

**The Hong Kong Polytechnic University
Department of Applied Mathematics**

Financial Mathematics Seminar

Non-concave distributionally robust stochastic control in a discrete time finite horizon setting

by

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Abstract

In this article we present a general framework for non-concave distributionally robust stochastic control problems in a discrete time finite horizon setting. Our framework allows to consider a variety of different path-dependent ambiguity sets of probability measures comprising, as a natural example, the ambiguity set defined via Wasserstein-balls around path-dependent reference measures, as well as parametric classes of probability distributions. We establish a dynamic programming principle which allows to derive both optimal control and worst-case measure by solving recursively a sequence of one-step optimization problems. As a concrete application, we study the robust hedging problem of a financial derivative under an asymmetric (and non-convex) loss function accounting for different preferences of sell- and buy side when it comes to the hedging of financial derivatives. As our entirely data-driven ambiguity set of probability measures, we consider Wasserstein-balls around the empirical measure derived from real financial data. We demonstrate that during adverse scenarios such as a financial crisis, our robust approach outperforms typical model-based hedging strategies such as the classical Delta-hedging strategy as well as the hedging strategy obtained in the non-robust setting with respect to the empirical measure and therefore overcomes the problem of model misspecification in such critical periods.

Date: 28 March 2025 (Friday)

Time: 10:00-11:00 (Hong Kong Standard Time GMT +8)

Venue: TU817

Host: Prof. Guanxing Fu, The Hong Kong Polytechnic University

***** ALL ARE WELCOME *****