Robust Utility Indifference Valuation Revisited

A View from Optimal Transport

Keita Owari

Graduate School of Economics, The University of Tokyo
7-3-1 Hongo, Bunkyo-ku, Tokyo 113-0033, Japan
owari@e.u-tokyo.ac.jp

A model-free super-hedging problem of exotic options with semi-static strategies has attracted attention in financial mathematics; it is "model-free" in that no parametric assumption on the underlying process is made, but instead the marginal distributions of the underlying (under pricing measures) are given, which are derived from call option prices. Its dual is a martingale optimal transport problem, which is to find the maximum price over all martingale (pricing) measures with given marginals (i.e., models calibrated to observed call options). As a robust hedging/pricing problem, this approach is really robust as it relies (essentially) only on the marginals, while at the same time it might be too robust; the resulting price bound might be very big, and there is no flexibility to incorporate other information than marginals (e.g. "drift").

In this talk, we propose an exponential robust utility indifference valuation problem with semi-static strategies where we are given a family of calibration-consistent real-world models. We prove a general duality formula where the dual is a minimisation over all martingale measures on the path-space with given marginals, similar to the optimal transport but with an additional penalty term. Then we conclude with some remarks and perspectives on possible choices of family of real-world models and implementation as well as the connection to the model-free super/sub-hedging.