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NISS

Parameters

A quarterly newsletter from the National Institute of Statistical Sciences

NISS and OCC Explorations Workshop: Financial Risk Modeling and Banking Regulations

The room was packed at the NISS-OCC Explorations Workshop, "Exploring Statistical Issues in Financial Risk Modeling and Banking Regulation," held on February 5-6 2009 at the Office of the Comptroller of the Currency (OCC) in Washington DC. The OCC, a NISS-SAMSI affiliate, co-sponsored the workshop.

In response to the success of this workshop, a second workshop is scheduled for 20-21 October 2009, also to be held at the OCC headquarters in Washington, DC. Registration will be available on the NISS website and pre-registration is required as space is limited.

The keynote speaker, Paul Embrechts, professor of Mathematics, ETH, Zurich, delivered an overview of the roles for statistics in quantitative risk management in the banking context. He noted that as risk modeling and management is now rapidly evolving, focus on the fundamentals is critical at this juncture to provide the necessary underpinning to approach issues including risk aggregation, interdependence and concentration of risks, and propagation of impact of extreme events analytically and with an eye to policy development.

Everyone listened attentively to the presentations regarding development of new risk models for the banking industry.

Speakers from the banking and regulatory community addressed both financial risk and operational risk from the regulatory, banking and monitoring perspectives. From the regulatory community, Emré Balta, senior financial economist in the Credit Risk Analysis Division at OCC and Patrick de Fontnouvelle, VP of the Quantitative Analysis Unit of the Federal Reserve Bank of Boston outlined crucial issues for operational risk; Dennis Glennon, director of the Credit Risk Analysis Division at OCC, and Min Qi, senior financial economist also of the Credit Risk Analysis Division identified the central issues from a financial risk viewpoint. Michael Kalkbrenner, head of the portfolio modeling team within the Risk Analytics and Instruments department of Deutsche Bank outlined the internal risk modeling and prediction process; Douglas Dwyer, managing director of Moody's KMV, articulated the challenges to forecasting and indexing from a ratings agency's perspective.

Paul Embrechts, Professor of Mathematics, ETH, Zurich (left) and Alan Karr, director of NISS (right) chat during a break at the NISS-OCC Explorations Workshop.

Academic considerations of these same issues were presented by David J. Hand, Chair and professor of Statistics at Imperial College, London, Katherine Ensor, professor and chair of Statistics at Rice University, Nicholas Kiefer,

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A Note from the Director

The halls—both old and new—of NISS are humming as we prepare for a very busy summer. We have interviewed several outstanding postdoctoral candidates for the pleasingly large number of positions we have available. To date, four offers have been accepted, and we look forward to completing the recruiting process soon. Starting this summer, we will have eight post-doctoral fellows, the most in the history of NISS! You can read more about our new hires in the summer issue of ***NISS Parameters***, and can meet current postdoc Jessie Xia elsewhere in this edition.

New postdocs mean new research activity. One major new project is underway—a very complex study with National Cancer Institute on the Clinical Proteomic Technology Assessment for Cancer (CPTAC). This summer, the NISS/NASS research in residence program begins, and three teams of researchers who be working at NISS. Faculty members Balgobin Nandram of Worcester Polytechnic Institute, Scott Holan of the University of Missouri, Linda Young of the University of Florida and Pamela Arroway, Barry Goodwin and Sujit Ghosh of North Carolina State University will lead the research teams, each of which also includes a graduate student and one of our new postdocs. A new TRB-funded project on uncertainty in travel time prediction and an NSF/DTRA-funded project on syndromic surveillance also will start this summer. Finally, our shared postdoctoral fellowship with the Hamner Institutes for Health Research, an RTP neighbor of NISS, has been revived; Jessie Xia is the current holder of this fellowship.

Thanks to the efforts and energy of communications director Jamie Nunnelly (among them this newsletter!), we are nearly ready to debut our re-designed web site. And we now have, as the result of a contest that drew more than 20 entrants, a NISS tagline: *The Statistics Community Serving the Nation.* No tagline can exist without a T-shirt, and we have a new one, pictured right. Over time, it will be distributed to many friends of NISS.

Alan Karr
Director

NISS Picks a Tagline

NISS held a tagline contest this past quarter. While there were several very good suggestions, none of the entries seemed to capture just what NISS does. However, the suggestions helped lead the staff to the phrase that was developed. Our new tagline is: ***The Statistics Community Serving the Nation.***

Thanks to everyone who helped come up with ideas. You will each get a t-shirt for contributing!

Research Profile:

NISS-NASS

NISS and NASS Collaborate on Cross-Sector Research

NISS and the National Agricultural Statistics Service (NASS), the survey and estimation arm of the U.S. Department of Agriculture, have formed a program called the Cross-Sector Research in Residence Program. The program consists of various teams, each comprised of a faculty researcher in statistics, a NASS researcher, a NISS mentor, a postdoctoral fellow and a graduate student, who will work together at NISS during the two consecutive summers. The NASS researcher and the postdoctoral fellow will work together during the academic year in Washington DC.

"NISS is particularly excited about the NISS-NASS program because it gives statistical researcher at different stages of their careers, from graduate students to postdoctoral fellows to senior academic statisticians, an ideal opportunity to tackle some of the hard problems at USDA and NASS, specifically," said Nell Sedransk, associate director of NISS.

Some of the areas of research that the team or teams will work on include Multivariate Imputation Mechanisms and Valid Mean Squared Error Estimation: Agricultural Resource Management Survey – Phase III; New Design and Estimation Methodologies for Biased Self-Exclusion (under-coverage): Estimation of Small Farms from Census Mail List; New Statistical Editing and Imputation Methods that Preserve Data Quality: Quarterly Agricultural Survey; and Statistical Multi-Source Predictive Models and Error Estimates: Major USDA Crop Protection Forecasts and Estimates.

NISS will host a workshop June 1-2 to kick off the collaboration of the two organizations. The meeting will kick off this new collaboration. NASS will review the latest methods in editing surveys that other organizations are using and will highlight NASS' developing plans to improve its system.

NISS-OCC Workshop

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professor of Economics at Cornell University (and senior advisor to the Enterprise Risk Analysis Division at OCC), Don McLeish, professor of Statistics and Actuarial Science, University of Waterloo and John Liechty, associate professor of Statistics at Pennsylvania State University.

The first day was spent on the exposition of issues from the three different vantage points. Discussion repeatedly returned to the problems of quantification of risk and of model validation and model optimization, and consequently the specific requirements for data at each level of detail. From the risk modeling at the level of individual banks, these issues quickly expanded to questions for the larger community of banks, with all the attendant problems of interdependence.

The second day, the participants divided into six working groups, each to review one of the principal topics that emerged and to develop outlines or initial drafts of white papers. These white papers are intended to connect both fundamental statistical concepts and formalizations useful in developing methodology with the banking and/or regulatory risk modeling objectives.

The presentations are available at http://www.niss.org/affiliates/financialrisk200902/financial_risk_home.html.

Postdoc Profile:

Jessie (Qing) Xia

Jessie (Qing) Xia is one of NISS' more seasoned postdoctoral fellows. Jessie grew up in Nantong, also known as "The pearl of the Yangtze river." She got her Bachelor's degree from Tsinghua University in Beijing and later worked for a company there. Then she decided to come to the United States to pursue her advanced degrees. She attended Duke University, and received both her Master's degree in statistics and her Ph.D. in biomedical engineering at Duke. Jessie joined NISS in 2007.

Jessie is one of the people at NISS who are working with the National Cancer Institute on the Clinical Proteomic Technology Assessment for Cancer (CPTAC).

Current cancer proteomic research is hampered by a lack of standardized technologies and methodologies, which are critically needed in order to more effectively discover and validate proteins and peptides relevant to cancer, or "biomarkers'. NCI established a collaborative network of five CPTAC teams to address this critical need. The goal is to enable all researchers conducting cancer-related protein research at different laboratories to effectively use proteomic technologies and methodologies to directly compare and analyze their work. This should lead in turn to improved diagnostics, therapies and even prevention of cancer. NISS was brought into the project to provide statistical expertise and guidance on the project and to help coordinate the efforts of the five centers.

Jessie (Qing) Xia in her office at NISS

The five centers currently involved in this research include: Broad Institute of MIT and Harvard, Memorial Sloan-Kettering Cancer Center, Purdue University, University of California, San Francisco/Lawrence Berkeley National Laboratory/ Buck Institute, and the Vanderbilt University School of Medicine. NCI also has five working groups underway including: bioinformatics, digestion, verification, protein standards and unbiased discovery.

"We are glad we are actively contributing to NCI's cancer research through this important project. For example, one group we are working with is the digestion working group. They are interested in comparing the digestion

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Calendar of Events

NISS-NASS Cooperative Research Conference
June 1-2, 2009 at NISS in Research Triangle Park, NC. ARA ELIGIBLE.

ITSEW 2009: The Concept of Total Survey Error—Uses and Abuses
June 14-17, 2009 in Tällberg, Sweden. ARA ELIGIBLE.

NISS-OCC Explorations Workshop
October 20-21, 2009 in Washington, DC. ARA ELIGIBLE.

Affiliate Profile:
Office of the Comptroller of the Currency

The Office of the Comptroller of the Currency (OCC) Economics Department joined the NISS/SAMSI affiliates program in April 2008. The OCC Economics Department delivers economic and quantitative analysis to policy makers and bank supervisors at the OCC. This encompasses an active program of economic research and analysis, using traditional tools of statistics and econometrics to bring data to bear on policy issues.

The OCC was established in 1863 as a bureau of the U.S. Department of the Treasury to charter, regulate and supervise all national banks, which hold 70 percent of all commercial banking assets. The OCC also supervises the federal branches and agencies of foreign banks. Headquartered in Washington, D.C., the OCC's nationwide staff conducts on-site reviews of national banks and provides ongoing supervision of bank operations. The agency also issues rules, legal interpretations, and corporate decisions concerning banking, bank investments, bank community development activities and other aspects of bank operations. The OCC is headed by the Comptroller of the Currency, who is appointed by the President, with Senate confirmation, for a five-year term.

The Economics Department provides expert advice to OCC bank examiners, sometimes from the office but often out in the field, to assess the quality of banks' risk measurement methods and generally provide quantitative modeling expertise. This is generally done by the Risk Analysis Divisions (the RAD group). The economists, statisticians, and mathematicians of the RAD group generally also conduct their own independent research, for presentation at professional meetings or publication in journals, research

Emré Balta, Senior Financial Economist at OCC, speaks at the NISS-OCC Explorations Workshop in February.

that often reflects the modeling issues they confront in practice in the banks. They also frequently design and deliver training on quantitative topics for OCC examiners.

The types of statistical work conducted by staff in RAD, and the problems they confront in practice, vary depending on the specific needs of bank supervisors, as reflected in the variations in primary focus of the four divisions within the RAD group:

Compliance RAD specializes in using statistical methods to model a bank's compliance with applicable laws, primarily in the area of fair lending.

Credit RAD specializes in models and methods used for credit scoring, credit ratings, and credit risk-measurement in banking.

Enterprise RAD specializes in economic capital modeling, enterprise-wide stress testing, operational risk modeling, and methods banks use to allocate capital internally.

Market RAD specializes in the risk-measurement and asset-pricing models that banks use for over-the-counter derivative dealing, portfolio management, asset-liability management, mortgage banking, and asset securitization.

Statistical analysis has become increasingly important in banking and in bank regulation, and the department has evolved to reflect that shift. The RAD group in particular has grown significantly and become more central to bank supervision and regulation, due to the growing use of quantitative models by banks for risk management and decision making. Although the primary responsibility for assessing the suitability of these models rests with each individual bank as part of their validation processes,

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Jessie Xia Profile Continued

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protocols to see for certain what an advantage or disadvantage might be of using a certain protocol. One limiting factor is the machine time. It takes a lot of time for each protocol to run on the mass spectrometry. Each specimen takes about one and a half hours to go through the machine, plus some extra time for a blank washout run in-between. So, there is a limitation on how many replicates we can do. Once we optimize the design to that they can achieve their primary study goals," notes Jessie.

NISS is also helping some other working groups with experimental designs. NISS will assist in creating standards that will be used across the various labs and institutions to ensure that consistent replications can be achieved.

Jessie enjoys working on a variety of projects. "I have learned a lot since I started working here," she says, "Not only do I get to use my expertise in statistics and biomedical informatics, I also understand more of the area of work each project is about." In addition to the CPTAC project, Jessie played a leading role in QT interval studies in collaboration with Eli Lilly and Company, high-dimensional microarray data analysis of fetal mouse gonad development and is currently collaborating with The Hamner Institutes for Health Sciences on a toxicology project to aid in toxicity testing of environmental chemicals.

Jessie presented her QT work at the First International Symposium on Biopharmaceutical Statistics held in Shanghai last year. This year she will present some of her recent work at the First ToxCast Data Analysis Summit in May, and the 2009 Joint Statistical Meetings in August. Meanwhile, she is writing several papers.

OCC Profile Continued

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bank supervisors increasingly are required to understand the technical details of these models and, when warranted, recommend adjustments or enhancements to model designs as part of the supervisory process. The RAD staff provides the needed expertise within the OCC through direct participation in examinations, construction of models and tools for use by examiners, consultation with examiners and policymakers, educational outreach and training of examiners, and preparation of written materials for use by examiners and policymakers.

OCC and NISS held an Explorations Workshop, *"Exploring Statistical Issues in Financial Risk Modeling and Banking Regulations,"* at the OCC headquarters in Washington DC in February 2009. As Professor Paul Embrechts pointed out at the workshop, statistical quantities are "hardwired" into banking regulations. The Basel II Accord, which formulates international risk-based capital adequacy standards for financial institutions, specifies the use of an extreme quantile (known as the Value-at-Risk) as the measure of risk; this makes minimum capital requirements one of the few areas of law with a significant and explicit reliance on statistics. Basel II is not the only instance of this; for example, statistical tests of significance are a key component of the enforcement of laws and regulations related to fair lending.

Advances in risk-modeling techniques are developing quickly in the financial industry for many reasons, including reliance on risk-based pricing, the need to value portfolios of securitized loans, and the inclusion of risk measurement tools under the Basel II capital framework. Many of the techniques under consideration by banks are too new or too specialized to have been studied within the traditional academic research framework. Affiliating with NISS provides the opportunity to further OCC's ability to review these models and provide expert opinions, and to facilitate cooperative research across multiple disciplines and to communicate the challenges faced by practitioners to the academic research community.

The staff in the RAD group and in other parts of the OCC Economics Department have active research programs of their own. Discussing ideas and interacting with other scholars through NISS helps foster new ideas and additional research that ultimately brings great value to the OCC. As a quantitative department heavily engaged in statistical modeling, the mission of NISS to identify, catalyze and foster high-impact cross-disciplinary research involving statistical sciences made affiliation highly attractive. The February workshop was a perfect illustration of the value the OCC hopes to derive from NISS affiliation. NISS and OCC will hold another Explorations Workshop October 20-21.

Young Asserts Earlier Study on Cereal Consumption is Flawed

Stan Young, assistant director of Bioinformatics for NISS, published a paper in the ***Proceedings of the Royal Society B*** this winter. Young believes an earlier study published in the same journal was incorrect due to multiple testing errors. The original study by Mathews, Johnson and Neil, "You are What your Mother Eats" claimed that women who eat a lot of cereal at the time of conception are more likely to have a boy than a girl.

Young, along with his colleagues, Heejung Bang, Ph.D., of Cornell University and Kutluk Oktay, MD, FACOG, professor of Obstetrics & Gynecology and director, Division of Reproductive Medicine & Infertility Department of Obstetrics & Gynecology from New York Medical College, in their paper "Cereal-Induced Gender Selection? Most Likely a Multiple Testing False Positive," assert that the result of the original study is easily explained as chance. Young, Bang & Oktay examined the data sets from the original study and noted that 132 food items were tested for two time periods, totaling 264 statistical tests**.** With this many tests, it is quite likely that some apparent statistical significance will occur simply by chance.

At the standard significance level of 5 percent, the 264 tests will yield approximately 13 false positives unless the analysis is adjusted to account for multiple testing. Young, Bang & Oakley argue that this is precisely what the authors of the original papers failed to do.

While Young et al. didn't get the 50,000 Google hits that the original study received; the paper did generate a good amount of publicity. Young was interviewed by the **Wall Street Journal**, **NPR**, **ABC News Health Report**, **Web MD** and **Scientific American** to name a few. Young and his colleagues' findings were found in over 6,700 articles and blog entries, according to a Google search.

While this paper is complete, Young is still actively informing people about randomness and multiple testing errors. This past winter, he presented lectures about randomness to a statistics class at North Carolina State University and to the Science Communicators of North Carolina (SCONC).

Young also published a letter in the **Journal of American Medical Association** (JAMA) that commented on the potential statistical limitations of a study claiming that bisphenol A is associated with cardiovascular diagnoses, diabetes and abnormal blood level liver enzyme levels. According to Young, the earlier study, published in *JAMA* (September 16, 2008) by Dr. Ian A. Lang and colleagues, did not adequately address the possibility that multiple testing could lead to a false positive result.

This spring he published a letter in the **International Journal of Epidemiology** about multiple testing.

Stan Young speaks to the Science Communicators of North Carolina (SCONC) meeting (Photo by Russ Campbell).

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