

**Seminars on Statistics in Marketing and Psychology, Winter 2006**

**Research seminars in Marketing, Psychology and Statistics on FRI-DAYS 1.30-3.00pm or 2.00-3.30pm this term, in Fisher 500**

**These seminars will consist mainly of ongoing research presentations and discussions of published papers. You are welcome to join us.**

**LIST OF SEMINARS**

March 30. Organizational meeting

April 6th No talk.

April 13 Radu Herbei, Statistics Department

Convergence rates of Markov chains with an application to an inverse problem

Sampling from complex multivariate distributions via MCMC methods is now a widely used approach. Standard Markov chain theory provides sufficient conditions for a variety of MCMC algorithms to converge to the target distribution. In practice, however, mainly due to the complicated nature of the problem, one rarely checks that all the conditions hold. In this presentation I will briefly review basic MCMC algorithms and rates of convergence. As an application, we study the convergence of the Markov chain arising in an oceanographic inverse problem.

April 27th. Trish Van Zandt and Mari Jones, Psychology Department

Temporal Contexts in Choice Response Time

The theory that a simple choice among  $n$  alternatives occurs as a gradual accumulation of "evidence" over time is now widely accepted and has received support from neurophysiological studies. Mathematical models that represent this theory vary somewhat, but all assume that evidence can be represented as a stochastic process that terminates when the level of evidence exceeds a criterion. A signal-detection theory "front end," parameters of which are determined by stimulus factors, provides variability in the rates of evidence accumulation.

We will show how temporal cues provided by the events in an experiment can affect the accumulation process. In particular, we will present data showing how subjects exploit task rhythm to improve their performance. We use a diffusion process as a model of the choice task, and Large and Jones' (1999) attentional entrainment model to modulate the parameters of the diffusion process. Together these two models can explain some of the effects we observe in our data, including the elimination of a speed-accuracy tradeoff.

May 4th. Greg Allenby, Marketing Department

When Consumers Go Beyond Choice: Models For Trade-Up and Change in

Consideration Set  
(Joint work with Mark Garratt)

The talk highlights the economic interpretation of the multinomial logit model and explains one of its shortcomings related to the absence of the budget constraint from the model. Relative brand choice probabilities are independent from (changes in) the budget allocated to a product category. An alternative, non-homothetic formulation is shown to result in improved fit and more sensible implications.

May 11th. No seminar

May 18th. **NOTE TIME 2.30PM AND PLACE COCKINS 212**

Angela Dean, Statistics Department

Optimal experimental design for hyperparameter estimation in hierarchical linear models with application to marketing

This is joint work with Greg Allenby and Qing Liu, Marketing Department.

Optimal design for the efficient estimation of hyperparameters in hierarchical linear models is discussed. A criterion is derived under a Bayesian formulation for both the situation of independent random effects and that of correlated random effects. It is shown by example that designs obtained by fixing the error variance and the random effects covariance matrix to the means of their respective prior distributions can be as efficient or almost as efficient as optimal designs obtained by integrating over the prior distributions. We obtain explicit forms of the structure of such optimal designs and study the efficiency of exact designs when the optimal structure cannot be achieved. Design robustness is studied under various prior mean specifications of the covariance matrix, and resulting implications for practical applications are discussed.

May 25th. Longjuan Liang Psychology, Department.

A semi-parametric approach to estimating item response functions

In Item Response Theory (IRT), normal ogive functions or logistic functions are typically used to model the Item Characteristic Curve (ICC). Although the one parameter (1PL), two parameter (2PL) or three parameter (3PL) logistic models have been shown to be useful in a variety of situations, there are cases where these models do not produce a good fit to the data. The Logistic function of a Monotonic Polynomial (L-MP) is a model proposed aiming to improve the model-data fit.

The L-MP model replaces the linear exponent of the 1PL or 2PL model with a monotonic polynomial. It is a general model which includes the 1PL or 2PL model as a special case. A surrogate-based two-stage approach is used to obtain the estimates from the L-MP model. The results from the simulation studies and a real data example will be presented.

June 1st. Eloise Kaizar, Statistics Department.

#### Research Synthesis with Sparse Data

Meta-analysis is commonly used to estimate treatment effect size from collections of randomized trials with binary outcomes. This estimation becomes difficult when no outcome events are observed in one arm of some studies. This problem has recently come to the fore in the pharmaceutical industry in the wake of scandals relating the safety assessments of SSRI antidepressants, COX-2 inhibitors, and most recently Rosiglitazone (Avandia). I will discuss both frequentist and Bayesian approaches to the difficult problem of estimating treatment effect size from a collection of sparse  $2 \times 2$  tables.