferences, outcomes or sure-thing dominance, and invariance with respect to strategically-equivalent reformulation imply separability/cancellation/independence/sure-thing substitutability. Thus consequentialism (Hammond, 1988) returns by the back door despite Machina's (1988) careful development of the case for dynamically consistent but nonconsequentialist behavior. This result is implicit in the work of Burks (1977), given suitable reinterpretations of subtrees as small-world consequences. An early section is devoted to important practical consideration in modeling decisions as trees.

From R. Duncan Luce, Irvine Research Unit in Mathematical Behavioral Sciences, Social Science Tower, University of California, Irvine, CA 92717:

Where Does Subjective Expected Utility Fail Descriptively?

4 papers

The descriptive failure of subjective expected utility (SEU) invites asking which of its underlying postulates lead to the trouble and then developing a more adequate theory. SEU is based on three major tenets of rationality: transitivity of preference, monotonicity of preference under chance mixtures of alternatives, and accounting equations that assert that different framings of the same uncertain alternative are judged to be indifferent in preference. Monotonicity is closely related to, but distinct, from, what economists refer to as independence or dominance. Empirical evidence that has been interpreted as violations of transitivity and monotonicity are reexamined. For the former, it is argued that the procedures used in preference reversal experiments are major sources of the intransitivities and that when a pure choice experiment is carried out, the evidence for intransitivity largely disappears. For monotonicity, the data--basically variants on the Allais paradox--used to implicate it in fact jointly implicate it and one or more of the accounting equations. Since the more complex accounting equations are really not very plausible descriptively, they, instead of monotonicity, may be the problem. Moreover, in the one published case where monotonicity was studied in isolation, it received support. Thus, transitivity and monotonicity appear to be tentatively acceptable, but considerable restraint is needed in invoking accounting equations--idempotence, complementarity, and event commutativity--are assumed to hold for binary mixtures. These assumptions coupled with the postulate of an interval scale representation--which it is argued is not a very limiting assumption--result in a rank-dependent SEU representation, which reduces to the SEU representation when more complex accounting equations are invoked. A generalization of the theory to non-binary mixtures is described. It rests upon a recursive decomposition postulate that leads back to the binary case. Problems in testing the theory are discussed.

Rational Versus Plausible Accounting Equivalences in Preferences Judgments

Subjective expected utility (SEU) embodies four distinct principles of rational behavior. Although all have been called into some question empirically, the least plausible and least studied is the property that logically equivalent gambles are treated as indifferent in preference. The paper describes some results that arise when this property is sharply weakened and to some degree replaced by alternative rational and not-so-rational assumptions. The resulting utility representations, like SEU, are weighted averages of the utilities of consequences, but with the weights dependent on more than the underlying chance event. In rank-dependent cases, which arise from a restricted assumption about logically

equivalent gambles, the weights depend upon the rank position of the corresponding consequence. In rank- and sign-dependent models, they depend both on the rank position of the consequence associated to the event and on whether it is a gain or a loss. The theory giving rise to the latter involves an additional primitive, namely, joint receipt of gambles, in terms of which new rational and irrational assumptions are invoked. The result generalizes prospect theory to gambles with more than a single gain and a single loss.

Linear Utility Models with Rank- and Sign-Dependent Weights

Binary SEU, prospect theory, and rank dependent theory are generalized to a linear theory with weights that depend both on the sign, relative to a status quo, of the consequence that is associated with an event and on which consequence is more preferred. This rank- and sign-dependent (RSD) representation, Eq. (3), has four weighting functions. They can be reduced to two in four ways, which correspond to the earlier theories.

The remaining developments depend upon the concept of joint receipt of gambles and the assumption that utility is additive over this operation. The above special cases are characterized, and gedanken experiments rule out the pure sign-dependent and prospect theory cases. The rank-dependent case is probably also inadequate empirically. Thus, it appears that the full blown theory is needed, although probably with only two weighting functions if the following plausible condition obtains: "a if event A occurs, b otherwise" is judged indifferent to "b if the event not A, a otherwise."

Explanations are offered for the differences among buying price, selling price, and choice indifference, for why judged and choice indifferences to monetary gambles need not agree, and for why people buy both lotteries and insurance.

Additive utility, the assumption that each mixing operation can be represented as a unit structure, and the simplest distribution equation interrelating mixtures and joint receipt imply (Theorem 3) that utility for money must be a power function, one for gains and another losses, and that the RSD representation is forced.

The RSD representation is axiomatized qualitatively (Theorem 4) by drawing upon earlier work in measurement theory. The key axioms decompose gambles into simpler ones in one way if the consequences are both gains or both losses (Eq. 29) and another way if both a gain and a loss is involved (Eq. 30). These decompositions, while not logically correct, are conceivable descriptive rules of behavior.

Concatenation Structures that are Homogeneous Between Singular Points

A point e in a concatenation structure $\chi = (X, \mathcal{L}, \circ)$ is said to be singular if it is fixed under all automorphisms of the structure. A translation is an automorphism with no fixed points other than the singular ones. It is assumed that χ is finitely unique, from which it follows (Theorem 1) that there are at most three singular points, two extreme ones and one interior. It is also assumed that between adjacent singularities χ is homogeneous in translations, in which case the singular points are further characterized (Theorem 2), the interior one being a generalized zero (Definition 4). It is shown how to replace a generalized zero by a zero ($e \circ x = x \circ e = x$) (Theorem 3) and how to partition χ into homogeneous structures on either side of e (Theorem 4). The major problem in representing such structures is to understand how the two halves relate. For structures on a continuum that are translation homogeneous between singularities, finitely unique, and solvable relative to the zero a representation exists in terms of a generalized unit structure involving two monotonic increasing functions and four constants (Theorem 5).

From John Quiggin, Dept. of Agricultural and Resource Economics, 2200 Symons Hall, University

4 papers

of Maryland, College Park, MD 20742:

Regret Theory-the General Case

The regret theory of choice under uncertainty proposed by Loomes and Sugden has performed well in explaining and predicting violations of Expected Utility theory. However, its usefulness as an economic theory of choice has been limited because the model has been confined to pairwise choices. In this paper, regret theory is generalized to cover arbitrary finite and infinite choice sets. The stochastic dominance and comparative static properties of the model are outlined. A number of special cases are derived in which regret theory is equivalent to other well-known theories of choice under uncertainty.

Comparative Statics for Rank-Dependent Expected Utility Theory

Recently, a number of generalizations of the Expected Utility (EU) model have been proposed. In order to make such generalizations useful, it is necessary that they should yield sharp comparative static results, like those obtained using EU theory. In this paper, Rank Dependent Expected Utility (RDEU) theory, a generalization of EU theory, based on the concept of probability weighting is examined. A number of methods of extending results from EU to RDEU are considered. It is shown that a major class of comparative static results can be extended to the RDEU model, but not to the case of general smooth preferences. This is because RDEU maintains the separation between probabilities and utilities which is abandoned in the general case. In addition, the process yields some new results in the EU model.

A Stronger Characterization of Increasing Risk

The second stochastic dominance definition of increasing risk has many attractive features in the context of pairwise choices between distributions. However, it has proved far less tractable in comparative static problems. In particular, in the standard portfolio problem an increase in risk does not necessarily lead to a reduction in the share of the portfolio allocated to the risky asset by risk-averse investors. Similar problems arise with consideration of increasing risk aversion. In this paper, an alternative and more restrictive definition of increasing risk, referred to as monotone spread is derived, and shown to overcome this problem. The monotone spread concept is the natural dual of concepts of risk aversion arising in the Rank-Dependent Expected Utility theory of Quiggin (1982) and Yaari (1987).

Stochastic Dominance, Efficient Sets and Galois Duality

A dual relationship between families of preference functionals and partial orderings on the space of probability distribution is described and used to derive a range of results in the theory of efficient sets and stochastic dominance for expected utility and generalized theories including the smooth preferences model of Machina and the rank-dependent EU model of Quiggin and Yaari. A number of recently published results are derived as special cases.

From **Rakesh K. Sarin**, Fuqua School of Business, Duke University, Durham, NC 27706:

What Now for Generalized Utility Theory?

The generalized utility theories developed over the past decade can serve as important diagnostic tools to uncover causes for distortions in assessed probability and utility functions, but each such theory violates one or the other of two normatively compelling properties of preferences: the principle of optimality, and economic equivalence. It is apparent that a gap

between descriptive theory and normative theory will always exist. This is because people's unaided judgments and choices are influenced by ignorance, cognitive limitations, and psychological concerns. It is inappropriate to substitute a descriptive theory for a normative theory because of its flexibility or generality. It is equally inappropriate to continue to use a normative theory as an individual-level assumption about people's actual behavior in economics and other social sciences.

From **Robert Sugden**, School of Economic and Social Studies, University of East Anglia, Norwich NR4 7TJ, United Kingdom:

An Axiomatic Foundation for Regret Theory

This paper, which extends previous work by Fishburn, presents a set of axioms which imply a form of regret theory. In the case of choice from two acts, these axioms are similar to those from which Savage derived expected utility theory, except that the transitivity axiom is dropped. Some of Savage's other axioms are strengthened, and a new definition of 'is as probable as' is used. These axioms are extended to the case of choice from n acts by making preferences between any two acts contingent on the nature of the other acts in the choice problem.