Program on Financial Mathematics, Statistics and Econometrics
Workshop on Model Uncertainty
January 27, 2006

Speaker Abstracts

Evan Anderson
Northern Illinois University
Department of Economics
ewanderson@niu.edu

Lars Peter Hansen
University of Chicago
Department of Economics
l-hansen@uchicago.edu

"Small Noise Methods for Risk Sensitive/Robust Economies"

We study small noise expansions for discrete-time infinite horizon control problems with risk sensitivity or equivalently with a concern about robustness. We follow Epstein and Zin (1989) and model the preferences of the decision-maker recursively. As shown by Hansen and Sargent (1995) for linear-quadratic, Gaussian control problems, the recursive formulation of risk sensitivity preserves the tractability of risk-sensitive control theory. The resulting risk-sensitive control problem has a solution that is identical to that of a particular type of robust control problem. Our focus is on using small noise expansions for three different purposes:

(1) To provide a fast method for solving dynamic stochastic problems.
(2) To quantify the affect of uncertainty on optimal control laws.
(3) To quantify how the introduction of risk sensitivity or robustness alters optimal control laws.

Evan Anderson
Northern Illinois University
Department of Economics
ewanderson@niu.edu

"The Impact of Risk and Uncertaintyon Expected Returns"

Co-authors: **Eric Ghysels** (University of North Carolina-Chapel Hill) and **Jennifer Juergens** (Arizona State University)

Steven Durlauf
University of Wisconsin, Madison
Department of Economics
sdurlauf@ssc.wisc.edu

Giacomo Rondina
University of Wisconsin, Madison
Department of Economics
grodina@wisc.edu

"Design Limits and Optimal Policy Evaluation"

This paper has two goals. First, we attempt to characterize fundamental (i.e. unavoidable) tradeoffs between the volatility of state variables at different frequencies in dynamic economic models. This abstract characterization, which is based upon and in turn generalizes a set of interesting results in the control theory literature, will be used to understand how different monetary policy rules engage in frequency by frequency specific stabilization of the economy. Our analysis allows one to compute frequency by frequency Phillips curves (which trade off output and inflation variance at a given frequency) for alternative policy rules and thereby generalize the sorts of inflation/output volatility tradeoffs that are conventionally studied.

Second, we introduce model uncertainty into our analysis to evaluate the frequency by frequency robustness of rules when such uncertainty is present. With the seminal work of Hansen and Sargent, much recent work in macroeconomics has focused on the analysis of contexts in which economic actors face model uncertainty. Our paper attempts to extend this research in a number of directions using the ideas of fundamental limits. We consider single input/multiple output systems (as occur when the federal funds rate is used to stabilize inflation and output) in which backwards and forward looking elements are present.

Yossi Feinberg
Stanford University
Graduate School of Business
yossi@gsb.stanford.edu

"Non-Bayesian Testing of a Stochastic Prediction"

We propose a method to test a prediction of the distribution of a stochastic process. In a non-Bayesian non-parametric setting, a predicted distribution is tested using a realization of the stochastic process. A test associates a set of realizations for each predicted distribution, on which the prediction passes. So that there are no type I errors, a prediction assigns probability 1 to its test set. Nevertheless, these sets are "small", in the sense that "most" distributions assign it probability 0, and hence there are "few" type II errors. It is also shown that there exists such a test that cannot be manipulated, in the sense that an uninformed predictor who is pretending to know the true distribution is guaranteed to fail on an uncountable number of realizations, no matter what randomized prediction he employs. The notion of a small set we use is category I, described in more detail in the paper. **JEL Classification**: K9

Co-author: **Eddie Dekelyand** (Northwestern University and Tel-Aviv University)

Lars Peter Hansen
University of Chicago
Department of Economics
l-hansen@uchicago.edu

Thomas Sargent
New York University
Department of Economics
ts43@nyu.edu

"Recursive Robust Estimation and Control without Commitment"

In a Markov decision problem with hidden state variables, a posterior distribution serves as a state variable and Bayes' law under an approximating model gives its law of motion. A decision maker expresses fear that his model is misspecified by surrounding it with a set of alternatives that are nearby when measured by their expected log likelihood ratios (entropies). Martingales %under the approximating model represent alternative models. A decision maker constructs a sequence of robust decision rules by pretending that a sequence of minimizing players choose increments to a martingale and distortions to the prior over the hidden state. A risk sensitivity operator induces robustness to perturbations of the approximating model conditioned on the hidden state. Another risk sensitivity operator induces robustness to the prior distribution over the hidden state. We use these operators to extend the approach of Hansen and Sargent (IEEE) to problems that contain hidden states. The worst case martingale is overdetermined, expressing an intertemporal inconsistency of worst case beliefs about the hidden state, but not about observables.

Marc Henry
Columbia University
Department of Economics
mh530@columbia.edu

"Testing Non-Identifying Restrictions"

We propose a conservative testing procedure for the validity of restrictions in a structural model without identifying assumptions. The model is defined as a binary relation between latent and observable variables, coupled with a hypothesized family of distributions for the latent variables. The objective of the testing procedure is to determine whether this hypothesized family of latent variable distributions has a non-empty intersection with the set of distributions compatible with the observable data generating process and the binary relation defining the model.

Martin Schneider
Federal Reserve Bank of Minneapolis
ms1927@nyu.edu

"Ambiguity, Information Quality and Asset Pricing"

When ambiguity-averse investors process news of uncertain quality, they act as if they take a worst-case assessment of quality. As a result, they react more strongly to bad news than to good news. They also dislike assets for which information quality is poor, especially when the underlying fundamentals are volatile. These effects induce ambiguity premia that depend on idiosyncratic risk in fundamentals as well as skewness in returns. Moreover, shocks to information quality can have persistent negative effects on prices even if fundamentals do not change.

Co-author: **Larry Epstein** (University of Rochester)

Raman Uppal
London Business School
Department of Finance
ruppal@london.edu

Lorenzo Garlappi
University of Texas-Austin
Department of Finance
lorenzo.garlappi@mccombs.utexas.edu

"To Hold Familiar Assets or To Diversify? Keynes Meets Markowitz"

Co-authors: **Phelim Boyle** (University of Waterloo) and **Tan Wang** (University of British Columbia)

Laura Veldkamp
New York University-Stern
Department of Economics
lveldkam@stern.nyu.edu

"Information Acquisition and Portfolio Under-Diversification"

We develop a rational model of investors who choose which asset payoffs to acquire information about, before forming portfolios. Scale economies in information acquisition lead investors to specialize in learning about a set of highly-correlated assets. Knowing more about these assets makes them less risky and more desirable to hold. Benefits to specialization compete with benefits to diversification. The resulting asset portfolios appear under-diversified from the perspective of standard theory, but are optimal. In equilibrium, information is a strategic substitute because assets that many investors learn about have low expected returns. Increasing returns, combined with strategic substitutability leads ex-ante identical investors to specialize in different information, and hold different portfolios. Information choice rationalizes investing in a diversified fund and a set of highly-correlated assets, an allocation observed in the data but usually deemed anomalous.

Co-author: **Stijn Van Nieuwerburgh** (New York University-Stern)