

## **Research Highlight: Stochastic Control for a Class of Nonlinear Kernels and Applications**

**Work of Assistant Professor ZHOU Chao**

The topic of model uncertainty has attracted a great deal of interest in both academia and financial industry, as emphasized in various papers by Lars Hansen and Thomas Sargent (both Nobel Laureates in Economics). New theories are proposed to improve the way of quantifying model uncertainty. Innovative works have been done on the research of this domain. Stochastic control techniques were widely used in these recent works.

In this paper, Dr Zhou Chao and his co-authors consider a stochastic control problem for a class of nonlinear kernels. More precisely, their problem of interest consists in the optimization, over a set of non-dominated probability measures, of solutions of backward stochastic differential equations (BSDEs). Since BSDEs are nonlinear generalizations of linear expectation, this problem can be understood as stochastic control of a family of nonlinear expectations, or equivalently of nonlinear kernels. Their main contribution is to prove a dynamic programming principle for this problem in an abstract setting, which they use to provide a semimartingale characterization of the value function. Then they explore applications of their results, including wellposedness of second order BSDEs, a nonlinear optional decomposition in a robust setting, and a viscosity solution to a path-dependent partial differential equation.

### **Reference:**

[1] D. Possamaï, X. Tan and C. Zhou, "Stochastic control for a class of nonlinear kernels and applications". *The Annals of Probability*, 2018, 46(1): 551-603.