CEAR Workshop:

Structural Modeling of Heterogeneity in Discrete Choice Under Risk and Uncertainty

December 1 and 2, 2011, Atlanta

General Information

The workshop disseminates current innovations in econometric and psychometric treatment of structural statistical modeling of heterogeneity, mainly as applied to decision making under risk and uncertainty. By heterogeneity, we mean heterogeneity of models and/or model parameters across populations of persons, decision making situations and/or decision making processes.

Organizers

Jerome Busemeyer and Nathaniel Wilcox are the organizers of this workshop, which is funded by the Center for the Economic Analysis of Risk (CEAR) at Georgia State University. See cear.gsu.edu for more information on CEAR. Contact Busemeyer at jbusemey@indiana.edu or Wilcox at nwilcox@chapman.edu about the substance of the workshop, and contact Mark Schneider at cear@gsu.edu with questions about participation and logistics.

Dates & Times

Thursday Dec. 1 – 9 am to 5 pm. Refreshments and lunch will be provided.
Friday Dec. 2 – 9 am to 5 pm. Refreshments and lunch will be provided.
Contact Mark Schneider at cear@gsu.edu for special dietary needs.

Location

The CEAR Seminar Room is on the 11th floor of the J. Mack Robinson College of Business at Georgia State University. The physical address is 35 Broad Street, **11th Floor**, Atlanta, GA 30303. The Seminar Room will be to the right as you exit the elevators.

Lodging & Attendance

Attendance is open to all that are interested; however, due to space constraints a first-come, first-served policy will be followed. To verify if space is available and confirm attendance contact Mark Schneider at (404) 413.7463 or send an e-mail to cear@gsu.edu.

Program

Thursday December 1

9:00 – 9:50	Continental breakfast and coffee
9:50 – 10:00	Jerome Busemeyer (Indiana) and Nathaniel Wilcox (Chapman) *Welcome and Introduction*
10:00 – 11:20	Michael Lee (UC Irvine) *How cognitive modeling can benefit from hierarchical Bayesian models*
11:20 – 11:40	Discussion
11:40 – 1:00	Lunch (catered buffet in CEAR seminar room)
1:00 – 2:20	John Rust (University of Maryland and Georgetown University) *The Home Selling Problem: Theory and Evidence*
2:20 – 2:40	Discussion
2:40 – 3:10	Coffee
3:10 – 4:30	Jerome Busemeyer (Indiana University) *Bayesian model comparison and hierarchical Bayesian parameter estimation of quantum versus traditional decision models designed to account for experimental findings regarding dynamic inconsistency.*
4:30 – 4:50	Discussion
6:30 – ?	Dinner for invited guests at ???

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Program (continued)

Friday December 2

9:00 – 10:00	Continental breakfast and coffee
10:00 – 11:20	Eric-Jan Wagenmakers (University of Amsterdam) *Unexpected Participant Heterogeneity in the Iowa Gambling Task*
11:20 – 11:40	Discussion
11:40 – 1:00	Lunch (catered buffet in CEAR seminar room)
1:00 – 2:20	Michel Regenwetter (University of Illinois Champaign Urbana) *Random Cumulative Prospect Theory: Mathematical formulations, statistical challenges, and empirical tests*
2:20 – 2:40	Discussion
2:40 – 3:10	Coffee
3:10 – 4:30	Nat Wilcox (Chapman University) *Rank-Dependent Weights: Heterogeneity, Distributions and Stability*
4:30 – 4:50	Discussion
5:00	End of workshop

Presenters, Affiliation, Titles, Coauthors and Abstracts

Jerome Busemeyer (Department of Psychological and Brain Sciences Indiana University)

Title: Bayesian model comparison and hierarchical Bayesian parameter estimation of quantum versus traditional decision models designed to account for experimental findings regarding dynamic inconsistency.

Abstract: Quantum models of decision making have recently been used to explain some paradoxical findings that have resisted explanations by more traditional models of decision making. This success is tempered, however, by the criticism that quantum models may fit better because they are more complex (after all they use complex numbers). To counter this criticism, we examined a large experimental data set that investigated a violation of rational decision making called dynamic inconsistency. We formulated a traditional decision model based on prospect theory, and another model based on quantum theory. Both models used four parameters: they share a risk aversion utility parameter, a loss aversion utility parameter, a memory/ dependency for past choices parameter; but they differ in a key fourth parameter that determines the probabilistic nature of choice. A Bayes factor was computed for each person from the ratio of the two expected likelihoods (one obtained from each model) using either uniform or normal priors. Next a hierarchical Bayesian model was formulated for the quantum model, which was used to estimate the posterior distribution for the key 'quantum' parameter. A striking result is that the key quantum parameter exhibits a posterior distribution that has an oscillating pattern across its range of values.

Michael Lee (Department of Cognitive Sciences, University of California Irvine)

Title: How cognitive modeling can benefit from hierarchical Bayesian models

Abstract: Hierarchical Bayesian modeling provides a flexible and interpretable way of extending simple models of cognitive processes. We focus on three advantages, and explain each using a case study. The first advantage involves the development of more complete theories, including accounting for variation coming from sources like individual differences in cognition. We demonstrate this in a case study involving individual differences in category learning. The second advantage involves using a few key psychological variables to explain behavior on multiple tasks. We demonstrate this in a case study involving children's acquisition of number concepts. The third advantage involves the capability to account for observed behavior in terms of the combination of multiple different cognitive processes. We demonstrate this in a case study involving searching and stopping processes in heuristic decision making. While our case studies are drawn from the cognitive sciences, the modeling issues are more general, and we discuss their applicability to the empirical sciences more broadly.

Michel Regenwetter (Department of Psychology, University of Illinois Champaign Urbana)

Title: Random Cumulative Prospect Theory: Mathematical formulations, statistical challenges, and empirical tests.

Two serious problems plague research in decision sciences. One concerns aggregation of individual choice data. Much research in individual decision making routinely aggregates data across decision makers or across repeated choices made by a given individual. Yet, as the theory of voting has famously shown, such aggregated choices may not match the choices of any single decision maker at any given time. This problem has long been known under the heading of "voting paradoxes" in economics and political science. A second problem in the decision sciences concerns a conceptual, mathematical, and statistical disconnect between major decision making theories on the one hand, and empirical data on the other hand. Algebraic decision theories are static, whereas behavior is highly variable. In this project we address the first of these problems through a quantitative framework that dissociates individual decision making from group or societal choice. The solution is to make variability of preferences an inherent part of the theory. The second problem is addressed by leveraging recent advances in mathematical modeling and in statistical inference. These advances allow for the conduct of quantitative contests among major decision theories using laboratory data. I will report on this project with special emphasis on probabilistic specification of Cumulative Prospect Theory and its test in the laboratory.

John Rust (Department of Economics, University of Maryland and Georgetown University)

Title: The Home Selling Problem: Theory and Evidence (with Antonio Merlo and François Ortalo-Magné)

This paper formulates and solves the problem of a homeowner who wants to sell their house for the maximum possible price net of transactions costs (including real estate commissions). The optimal selling strategy consists of an initial list price with subsequent weekly decisions on how much to adjust the list price until the home is sold or withdrawn from the market. The solution also yields a sequence of reservation prices that determine whether the homeowner should accept bids from potential buyers who arrive stochastically over time with an expected arrival rate that is a decreasing function of the list price. This model was developed to provide a theoretical explanation for list price dynamics and bargaining behavior observed for a sample of homeowners in England in a new data set introduced by Merlo and Ortalo-Magné (2004). One of the puzzling features that emerged from their analysis (but which other evidence suggests holds in general, not just England) is that list prices are sticky: By and large homeowners appear to be reluctant to change their list price, and are observed to do so only after a significant amount of time has elapsed if they have not received any offers. This finding presents a challenge, since the conventional wisdom is that traditional rational economic theories are unable to explain this extreme price stickiness. Recent research has focused on “behavioral” explanations such as loss aversion in attempt to explain a homeowner’s unwillingness to reduce their list price. We are able to explain the price stickiness and most of the other key features observed in the data using a model of rational, forward-looking, risk-neutral sellers who seek to maximize the expected proceeds from selling their home net of transactions costs. The model relies on a very small fixed “menu cost” of changing the list price, amounting to less than 6 thousandths of 1% of the estimated house value, or approximately £12 for a home worth £200,000.

Eric-Jan Wagenmakers (Department of Psychology, University of Amsterdam)

Title: Unexpected Participant Heterogeneity in the Iowa Gambling Task (with Helen Steingröver and Ruud Wetzels)

The Iowa gambling task (IGT; Bechara, Damasio, Damasio, & Anderson, 1994) is often used to assess decision-making deficits in clinical populations. However, a growing body of evidence suggests that even healthy participants perform poorly on the IGT. We present a literature review showing that performance of healthy participants is highly variable and often driven by the frequency of negative outcomes. These conclusions are corroborated by an individual-subjects analysis of decision-making dynamics in an IGT featuring hundreds of healthy participants. In addition, our data show that many healthy participants fail to progress from an initial stage of exploration to a later stage of exploitation. We discuss the consequences of these findings for the dominant model of performance in the IGT: the Expectancy-Valence model (EV; Busemeyer & Stout, 2002). Our results suggest that the IGT may not be a convincing tool to measure and describe decision-making deficits in clinical populations. We end by discussing possible alternative tasks for which more homogeneous results may be obtained.

Nat Wilcox (Economic Science Institute, Chapman University)

Title: Rank-Dependent Weights: Heterogeneity, Distributions and Stability

Mixture models frequently require parametric assumptions about mixing distributions. Even when this is not a requirement, prior information about empirically supported parametric mixing distributions can improve inferential power. Therefore, detailed study of individual choice—undertaken in a relatively catholic (non-parametric) manner can help inform the construction of useful and powerful mixture models. I draw on several recent binary discrete choice experiments designed to reveal individual rank-dependent weighting functions in a relatively nonparametric manner with relatively good power. The distribution of these weighting functions across subjects is surprisingly heterogeneous. Still, relatively low-dimensional characterizations of this heterogeneity seem to be available to builders of mixture models. I also discuss the sensitivity (and hence stability) of inferred weighting function distributions (to variations in experimental design and error model assumptions).

GSU Participants

- Glenn Harrison (RMI and CEAR)
- Rusty Tchernis (Economics)
- Jimmy Martinez (RMI)

Invited Non-GSU Participants

- Jerome Busemeyer (Indiana University)
- Michael Lee (University of California Irvine)
- Michel Regenwetter (University of Illinois Champaign Urbana)
- John Rust (University of Maryland)
- Eric-Jan Wagenmakers (University of Amsterdam)
- Nathaniel Wilcox (Chapman University)