

## Bowles Symposium 2017: Predictive Analytics and Risk Analytics

**Time:** November 9–10, 2017 (Thursday, Friday)

**Place:** CEAR Seminar Room (11th floor), Robinson College of Business at Georgia State University

### Schedule:

November 9 (Thursday)	
08 : 00am – 09 : 00am :	Breakfast in CEAR seminar room (11th floor)
09 : 00am – 10 : 30am :	Dr. Jed Frees Moderator: Dr. Samuel Cox
10 : 30am – 12 : 00am :	Dr. Guojun Gan Moderator: Mr. Andrew Golub
12 : 15pm – 13 : 45pm :	Lunch (11th floor)
14 : 00pm – 15 : 30pm :	Dr. Maurice Stucke Moderator: Dr. Ramsi Woodcock
15 : 30pm – 17 : 00pm :	Dr. Peter Swire Moderator: Dr. Ramsi Woodcock
18 : 30pm – 21 : 00pm :	Dinner at Sear Restaurant–Atlanta Marriott Marquis Speech by RMI Chair: Dr. Ajay Subramanian
November 10 (Friday)	
08 : 00am – 09 : 00am :	Breakfast in CEAR seminar room (11th floor)
09 : 00am – 10 : 30am :	Dr. Steven Mildenhall Moderator: Dr. Jed Frees
10 : 30am – 12 : 00am :	Dr. Emre Yoldas Moderator: Dr. Haci Akcin
12 : 05pm – 13 : 15pm :	Lunch (11th floor)
13 : 30pm – 15 : 00pm :	Dr. Dodzi Attimu Moderator: Dr. Liang Peng
15 : 00pm – 16 : 30pm :	Dr. Zhiwei Zhu Moderator: Mr. Tony Green
16 : 45pm – 18 : 15pm :	Dr. Yimin Yang Moderator: Dr. Liang Peng
19 : 00pm – 21 : 00pm :	Dinner at McCormick & Schmick’s Seafood & Steaks

**Remark:** i) Dinners are for speakers, faculty and RMI Ph.D. students. ii) Atlanta Marriott Marquis: 265 Peachtree Center Ave NE, Atlanta, GA 30303; iii) McCormick & Schmick’s Seafood & Steaks: 190 Marietta Street, One CNN Center, Atlanta, GA 30303

**Talks:**

- *Speaker* : Dr. Jed Frees, University of Wisconsin

*Title* : Modeling dependent insurance risks: customer loyalty and risk in personal insurance

*Abstract* : In the first portion of the talk I discuss the importance of modeling dependencies among insurance risks. I set the stage for this by describing various risk control mechanisms that the insurer has at its disposal and use this platform for describing the types of associations that are of concern to insurers. To model dependencies, I focus on the use of a copula, a probabilistic tool widely used in insurance and other disciplines.

The second portion of the talk, on "Customer Loyalty and Risk in Personal Insurance," is joint work with Catalina Bolanc, Montserrat Guillén, and Emiliano Valdez. This work connects two strands of research on modeling personal (automobile and homeowners) insurance. One strand involves understanding the joint outcomes of separate personal insurance contracts, e.g., do higher automobile claims suggest more severe homeowner claims? A second strand of the literature involves understanding determinants of customer loyalty. For example, we now know that when a customer cancels one insurance contract, he or she is likely to cancel all other contracts soon after. We use copula regression to model the joint outcomes of auto and home claims as well as customer loyalty. Including customer loyalty, or duration with the company, is complicated because of the censoring of this time variable as well as the discreteness. Although customers may cancel the contract at any time, cancellation typically occurs at contract renewal, making this variable essentially a discrete outcome. Composite likelihood and generalized method of moments techniques allow us to address the special features of this data structure.

*Brief biography* : Dr. Edward W. (Jed) Frees is a professor in the Risk and Insurance Department of the Wisconsin School of Business. He is the Hickman Larson Chair of Actuarial Science. His research interests are in actuarial science, regression and business forecasting, and panel data.

Dr. Frees is a Fellow of both the Society of Actuaries and the American Statistical Association. He is the only individual to be a Fellow of both organizations.

Prior to earning his Ph.D., Dr. Frees was employed by M& R Services (a Seattle actuarial and software consulting firm), John Eriksen's & Partners (a New Zealand actuarial consulting firm), and the United Kingdom's Government Actuaries Department. In addition, in 1989-1990 he was a visiting principal researcher at the U. S. Bureau of the Census. His home has been UW-Madison since 1983, where he teaches courses in statistics and actuarial science.

Dr. Frees received his Ph.D. in mathematical statistics from the University of North Carolina at Chapel Hill.

- *Speaker* : Dr. Guojun Gan, University of Connecticut

*Title* : Valuation of large variable annuity portfolios: past and recent developments

*Abstract* : In the past two decades, lots of variable annuity contracts have been sold by insurance companies. Insurers with large blocks of variable annuity business have faced great challenges especially when it comes to valuing the complex guarantees embedded in these products. The financial risks associated with guarantees embedded in variable annuities cannot be adequately addressed by traditional actuarial approaches. In practice, dynamic hedging is usually adopted by insurers and the hedging is done on the whole portfolio of VA contracts. Since the guarantees embedded in VA contracts sold by insurance companies are complex, insurers resort to Monte Carlo simulation to calculate the Greeks required by dynamic hedging but this method is extremely time-consuming when applied to a large portfolio of VA contracts. In this talk, I will talk about the computational problems associated with dynamic hedging and present some past and recent developments to address these computational problems.

*Brief Biography* : Dr. Guojun Gan is an Assistant Professor in the Department of Mathematics, University of Connecticut, Storrs, CT. He joined the faculty of actuarial program in August 2014. His research interests include actuarial science, data mining, and big data analysis.

During the period from April 2008 to April 2014, Dr. Gan worked in the Global Variable Annuity Hedging Department at Manulife Financial, an international life insurance company headquartered in Toronto, Canada. In this job, his main responsibility was to improve, explore, and implement mathematical models to support the global hedging programs of Manulife Financial. Prior to this, he worked for a hedge fund for about one year at Oakville, Ontario, Canada.

Dr. Gan enjoys doing research and teaching students. While working in the industry, he published two books on teaching clustering algorithms and mathematical finance to students and practitioners.

- *Speaker* : Dr. Maurice Stucke, University of Tennessee

*Title* : How digital assistants can harm our economy, privacy and democracy?

*Abstract* : This talk will examine the emerging frontier of personal digital assistants. These helpers are being developed by the leading online platforms: Google Assistant, Apple's Siri, Facebook's M, and Amazon's Alexa-powered Echo. These super-platforms are heavily investing to improve their digital assistant offerings. For those who grew up watching *The Jetsons*, the prospect of a personal helper might seem marvelous. Many already rely on Google's search engine to find relevant results, Facebook to identify relevant

news stories, Amazon for book recommendations, and Siri to place phone calls, send text messages, and find a good restaurant nearby. Many also already benefit from basic digital assistants. Personal digital assistants are seeking to interact with users in a human-like way. With its increasing sophistication, a digital assistant promises to transform how individuals access information, communicate, shop, are entertained, control smart household appliances, and raise their children. The digital assistant will also undertake mundane tasks and free its users' time. Digital assistants can provide more than information and services; they can anticipate one's needs and requests. After all, being privy to so many of its users' activities, the assistant will become their digital shadow. The digital assistant, with its users' trust and consent, will likely become the key gateway to the World Wide Web. These technological developments promise to transform and improve our lives, yet they come at a cost. As they occupy a critical gatekeeper position in a multi-sided market, the assistants may not always operate with our interests in mind. This reality raises challenging questions: Despite their promise, can digital assistants actually reduce one's welfare? Might their rise reduce the number of gateways to the digital world, increase a few firms' market power, and limit competition? And if so, what are the potential social, political, and economic concerns?

*Brief biography* : Dr. Stucke brought 13 years of litigation experience when he joined the UT College of Law faculty in 2007. As a trial attorney at the U.S. Department of Justice, Antitrust Division, he successfully challenged anticompetitive mergers and restraints in numerous industries, and focused on policy issues involving antitrust and the media. As a Special Assistant U.S. Attorney, he prosecuted a variety of felony and misdemeanor offenses, including running a weekly docket before the Honorable Thomas Rawles Jones, Jr. As an associate at Sullivan & Cromwell, Dr. Stucke assisted in defending Goldman Sachs, CS First Boston, and Microsoft in civil antitrust litigation. The Legal Aid Society presented him two awards for his criminal appellate and defense work.

Since coming to UT, Dr. Stucke has been a prolific legal scholar. His scholarship, which has been cited by the U.S. federal courts, the OECD, the United Nations, and privacy, consumer protection, and competition agencies and policymakers, is already having an impact. He was invited by the OECD and governmental authorities from Canada, the European Union, Ireland, Italy, the Netherlands, Norway, South Korea, United States, and United Kingdom to discuss his research.

He has co-authored two books, *Big Data and Competition Policy* (Oxford University Press 2016) and *Virtual Competition* (Harvard University Press 2016). His research on the digital economy has been featured in *The Economist*, *Guardian*, *Harvard Business Review*, *New York Review of Books*, *New Yorker*, *New York Times*, *Science*, *Times Higher Education*, *Wall Street Journal*, *Wharton Business Radio*, and *Wired*.

Dr. Stucke received several awards for his scholarship, including the Carden Award for Outstanding Scholarship, the 2016 Antitrust Writing Award by Concurrences Review and George Washington University, the Jerry S. Cohen Memorial Award, presented annually for the best antitrust scholarship, the College's W. Allen Separk Faculty Scholarship Award, the Marilyn V. Yarbrough Award for Writing Excellence, and the Chancellor's Honors Award for Research and Creative Achievement–Professional Promise.

- *Speaker* : Dr. Peter Swire, Georgia Institute of Technology

*Title* : Privacy, cybersecurity, and data analytics

*Abstract* : The utility of data analytics will be undermined if there are privacy or cybersecurity problems with the processing of doing the analytics. This talk will first highlight cybersecurity issues in data analytics, developing the idea that analysts do not want "Big Data" to become "Big Data Breach." The talk will then turn to privacy issues that can arise in Big Data. A large portion of analytics projects analyze data about individuals, called "personally identifiable information" in privacy scholarship, law, and practice. Data analytics must first of all comply with applicable law and policies, such as under medical and financial laws in the United States, and comprehensive data protection regimes in Europe and many other countries. Next, Big Data poses serious challenges to the practice of de-identification. For many reasons, re-identification is becoming easier over time, in large part due to the greater number of potentially identifying data points that is part of Big Data. Researchers and practitioners thus need to consider the risks of re-identification when pursuing analytics projects.

*Brief biography* : Dr. Peter Swire is Professor of Law and Ethics at the Georgia Tech Scheller College of Business. He has appointments by courtesy with the College of Computing and School of Public Policy. He is Senior Counsel with Alston & Bird, LLP.

In 2015, the International Association of Privacy Professionals, among its over 20,000 members, awarded him its Privacy Leadership Award. In 2013, he served as one of five members of President Obama's Review Group on Intelligence and Communications Technology. Prior to that, he was co-chair of the global Do Not Track process for the World Wide Web Consortium. He is Senior Fellow with the Future of Privacy Forum, and a Policy Fellow with the Center for Democracy and Technology.

Under President Clinton, Dr. Swire was the Chief Counselor for Privacy, in the U.S. Office of Management and Budget. He is the only person to date to have U.S. government-wide responsibility for privacy policy. In that role, his activities included being White House coordinator for the HIPAA medical privacy rule, chairing a White House task force on how to update wiretap laws for the Internet age, and helping negotiate the U.S.-E.U.

Safe Harbor agreement for trans-border data flows. Under President Obama, he served as Special Assistant to the President for Economic Policy.

Dr. Swire is author of five books and numerous scholarly papers. He has testified often before the Congress, and been quoted regularly in the press. Dr. Swire graduated from Princeton University, summa cum laude, and the Yale Law School, where he was an editor of the Yale Law Journal.

- *Speaker* : Dr. Stephen Mildenhall, St. John's University

*Title* : The role of the traditional insurer in a disrupted world

*Abstract* : FinTech disruptors are investing billions of dollars to reshape the insurance industry. Do these flows represent an extensional threat to traditional insurers? The role of a traditional insurer can be broken into four parts: customer, paper, claims, and capital. The functions of each part are analyzed in reference to more traditional approaches to insurer function. Clayton Christensen's theory of disruption is reviewed and applied to the insurance industry. The potential impact of FinTech investments are analyzed along three functional dimensions: predictive analytics and granular underwriting, blockchain and disaggregated trust, and risk analytics and risk shaping. Disruptive insurance investments are often in areas orthogonal to or consistent with the roles of a traditional insurer. Where they challenge core insurer roles directly they face high hurdles from fundamental economic inefficiency, often driven by morale hazard, or because they undermine the societal function of insurance. Traditional insurers serve a unique purpose within a modern economy that is more likely to be helped than hurt by FinTech disruption.

*Brief biography* : Dr. Stephen Mildenhall is Assistant Professor of Risk Management and Insurance and Director of Insurance Data Analytics at the School of Risk Management in the Tobin College of Business at St. John's University. Steve has twenty five years experience in the insurance industry. Prior to joining St. John's in 2016 he was Global CEO of Analytics for Aon plc, based in Singapore, and head of Aon Benfield Analytics. He helped found and establish Aon's Singapore Center for Innovation and Analytics. The Center is a cross-functional group of insurance and HR analytics professionals serving all of Aon's businesses. As head of Aon Benfield Analytics he led a team of over 500 professionals in actuarial science, catastrophe modeling, accounting and financial modeling and worked extensively with reinsurance clients on risk assessment and mitigation, ERM, economic capital modeling and other risk related questions. He joined Aon in 2003. Previously he was Vice President of Actuarial Pricing for Kemper Insurance. He began his career at CNA in 1992 and held positions there as the specialty lines actuary with CNA Re Facultative and as a pricing and special projects actuary with CNA Personal Lines. Steve is a Fellow of the Casualty Actuarial Society, an Associate of the Society of Actuaries, a

Chartered Enterprise Risk Analyst, and a CAS Institute Certified Specialist in Predictive Analytics. He is a member of the American Risk and Insurance Association and the Risk Theory Society. He served on the ARIA Board of Directors from 2013-2016. He earned his Masters and PhD degrees in Mathematics from the University of Chicago, and a BSc in Mathematics from the University of Warwick in England. He is also a member of the CAS Committee on the Theory of Risk and was its chairman from 2008-2010. Steve is a frequent speaker at professional meetings and industry events. He is also the author of a number of published papers in risk theory, the intersection of insurance and finance, and applications of probability and statistics to reserving and rate making problems. His research has appeared in the Proceedings of the Casualty Actuarial Society, the North American Actuarial Journal and the Duke Math Journal.

- *Speaker* : Dr. Emre Yoldas, Board of governors of the federal reserve system

*Title* : Financial stress and equilibrium dynamics in term interbank funding markets

*Abstract* : Interbank funding markets are central to the functioning of the financial system and the transmission of monetary policy. Libor-OIS spreads have been widely-used indicators of conditions in these markets. We construct models that incorporate the long-run equilibrium relationship between term Libor and OIS rates and their regime-dependent dynamics. We find strong evidence for three regimes in the interbank funding market that resemble different pricing of risk and equilibrium outcomes, as suggested by the recent theoretical literature. We show that significant adjustments toward long-run equilibrium typically occur following large shocks to risk premia, but this relationship tends to breakdown in moderate stress regimes. We provide point and interval estimates for stress thresholds that serve as potential benchmarks for policy makers and market participants to assess funding conditions.

*Brief biography* : Dr. Emre Yoldas is a principal economist at the Board of Governors of the Federal Reserve System. He received his Ph.D. in Economics in 2008 from University of California - Riverside. His current research topics are money market dynamics and financial industry risk. His papers appear in various journals such as Journal of Business and Economic Statistics, Studies in Nonlinear Dynamics and Econometrics, Journal of Empirical Finance, Economics Letters, etc.

- *Speaker* : Dr. Dodzi Attimu, Massachusetts Mutual Life Insurance Company

*Title* : Reassessing model risk assessments – a Bayesian approach to model risk assessments

*Abstract* : Models are ubiquitous in the finance and insurance industry and so is the risk inherent in their use. The Federal Reserve Board of Governors' Office of the Comptroller

of the Currency in their Supervisory Guidance on Model Risk Management defines a model as: A quantitative method, system, or approach that applies statistical, economic, financial, or mathematical theories, techniques, and assumptions to process input data into quantitative estimates. In this talk I will briefly introduce a framework for characterizing models in a formal way that is consistent with the aforementioned definition and establish the usefulness of such formalism. I will then address the concept of model risk assessment which is roughly speaking a mechanism of estimating the potential for adverse consequences from the use of models. Model risk assessments are traditionally done using scoring mechanisms. In this talk, I will approach the model risk assessment exercise utilizing a Bayesian framework and contrast this approach with the traditional score-based methodologies.

*Brief biography* : Dr. Dodzi Attimu currently leads the model validation area in MassMutual’s model risk management program. Prior to that he was an asset-liability management(ALM) modeling and pension risk transfer(PRT) modeling actuary at Prudential Financial. He joined Prudential from The Hartford Financial Services Group where he worked in model validation as part of the model risk management team. He started his actuarial career with ING (now VOYA) and had roles spanning product development, ALM, and modeling of variable annuities, fixed annuities and equity indexed annuities. Dr. Dodzi received his PhD in Mathematics from Howard University, his BS in Mathematics & Computer Science from the University of Ghana. He is a fellow of the Society of Actuaries, a member of the American Academy of Actuaries and a holder of the Chartered Financial Analyst designation.

- *Speaker* : Dr. Zhiwei Zhu, BI Analytics Consulting

*Title* : Risk analytics, data science, and the 4th industrial revolution

*Abstract* : Professor Klaus Schwab, Founder and Executive Chairman of the World Economic Forum wrote a book, "The Fourth Industrial Revolution", to describe a phenomenon that is happening and fundamentally changing the way we live, work, and relate to one another. In this discussion, I'll explore

- 1. What the 4th industrial revolution is about and how it differs from the previous three industrial revolutions.
- 2. How data and analytics fit in the 4th industrial revolution.
- 3. Primarily in risk management businesses, what insurance industry is concerned and is doing to prevent being disrupted.
- 4. Where the 4th industrial revolution will generate demands of skills and workforce.

*Brief biography* : Dr. Zhiwei Zhu has over 15 years of insurance industry experiences. He served as Senior Vice President of Consumer Data and Analytics at Swiss Re, Vice President of Risk Modeling and Analytics at SCOR Global Life, and Vice President of Advanced Analytics at Assurant Health.

Prior to his industry adventure, Dr. Zhu taught graduate and undergraduate courses in Mathematics, Statistics, and Business departments. He also collaborated in researches and publications in College of Education and College of Human Medicine.

Dr. Zhu earned his Ph.D. in Statistics from Michigan State University and Master degree in Mathematics from the Central South University (China).

- *Speaker* : Dr. Yimin Yang, Protiviti Inc.

*Title* : What is FinTech?

*Abstract* : We will introduce 3 key fields in FinTech and talk about some of their applications. 1. Bitcoin & BlockChain; 2. AI & Machine Learning; 3. Big Data & Topology. We will explain in detail the technical aspects of Bitcoin network and major financial applications of BlockChain including insurance, shared economy and artwork. Machine Learning (ML) was used in developing AlphaGo—an AI computer program that plays the board game Go. We will discuss the intuitions behind ML and AlphaGo. Although Big Data is a hot topic, there is no real breakthroughs in its methodologies and approaches until the recent development made by Stanford professor Gunnar Carlsson who introduced topological methods into Big Data with great success. We will talk about his methodology and application.

*Brief biography* : Dr. Yimin Yang is the Director at Protiviti. He has over 15 years of experience in risk management, including heading quantitative analytics for two top 10 U.S. banks where he developed enterprise-wide methodologies, techniques and applications for risk modeling and business development. He has risk management experience across both credit and market risk areas and is responsible for credit and market risk analytics, quantitative modeling, and capital management at Protiviti. Dr. Yang received his Ph.D. in mathematics from University of Chicago. He is a frequent speaker at seminars and conferences, and holds advisory roles to several financial engineering and risk management programs.

## **Participants:**

- *Speakers:*
  - Dr. Dodzi Attimu, Massachusetts Mutual Life Insurance Company  
(dattimu06@massmutual.com)

- Dr. Jed Frees, University of Wisconsin (jffrees@bus.wisc.edu)
  - Dr. Guojun Gan, University of Connecticut (guojun.gan@uconn.edu)
  - Dr. Stephen Mildenhall, St. John’s University (mildenhs@stjohns.edu)
  - Dr. Peter Swire, Georgia Institute of Technology (Peter.Swire@scheller.gatech.edu)
  - Dr. Maurice Stucke, University of Tennessee (mstucke@utk.edu)
  - Dr. Yimin Yang, Protiviti Inc. (yimin.yang.usa@gmail.com)
  - Dr. Emre Yoldas, Board of governors of the federal reserve system (emre.yoldas@frb.gov)
  - Dr. Zhiwei Zhu, Consultant (zhiwei.zhu@live.com)
- *GSU Faculty:*
    - Dr. Haci Akcin (hakcin1@gsu.edu)
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  - *Others:*
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- Jihwa Yu (jyu28@student.gsu.edu)
- Tianchi Zhang (tzhang14@student.gsu.edu)
- Dachuan Zhang (dachuanz.gsu@gmail.com)

**Location:** The workshop will be held in the CEAR Seminar Room, which is located on the 11th floor of the J. Mack Robinson College of Business at Georgia State University. The physical address is 35 Broad Street NW, 11th Floor, Atlanta, GA 30303. Please use the street level entrance on Broad Street.

**Directions:** i) MARTA Subway: 35 Broad Street is located 1 block northwest of the Five Points Marta Rail Station in Downtown Atlanta; the station is located at the intersection of all metro lines. One-way Rail Ride costs \$2.50, and multiple-day passes are also available for purchase. Tickets can be easily purchased from vending machines at all MARTA stations. This is by far the easiest method, and is on a direct line to Atlanta International Airport.

ii) Driving: From Interstate 75/85 (the connector) going NORTH take exit 248B for Edgewood Ave toward Auburn Ave / J W Dobbs Ave. Turn left at Edgewood Ave SE and proceed 0.6 miles. Turn left onto Park Pl. SE / Pryor St. SE. At the FIRST cross street, turn right onto Decatur St. SE. Continue onto Marietta St. NW. The next intersection is Broad St. and is where our facility is located. There is no street parking available nearby; however, there are pay lots and garages nearby. Costs range from \$5 to \$10 depending on the lot/garage used.

From Interstate 75/85 (the connector) going SOUTH take exit 248D for J W Dobbs Ave toward Jesse Hill Dr. Use the right lane to keep right at the fork and stay on Exit 248D. Turn right onto John Wesley Dobbs Ave NE, and proceed for 0.2 miles. Turn left onto Courtland St. NE, and continue for 0.2 miles. Turn right onto Edgewood Ave SE and proceed 0.3 miles. Turn left onto Park Pl. SE / Pryor St. SE. At the FIRST cross street, turn right onto Decatur St. SE. Continue onto Marietta St. NW. The next intersection is Broad St. and where our facility is located. There is no street parking available nearby; however, there are pay lots and garages nearby. Costs range from \$5 to \$10 depending on the lot/garage used.

**Parking** (one option): There is covered, pay for parking at Lanier Public Parking lot located at 150 Carnegie Way; Atlanta, GA 30303. The lot is about 5 blocks away from the workshop site at 35 Broad Street.

**Lodging:** The Ellis Hotel is walking distance to workshop. The Ellis's information: 176 Peachtree Street Northwest, Atlanta; Phone: (404) 523-5155; Website: [www.ellishotel.com](http://www.ellishotel.com)