Robust and model-independent finance
La finance robuste et indépendante du modèle
(Org: **Leonard Wong** (University of Toronto))

STEVEN CAMPBELL, University of Toronto
Functional portfolio optimization in stochastic portfolio theory

This talk will present a concrete and fully implementable approach to the optimization of functionally generated portfolios in stochastic portfolio theory. The main idea is to optimize over a family of rank-based portfolios parameterized by an exponentially concave function on the unit interval. This choice can be motivated by the long-term stability of the capital distribution observed in large equity markets and avoids the curse of dimensionality. The resulting optimization problem, which is convex, is flexible as various regularizations and constraints can be imposed on the generating function. Moreover, it is well-posed, and a stability estimate in terms of a Wasserstein metric of the input measure will be provided. A discretization and optimization algorithm for the problem will also be introduced and illustrated with empirical examples using CRSP data from the US stock market.

IBRAHIM EKREN, FSU
On the asymptotic optimality of the comb strategy for prediction with expert advice

For the problem of prediction with expert advice in the adversarial setting, we compute the exact leading order expansion for the long time behavior of the value function. Then, we use this expansion to prove that as conjectured in Gravin, Peres and Sivan (2016), the comb strategies are indeed asymptotically optimal for the adversary in the case of 4 experts. Joint work with Erhan Bayraktar, Xin Zhang and Yili Zhang.

MARTIN LARSSON, Carnegie Mellon University
High-dimensional open markets in stochastic portfolio theory

Stochastic portfolio theory studies investments in large equity markets. Such investments are frequently confined to an "open market": a high capitalization investment-grade subset of a much broader equity universe. We develop models for open markets which (i) are consistent with a given invariant distribution of relative market capitalizations, (ii) lead to explicit growth-optimal portfolios, (iii) are robust to the dimensionality and specific characteristics of lower-capitalization stocks outside the investment-grade subset, and (iv) serve as a worst-case model for a robust asymptotic growth maximization problem that incorporates model ambiguity. (Joint work with David Itkin.)

JINNIAO QIU, University of Calgary
Stochastic Black-Scholes Equation under Rough Volatility

Rough volatility is a new paradigm in finance. We shall talk about the option pricing problems for rough volatility models. As the framework is non-Markovian, the value function for a European option is not deterministic; rather, it is random and satisfies a backward stochastic partial differential equation (BSPDE) or so-called stochastic Black-Scholes equation. The wellposedness of such kind of BSPDEs and associated Feynman-Kac representations will be discussed. These BSPDEs are also used to approximate American option prices. Moreover, a deep learning-based method will be investigated for the numerical approximations to such BSPDEs and associated non-Markovian pricing problems. Examples will be presented for both European and American options.

This talk is based on joint work with Christian Bayer and Yao Yao.

ALEXANDER SCHIED, University of Waterloo
Model-free estimation of the roughness exponent of a continuous trajectory

We discuss ways of characterizing the "roughness" of a trajectory by means of its p^{th} variation or its Wiener–Young Φ-variation. This gives rise to an index, which can be interpreted as the Hurst parameter of the trajectory. We analyze several examples among classical fractal functions. We also discuss new estimators for the Hurst parameter, whose consistency can be established without any probabilistic assumptions on the underlying trajectories. Our results are illustrated by means of financial time series.

Based on joint work with Xiyue Han and Zhenyuan Zhang.

LUDOVIC TANGPI, Princeton University
Non-Asymptotic convergence rates for the estimation of risk measures

Consider the problem of computing the riskiness of a financial position F written on the underlying S with respect to a general law invariant risk measure (for instance the average value at risk). In practice the true distribution of S is unknown, and one needs to resort to historical data for the computation. In this talk we present rates of convergence results to the riskiness of F(S) when the distribution of S is estimated by its empirical measure given N observations. We will present (sharp) non-asymptotic rates for both the deviation probability and the expectation of the estimation error. This talk is based on a join work with Daniel Bartl.