Probability in Actuarial Science and Finance

Chair: Don McLeish (University of Waterloo)

ALEXANDER MELNIKOV, University of Alberta
Orthogonal Polynomials and their Applications in Financial and Actuarial Modeling

The primary goal of the talk is to present a new approach to financial and actuarial modeling which is based on polynomial extensions of probability distributions for financial assets and insurance claims. Besides improvements in modeling of asset returns and insurance claim sizes a better option pricing as well as risk measures calculations become possible using this approach. Theoretical findings are supported with numerical examples and illustrations exploiting financial and actuarial statistical data.

SHANOJA NAIK, University of Waterloo
The Fractional Diffusion Equation and a New Distribution with Heavy Tails

In the classical diffusion process, particles in a physical system spread according to the Gaussian process. Using fractional derivative on the partial differential equation, the solution turns out to be non Gaussian and we demonstrated that the invariance solution is a particular form of Wright function. We refer to the density function as the Wright distribution. It can also be thought of as a convolution of two random variables having inverse Gaussian and gamma distributions. The Wright distribution has heavy tails with other suitable properties to model financial data. We studied some properties and developed an estimation procedure.

RUODU WANG, University of Waterloo
Completely Mixable Distributions

A completely mixable distribution, defined as the marginal distribution of identically distributed dependent random variables having a constant sum, was recently introduced in 2011. In this talk, I will present the theory and applications of the family of complete mixable distributions. This family of distributions is relevant to Actuarial Science and Quantitative Risk Management; it plays an important role in solving the problems of risk aggregation with unknown dependence structure.

TAEHAN BAE, University of Regina
Valuing Retail Credit Tranches under Conditional Dependence

Under the single-factor structural credit risk modeling framework, we consider the double mixtures to model a general dependence structure beyond the typical conditional independence assumption between the entities in a homogeneous credit pool. For a large portfolio, the fair spread of a structured retail credit tranche is expressed in terms of the sums of single integrals which can be easily computed by a numerical method. We discuss the behaviors of tranche spreads by the level of dependence under four double mixture models, Gaussian-ICM, t-ICM, Gaussian-Beta and t-Beta, and calibrate these models to market data.