

New Ideas In Quantitative Finance Workshop
November 4, 2019
Speakers

8:00AM - 8:30AM – Registration and Introduction

8:30AM - 9:00AM - Terry Rockafellar, University of Washington (rtr@uw.edu)

Title: Risk and Robustness in Optimization Under Uncertainty

Abstract: Decisions often have to be made in circumstances where their outcomes are uncertain and will only be known in the future. In one approach, the future is modeled probabilistically and optimization is formulated in terms of risk measures applied to random variables. In another approach, commonly referred to as robust optimization, modeling is reduced to worst-case analysis over a specified uncertainty set. An intermediate idea is distributionally robust optimization, which can be described as probabilistic modeling with uncertain probabilities. In fact all these approaches, and more, fit into a single framework that provides broader insights into the ways that optimization can proceed.

9:00AM – 9:30AM - Artem Prokhorov, The University of Sydney, Australia (artem.prokhorov@sydney.edu.au)

Title: Efficient Estimation of Parameters in Marginal in Semiparametric Multivariate Models

Abstract: We consider a general multivariate model where univariate marginal distributions are known up to a common parameter vector and we are interested in estimating that vector without assuming anything about the joint distribution, except for the marginals. If we assume independence between the marginals and maximize the resulting quasi-likelihood, we obtain a consistent but inefficient estimate. If we assume a parametric copula (other than independence) we obtain a full MLE, which is efficient but only under correct copula specification and badly biased if the copula is misspecified. Instead we propose a sieve MLE estimator which improves over QMLE but does not have the drawbacks of the full MLE. We model the unknown part of the joint distribution using the Bernstein-Kantorovich polynomial copula and assess the resulting improvement over QMLE and over misspecified FMLE in terms of relative efficiency and robustness. We derive the asymptotic distribution of the new estimator and show that it reaches the semiparametric efficiency bound. Simulations suggest that the sieve MLE can be almost as efficient as FMLE relative to QMLE provided there is enough dependence between the marginals. [We demonstrate empirical relevance of the new estimator with two applications. First, we apply SMLE in insurance context where we build a flexible semi-parametric claim loss model for a scenario where one of the variables is censored. Next, we provide an example involving financial risk management and show how the use of SMLE can lead to superior value-at-risk estimates.

9:30AM – 10:00AM – Igor Cialenco, Illinois Institute of Technology (Cialenco@iit.edu)

Title: Adaptive Robust Control Under Model Uncertainty

Abstract: We propose a new methodology, called adaptive robust control, for solving a discrete-time control problem subject to model uncertainty, also known as Knightian uncertainty. We apply the general framework to an optimal portfolio allocation problem where the uncertainty comes from the fact that the true law of the underlying model is only known to belong to a certain family of probability laws. We develop a learning algorithm that reduces the model uncertainty through progressive learning about the unknown system. One of the key components in the proposed methodology is the recursive construction of the confidence sets for the unknown parameter.

10:00AM – 10:30AM – Break – Student Session – Stathis Tompaidis

10:30AM -- 11:00AM – Tom Keelin, Keelin Reeds Partners (tomk@keelinreeds.com)

Title: Introduction to the Metalog Distributions

Abstract: The metalog distributions are a new family of continuous probability distributions designed for flexibility, simplicity, and ease/speed of use in practice. Compared to the Pearson and other traditional distributions, metalogs have greater shape flexibility to represent a wide range of data sets. Moreover, the metalogs are comprised of simple closed-form equations; include unbounded, semi-bounded, or bounded forms which may be chosen according to the application; include a closed-form quantile function (F^{-1}) to facilitate Monte Carlo simulation; and may be quantile parameterized linearly by CDF data, which makes metalogs easier to use in practice than other distributions that require nonlinear optimization for parameter estimation. The metalogs have sufficient shape and bounds flexibility to provide new insights into data and to match virtually any traditional distribution—effectively obsoleting the need for other distributions in some application areas.

11:00AM – 11:30AM – Gaia Serraino, Deutsche Bank, London, UK (gaia.serraino@gmail.com)

Title: Challenges in Modeling the Margin Valuation Adjustment

Abstract: Since 1st September 2016, initial margin rules for non-cleared derivative transactions have been progressively coming into effect, increasing every year the numbers of in-scopemarket participants. Two-way Initial Margin are required to be exchanged to cover the potential future exposure resulting from a counterparty default. IM models are required to assume the maximum variations in the value of the netting set at a confidence level of 99% over the Margin Period of Risk and are subject to a minimum recalculation period; IM is thus dynamic over time and stochastic in nature. CCR internal models for collateralized exposure need to capture the changes in IM over time; in this talk we discuss the main challenges in incorporating IM models into Exposure models. Furthermore, posted and received IM need to be held in segregated accounts giving rise to IM funding costs that should be reflected into derivative pricing; we present the main challenges currently faced by financial institutions in modelling the Margin Valuation Adjustment.

11:30AM – Noon – Stathis Tompaidis, University of Texas at Austin (Stathis.Tompaidis@mcombs.utexas.edu)

Title: Extreme Yet Plausible

Abstract: Since the 2008 Financial Crisis, stress tests, based on extreme yet plausible scenarios, have become the preferred method of assessing the risk of large financial institutions. We consider the problem of choosing stress scenarios from a set of past, historical, scenarios, and propose an objective based on minimizing the variance of estimates of tail risk. Our approach expands methods from the area of optimal design of experiments to consider Conditional Value-at-Risk. We show that the resulting problem is combinatorial, and describe approximate algorithms to identify the scenarios that optimize our objective under both parametric and non-parametric settings. We investigate the efficiency of the algorithm, and compare the scenarios chosen by our algorithm to scenarios chosen by the Commodities, Futures, and Trading Commission to stress test central counterparties in 2017.

Noon – 12:30PM – Jun-ya Gotoh, Chuo University, Japan (jgoto@indsys.chuo-u.ac.jp)

Takuo Higashide, Nissay Asset Management Corporation

Kensuke Asai, Chuo University, Japan

Takahiko Fujita, Chuo University, Japan

Title: A New Formulation of Pair's Portfolio Selection with First Passage Time

Abstract: Pair trading is an investment strategy to earn a profit by taking a position on two assets whose spread (i.e., prices' difference) is expected to converge to a certain level. In this paper, we propose a simple but new formulation for portfolio selection of assets' pairs by introducing the mean and variance of the first passage time (FPT) of the processes of spreads. We found that the computed efficient frontier in terms of FPT was succeeded to the return-based efficient frontier in an effective manner. Besides, obtained portfolios had practically favorable features compared to the conventional single-pair trading strategy. This is a joint work with Takuo Higashide (Nissay Asset Management Corporation) and Kensuke Asai and Takahiko Fujita (Chuo University).

12:30PM – 12:45PM – Break

12:45PM – 1:15PM – Robert Frey, Stony Brook University (Robert.Frey@stonybrook.edu)
(Lunch Presentation)

1:15PM – 1:45PM – Michael Tiano, Stony Brook University (Michael.Tiano@stonybrook.edu)
(Lunch Presentation)

Title: An overview of Information Geometry and Super Harmonic Estimation

Abstract: Information geometry allows us to recast much of statistics into the language of differential geometry. Leveraging ideas from differential geometry we examine traditional statistical ideas such as entropy, factor models, the EM algorithm, and Bayesian priors in a geometric context. We finish by showing how the construction of a super harmonic prior on a statistical manifold leads to a bayesian prior which out performs the Jefferys prior.

1:45PM – 2:00PM - Break

2:00PM – 2:30PM – Harvey Stein, Bloomberg (hjstein@bloomberg.net)

Title: Speeding Up VaR With VDR

Abstract: Monte Carlo and historical risk calculations such as value at risk (VaR) and expected shortfall (ES) require repricing each position in a portfolio 1,000 times or more. This makes risk calculations challenging when the pricing functions themselves are slow. To make such calculations tractable, shortcuts such as smatrix pricing or reducing the number of paths) are often taken. But these approaches tend to substantially reduce accuracy as well. Here we present the Virtual Dimensional Reduction (VDR) approach. This approach improves the accuracy of approximations by drastically reducing the volume of the domain, yielding the effect of dimensional reduction without reducing the actual dimension. This approach is as efficient as matrix pricing but is almost as accurate as full revaluation, enabling accurate risk calculations with as little as 50-100 pricing calculations, thus yielding a speed-up of 10-20x compared to full revaluation with 1,000 scenarios.

2:30PM – 3:00PM – Peter Carr, New York University (pc73@nyu.edu)

Title: Dynamic Non-classical Arithmetic (DNA) and Option Pricing

Abstract: Non-classical arithmetics replace the ordinary addition and multiplication in classical arithmetic by alternative binary operations which preserve algebraic structure. Functions which are non-linear in classical arithmetic can become linear in a non-classical arithmetic. We first exploit this idea to price European-style optionality in an arbitrage-free way as a non-classical sum of a strike price and the underlying asset price. To capture the time decay of an option's price towards its intrinsic value, the non-classical arithmetic changes over time, leading to dynamic non-classical arithmetic (DNA). We then illustrate how DNA can also be used to price compound optionality. In particular, we value a Bermudan option in closed form.

3:00PM – 3:30PM – Rita D'Ecclesia, Sapienza University, Rome, Italy (rita.decclesia@uniroma1.it)

Title: Do Diamonds Shine in Investor Portfolios

Abstract: Diamonds are emerging as a new investment asset, providing great opportunities for trading, investing and diversification. Hedge funds and financial intermediaries have shown increased interest in the market and recent available data allow us to study its features and dynamics. The lack of a standardization system for the diamond commodity prevented the existence of an exchange regulated trading platform for diamonds which is being created and is starting to play an important role. Over the last decade trading diamonds has been advertised by banks and financial intermediaries as a hedge even if not enough evidence was provided. Diamond stocks have also been considered as a promising diversification asset for investors' portfolios (McKeough, 2015; Neil, 2014; Wilson and England, 2014; Cameron, 2014), though, to our best knowledge, neither academic scholars nor industry professionals have tested this hypothesis. In this paper we test if diamonds represent an hedge or safe haven in the investment worlds and if diamond stocks represent an alternative to investing in diamonds. We address two practical investment questions: Can an investment in diamonds represent a hedge for an investment portfolio? Is diamond equity sensitive to diamond prices? We use Polished Prices data set to build a Diamond basket index (D'Ecclesia Jotanovic 2017) and the diamond mining stock prices traded at the main stock markets to investigate the safe haven or hedge hypothesis and to study the relationship existing between diamond prices and diamond stocks. Our results show that Diamonds can represent a hedge in investor's portfolios, however the market of diamond-mining stocks does not represent a valid investment alternative to the diamond commodity market.

3:30PM – 4:00PM –Aparna Gupta, Rensselaer Polytechnic Institute (guptaa@rpi.edu)

Title: Identifying the Risk Culture of Banks Using Machine Learning

Abstract: Regulating risk culture in the financial industry requires understanding what drivers define the risk culture. We introduce unsupervised machine learning techniques to identify and define the risk culture for bank holding companies using textually extracted features from their 10-K filings. We develop a two-dimensional risk culture dictionary using risk culture frameworks and Loughran and McDonald's sentiment dictionary. Using principal component analysis, we find that uncertainty, litigious and constraining sentiments among risk culture features are important in identifying the risk culture of banks. Using a two-stage clustering approach, we identify three distinct risk culture clusters: good, fair and poor. Validating our cluster analysis results against quantitative bank risk measures, governance and performance indicators, we find that a sound risk culture in banks is characterized by high profitability ratios, bank stability, lower default risk and good governance. We also find that bank size and the financial time period influence the risk culture of banks.

4:00PM – 4:30PM – Break – Student Session – Harvey Stein – Bloomberg – Research Topics

4:30PM – 5:00PM – Alex Kreinin, IBM, Canada (Alex.Kreinin@ca.ibm.com)

Title: Backtesting of Portfolio Exposure Models

Abstract: Backtesting counterparty credit risk (CCR) models is a challenging problem. Such backtesting is becoming increasingly important in the financial industry since both the CCR capital charge and credit valuation adjustment (CVA) management have become a priority to banks. Today, there are no clear regulatory guidelines on exposure backtesting. This is in contrast to market risk models, where the Basel Committee set a strict set of rules in 1996, which are widely followed. Below, we discuss a quantitative methodology for the counterparty risk model backtesting. With this methodology, exposure envelope can be constructed using Monte Carlo scenarios. The envelope boundaries are used to compute the probability distribution of the fraction of time, f^* , the realized exposure spent outside of the envelope. The quantiles of the distribution of f^* are compared with that computed for the realized exposure to make a statistical decision on the model acceptance.

5:00PM – 5:30PM – Paul Glasserman, Columbia University (pg20@gsb.columbia.edu)

Title: Precision Factor Investing: Avoiding Factor Traps by Predicting Heterogeneous Effects of Firm Characteristics

Abstract: We apply ideas from causal inference and machine learning to estimate the sensitivity of future stock returns to observable characteristics like size, value, and momentum. By analogy with the informal notion of a "value trap," we distinguish "characteristic traps" (stocks with weak sensitivity) from "characteristic responders" (those with strong sensitivity). We classify stocks by interpreting these distinctions as heterogeneous treatment effects (HTE), with characteristics interpreted as treatments and future returns interpreted as responses. The classification exploits a large set of stock features and recent work applying machine learning to HTE. Long-short strategies based on sorting stocks on characteristics perform significantly better when applied to characteristic responders than traps. A strategy based on the difference between these long-short returns profits from the predictability of HTE rather than from factors associated with the characteristics themselves. This is joint work with Pu He.

5:30PM – 6:00PM – Raphael Douady, CNRS, University Paris 1-Sorbonne, France (Raphael.Douady@riskdata.com)

Title: Regime Switching Market Evolution and Calibration using AI, Relation to Polymodels

Abstract: Regime switching models, also known as hidden Markov models (HMM), represent market evolution as a random sequence of steps following a Markov chain of randomly selected different random generators, chosen among a finite set of possibilities. While, in simulations, they display a behavior that is a good representation of the observed market evolution, their calibration for risk and investment purposes is a challenge we shall address using AI techniques for breakpoints and regime identification and transition probabilities.

We shall also show how, in the context of a portfolio of funds (hedge funds or ETFs) or stocks, nonlinear polymodels can be used for regime identification and crisis anticipation with improved accuracy.

6:00PM – 6:30PM – James Glimm, Stony Brook University (james.glimm@stonybrook.edu)

Title: The Glimm Analytics Risk Module

Abstract: We present a risk module that captures most recognized features of financial assets, such as heavy tails and volatility clustering. The models are semi martingales, so that the same model can be used for risk assessment and optimization. We show results that appear to improve on commercial standards in estimated shortfall and Kolmogorov-Smirnov distance for time periods from two weeks to 30 minutes. Expected shortfall with the accuracy of 0.6% ES is demonstrated in backtesting of daily data. Applications to performance attribution are indicated.

6:30PM-7:00PM – Break

7:00PM – 9:00PM - Reception

New Ideas in Quantitative Finance Workshop
November 5, 2019
Speakers

8:00AM - 8:30AM - Yongqiao Wang, Zhejiang Gongshang University, China (wangyq@zjgsu.edu.cn)
Stan Uryasev, Stony Brook University (Stanislav.Uryasev@stonybrook.edu)

Title: Buffered-Rankings in Efficiency Analysis

Abstract: Instead of the best efficiency measure, in many practices one should evaluate one decision making unit (DMU) with the highest ranking that it can achieve by choosing the most favorable input/output weights. Because its computation involves minimizing the number of DMUs with efficiency measures better than this DMU, the efficiency ranking problem is computationally intractable for its non-convexity and dis-continuity. This paper proposes the best buffered-ranking, a characteristic similar to the best ranking, which is defined as the minimum number k that the efficiency measure of this DMU exceeds the average of the top k efficient DMUs. The buffered-ranking not only assesses the number of top efficient DMUs, but also their overall magnitude of efficiency. Computing the best ranking is equivalent to minimizing a probability of exceedance, while computing the best buffered-ranking is equivalent to minimizing a buffered-probability of exceedance. This paper also studies the worst buffered-ranking that is a characteristic contrary to the best buffered-ranking. Both the best and worst buffered-rankings can be obtained by solving a simple linear program. Experimental results on two widely-used data sets clearly demonstrate that buffered-rankings have a great computational advantage over rankings.

8:30AM - 9:00AM - Peter Tsyurmasto, KPMG (peter.tsyurmasto@gmail.com)

Title: Hedge Fund Decomposition with Traditional and Alternative Investment Strategies

Abstract: This talk presents a portfolio decomposition model that was successfully applied to 50+ institutional investors to determine the underlying risks that their portfolios were exposed to. The model applies a universe of 20+ investable multi-asset long/short strategies across asset classes (equities, fixed income, currencies, commodities, volatility) and styles (carry, value, momentum) along with traditional long-only indices. We further attempt to explain returns of hedge fund indices and build a shiny web-application tool that performs hedge fund decomposition in real-time, its prototype can be found on <https://ptsyurmasto.shinyapps.io/shinyapp>

9:00AM - 9:30AM - George Lan, Georgia Tech (George.Lan@isye.gatech.edu)

Title: Stochastic First-order Methods for Convex and Nonconvex Functional Constrained Optimization

Abstract: Functional constrained optimization is becoming more and more important in machine learning and operations research. Such problems have potential applications in risk-averse machine learning, semisupervised learning and robust optimization among others. In this talk, we first present a novel Constraint Extrapolation (ConEx) method for solving convex functional constrained problems, which utilizes linear approximations of the constraint functions to define the extrapolation (or acceleration) step. We show that this method is a unified algorithm that achieves the best-known rate of convergence for solving different functional constrained convex composite problems, including convex or strongly convex, and smooth or nonsmooth problems with stochastic objective and/or stochastic constraints. Many of these rates of convergence were in fact obtained for the first time in the literature. In addition, ConEx is a single-loop algorithm that does not involve any penalty subproblems. Contrary to existing dual methods, it does not require the projection of Lagrangian multipliers into a (possibly unknown) bounded set. Second, for nonconvex functional constrained problem, we introduce a new proximal point method which transforms the initial nonconvex problem into a sequence of convex functional constrained subproblems. We establish the convergence and rate of convergence of this algorithm to KKT points under different constraint qualifications. For practical use, we present inexact variants of this algorithm, in which approximate solutions of the subproblems are computed using the aforementioned ConEx method and establish their associated rate of convergence. To the best of our knowledge, most of these convergence and complexity results of the proximal point method for nonconvex problems also seem to be new in the literature.

9:30AM – 10:00AM – Giorgi Pertaia/Morton Lane

Giorgi Pertaia, University of Florida (gpertaia@ufl.edu)

Morton Lane, University of Illinois at Champaign-Urbana (mnlane@illinois.edu)

Matthew Murphy, Stan Uryasev

Title: Retirement Portfolio Selection

Abstract: A retiree with a savings account balance, but without a pension is confronted with an important investment decision that has to satisfy two conflicting objectives. Without a pension the function of the savings is to provide post-employment income to the retiree. At the same time, most retirees want to leave an estate to their heirs. Guaranteed income can be acquired by investing in an annuity. However, that decision takes funds away from investment alternatives that might grow the estate. The decision is made even more complicated because one does not know how long one will live. A long life expectancy may suggest more annuities, and short life expectancy could promote more risky investments. However there are very mixed opinions about either strategy. A framework has been developed to assess consequences and the trade-offs of alternative investment strategies. We propose a stochastic programming model to frame this complicated problem. The objective is to maximize expected estate value, subject to cash outflow constraints. The cash outflow shortages are penalized in the objective function of the problem. We use kernel method to build position adjustment functions that control how much is invested in each asset. These adjustments nonlinearly depend upon asset returns in previous years. Case study was conducted using two variations of the model. The parameters used in this case study correspond to typical retirement situation. The case study shows that if the market forecasts are pessimistic, it is optimal to invest in annuity. The case study results, codes, and data are posted at the website.

10:00AM – 10:30AM – Break – Student Session - Alan King – IBM – Research Topic

10:30AM- 11:00AM - Sasha Aravkin, University of Washington (saravkin@uw.edu)

Title: Fusing Evidence from Multiple Sources Using Robust Mixed Effects Models

Abstract: Meta-analysis allows merging estimates from multiple sources to get an aggregate estimate and its measure of uncertainty. In this talk, we look at the problem in detail and discuss classic statistical models for merging estimates from different sources as well as recent innovations. In particular, we discuss how to estimate bias and explainable heterogeneity robustly, and how the technology can be used in specific applied contexts. The technology was developed in the context of global health but we are very interested to apply the underlying model to finance, particularly since the technology only requires access to estimates and their uncertainty rather than underlying data or decision variables

11:00AM – 11:30AM – Stoyan Stoyanov, Stony Brook University (stoyan.stoyanov@stonybrook.edu)

Title: Model Risk and Disappointment Aversion

Abstract: Extensions of expected utility theory are sensitive to the tail behavior of the portfolio return distribution and may not be approximated reliably through higher-order moment expansions. We develop a novel approach for model risk assessment based on a projection method and apply it to portfolio construction. We provide an extensive out-of-sample analysis to explore the economic gains of incorporating non-normality about financial asset returns into utility maximization with the generalized disappointment aversion (GDA) preferences. We find that the marginal utility gains of the optimal portfolio of a GDA investor are remarkably robust to misspecifications in the marginal distributions but are very sensitive to the structural assumption of stock returns implemented through a factor model.

11:30AM – Noon – Greg Kapoustin, AlphaBetaWorks (gregk@alphabetaworks.com)

Title: Risk Models and Reality: How Risk Model Architecture Reveals Business Fundamentals

Abstract: Risk models used in portfolio construction, optimization, and risk management can be complicated and hard to interpret. For instance, the design tradeoffs that enable easy model estimation and high explanatory power can lead to un-investable factors that lack economic meaning for portfolio managers. The talk will provide specific illustrations of the choices that lead to expressive models with economically significant factors and exposures. Furthermore, such models can bolster human inquiry with insights about business fundamentals that are impractically difficult to obtain with traditional financial statement analysis. The result is quantamental portfolio management and security analysis that combine conventional fundamental analysis with quantitative techniques.

Noon – 12:30PM – Vadim Omelcenko, Alpiq Energy SE, Czech Republic (vadim.omelcenko@alpiq.com)

Title: Decomposition Techniques Applied on Large-scale MLP Problems

Abstract: We present algorithms for decomposition of large-scale optimization problems where we manage a pool of connected hydro-power plant. The directions of the decomposition are asset-wise and stagewise. In the asset-wise decomposition we test the capabilities of the Dantzig-Wolfe method and present our approach. In the stage-wise decomposition, we test capability of SDDiP methodology and compare the results with our recursive methods. These decomposition methods enable us to achieve substantial acceleration of the calculations sometimes in three orders of magnitude. In addition, we emphasize the way of how we handle the timing constraints that in general impede getting the optimal solution by SDDiP

12:30PM – 12:45PM – Break

**12:45PM – 1:15PM – Alan King, IBM, Thomas J. Watson Research Center (kingaj@us.ibm.com)
(Lunch Presentation)**

Title: On the Dynamic Management of Loan Portfolios

Abstract: We study a small portfolio of whole loans. We use public data from Lending Club. These loans are larger than a typical credit card limit and about 20% will default. In addition, many loans will prepay since the interest rates are rather high. We will discuss approaches to creating a loan portfolio strategy, in which \$10M is invested initially and new loans added periodically when cash reserves are available. We demonstrate typical sample-path performance of a score-threshold strategy of loan selection from randomly generated pools of loans. Next, we allow the investor to borrow funds up to some multiple of capital, as would be the case if the investor were a bank. The questions we address concern the prediction of payments, the modeling of risk constraints, for example CVaR, and the potential solution approaches when modeled as a multi-period stochastic program.

**1:15PM – 1:45PM – Attilio Meucci, Advanced Risk and Portfolio Management (attilio.meucci@arpm.co)
(Lunch Presentation)**

Title: New Results on Generalized inference

Abstract: We derive new analytical results for the minimum relative entropy distributions ensuing from views on expectations and covariances. We discuss a new numerical routine for more general views.

1:45PM – 2:00PM - Break

2:00PM – 2:30PM – Agostino Capponi, Columbia University (ac3827@columbia.edu)
Sveinn Olafsson, Thaleia Zariphopoulou

Title: Personalized Robo-Advising

Abstract: Automated investment platforms, or robo-advisors, have emerged as an alternative to traditional financial advisors. Their viability depends in a crucial way on the efficiency of the communication exchange between the client and the machine. We develop a novel robo-advisor algorithm that solves a dynamic version of the mean-variance investment criterion and also adapts over time to changing risk preferences of the client it serves. We quantify the trade-off that the client faces between the cost of updating risk preferences, i.e. communicating with the machine, and the benefit of obtaining investment advice that is more tailored to her risk profile. We study the regret measures arising from the robo-advisor's imperfect knowledge of the client's risk profile, and analyze their sensitivities to market and human-machine interaction. (joint work with Sveinn Olafsson and Thaleia Zariphopoulou)

2:30PM – 3:00PM – John Birge, University of Chicago (john.birge@chicagobooth.edu)

Title: Optimization of Credit Portfolios

Abstract: Portfolio optimization generally considers only non-defaultable assets. In reality, however, most marketable assets have the potential for default. This creates complications for optimizing large portfolios even if the underlying asset values may be modeled with a limited set of factors. We will discuss various approaches for overcoming this difficulty to optimize portfolios with credit risk exposures.

3:00PM – 3:30PM – Toshinao Yoshiba, Tokyo Metropolitan University and Bank of Japan, Japan (tyoshiba@tmu.ac.jp)

Title: Value-at-Risk and Expected Shortfall of Stock Portfolio Using Skew-t Copulas

Abstract: The multivariate Student-t copula is frequently used in financial portfolio risk management and other statistical areas when there is tail dependence in the data. It often is a good-fitting copula but can be improved on when there is tail asymmetry. We propose to use Azzalini–Capitanio (AC) and Generalized Hyperbolic (GH) skew-t copulas to incorporate asymmetric tail dependence of risk factors using the numerical implementation for maximum likelihood estimation proposed in Yoshiba (2018). We compare the parameters of the AC skew-t, GH skew-t, Student-t, Normal copulas using Akaike and Bayesian information criteria for the two groups of daily stock returns. Each group is given by the equally weighted portfolio which consists of three indices from TOPIX33 Sector Indices. The first portfolio consists of financial sectors portfolio with high correlation including bank, insurance, and securities sectors. The second consists of bank, air transportation, electricity sectors with low correlation. With validating the skewness of skew-t copulas both for the unfiltered returns and for the filtered returns by EGARCH models, we investigate the behavior of the value-at-risk and expected shortfall of the two types of stock portfolio by employing several backtesting methods. The backtesting methods include the unconditional coverage test, the independence test, and the conditional coverage test for value-at-risk, and the discrepancy measurement for expected shortfall. As the results, we show the value-at-risk with high confidence level is well captured by skew-t copulas especially in low correlated portfolio. We also show the discrepancy of expected shortfall is small when using skew-t copulas.

3:30PM – 4:00PM – Alexey Rubtsov, Ryerson University, Canada (arubtsov@ryerson.ca)

Title: Dynamic Portfolio Decisions with Learning and Uncertainty about Climate Change

Abstract: We consider the optimal stock-bond portfolio choice problem with learning and uncertainty about climate change. The stock risk premium is assumed to be an affine function of global temperature and an unobserved factor which is estimated via Bayesian learning. It is further assumed that probability distribution of future global temperature is uncertain. The optimal investment strategy is derived in closed form and analyzed for returns on S&P500 stock index

4:00PM – 4:30PM – Break – Student Session – Philip Bennett – DWS Investment Management Americas, Inc.

4:30PM – 5:00PM – Vladimir Ladyzhets, University of Connecticut (vladimir.ladyzhets@uconn.edu)

Title: Probability space of regression models and its applications to financial time series

Abstract: We introduce a notion of a probability space of regression models and discuss its applications to the stress testing based on the macroeconomic scenarios provided by the Federal Reserve Bank (FRB). The probability space of regression models $L=(M,P)$ consists of a set of regression models M and a probability measure P , which is based on the model "quality," i.e. its ability to "fit" into historical data and to forecast the future values of the target variable. The set of regression models M is assembled by selecting various combinations of input variables with different lags, transformations, etc., and varying historical data sets that are used for model building and validation. It is assumed that the model set M is "complete" in the sense that it exhausts all the regression models that is possible to build given available historical data and independent variables. Each model m from the set M yields a scenario $y(t;m)$ for the target variable y , and thus the probability space of regression models $L=(M,P)$ allows to build a probability distribution for $Y(t)$ for each projection time t . As an example, we demonstrate how those distributions can be used to estimate risk capital reserves required by the regulators for large U.S. banks.

5:00PM – 5:30PM – Andrew Mullhaupt, Stony Brook University (andrew.mullhaupt@stonybrook.edu)

Title: Information Geometry: Some Insights for the Buy Side

Abstract: A portfolio manager can often determine what risks are taken, and for how long. This can significantly change the best approach to statistical modeling and inference compared to other situations in finance (or more generally). Despite the elementary fact that the "asymptotic" picture of statistics is the limiting case of the "large sample" picture of statistics, we will set these pictures in stark contrast from the point of view of the portfolio manager. The (relatively) new idea of information geometry can provide a computationally tractable tool equally viable in both pictures, which allows us to examine some examples from forecasting, risk modeling, and pricing theory. Time permitting we will cover connections to machine learning.

5:30PM – 6:00PM – Aaron Kim, Stony Brook University (aaron.kim@stonybrook.edu)

Title: Hetero-Leptokurtic Processes and Option Pricing with Time Varying Volatility of Volatility

Abstract: In this paper, we introduce a new time series model having the stochastic skewness and stochastic kurtosis of the residual of ARMA-GARCH model with Normal Tempered Stable innovation. This model captures not only the clustering of volatility but also the time varying volatility of volatility. We empirically show that the model describes the stochastic skewness and stochastic kurtosis observed in S&P 500 index return data. The model is also applied to option pricing. We present Monte-Carlo simulation technique based on the model and perform a parameter calibration of the model for the S&P 500 option prices.

6:00PM-6:30PM – Peter Cotton, J.P. Morgan, Quantitative Research (peter.d.cotton@jpmorgan.com)

Title: Who Ya Gonna Call?

Abstract: We provide a fast numerical algorithm for inferring the distributions of participant scores in a multi-party contest from winning probabilities. We use this to formalize the choice faced by a party looking to buy or sell an illiquid asset, namely who to contact. We prove that selecting a collection of dealers from whom to solicit bids (respectively offers) reduces to minimization of a submodular function.