

2019 Workshop on Stochastic control and its applications

Schedule

29 January (Session 1)	
2:00-2:40	Zhen Wu
2:40-3:20	Xun Li
3:20-4:00	Tianyang Nie
29 January (Session 2)	
4:20-5:00	Guangchen Wang
5:00-5:40	Zuoquan Xu
5:40-6:20	Detao Zhang

Venue: Senate Room (M1603), 16/F, Li Ka Shing Tower, PolyU

A Unified Approach for the Well-posedness of Forward Backward SDEs and Its Applications

Zhen Wu, Shandong University, Shandong University

Abstract

In this talk, we introduce a unified scheme for solving non-Markovian FBSDEs. By use of a decoupling random field, the problem is eventually reduced to two dominant ODEs. We can prove all the existing frameworks could be analyzed using our new scheme. In addition, we present the existence theorem for the PDEs system connected with the coupled FBSDEs. And for the linear FBSDEs can not meet the requirement of this unified approach, we study the well-posedness by use of the linear transformation method.

An Indefinite Linear-Quadratic Optimal Control Problem for Mean-Field Stochastic Differential Equations over an Infinite Horizon

Xun Li, Department of Applied Mathematics,
The Hong Kong Polytechnic University

Abstract

An indefinite linear-quadratic (LQ, for short) optimal control problem is considered for mean-field stochastic differential equations with constant coefficients in an infinite horizon. The stabilizability of the control system is studied by the discussion of the well-posedness of the LQ problem. The optimal control can be expressed as a linear state feedback involving the state and its mean, through the solutions of two algebraic Riccati equations. The solvability of such kind of Riccati equations is investigated by means of semi-definite programming method.

Arbitrage-free pricing of American options and game options in nonlinear markets

Tianyang Nie, School of Mathematics, Shandong University

Abstract

We re-examine and extend the findings from the recent paper by Dumitrescu et al. SIFIN 2017, who studied American and game options in a particular market model using the nonlinear arbitrage-free pricing approach developed in El Karoui and Quenez 1997. In the first part, we provide a detailed study of unilateral valuation problems for the two counterparties in an American-style contract within the framework of a general nonlinear market. We extend results from Bielecki et al. PUQR 2018 and SIFIN 2015, who examined the case of a European-style contract. Moreover, we present a BSDE approach, which is used to establish more explicit pricing, hedging and exercising results when solutions to reflected BSDEs have additional desirable properties. In the second part, we consider the above setup in the framework of game options. We give a detailed study of unilateral pricing, hedging and exercising problems for the counterparties within a general nonlinear setup. We also present a BSDE approach, which is used to obtain more explicit results under suitable assumptions about solutions to doubly reflected BSDEs. This is a joint work with Edward Kim and Marek Rutkowski.

An optimal control problem of FBSDE under partial information

Guangchen Wang, School of Control Science and Engineering, Shandong University

Abstract

In this talk, we consider an optimal control problem driven by FBSDE, in which the system noise is correlated to the observation noise, and the coefficient of observation equation is unnecessarily bounded with respect to the state variable. This results in state equation and adjoint equation with unbounded stochastic coefficient, whose well-posedness and high-order moment estimates are obtained. By virtue of these estimates, a maximum principle for optimal control is established. This result improves that of Wang, Wu and Xiong [SIAM J. Control Optim., 51 (2013), pp. 491-524].

On mean variance models

Zuoquan Xu, Department of Applied Mathematics,
The Hong Kong Polytechnic University

Abstract

In this talk, two continuous-time mean-variance models will be presented. The first one studies constraints on the wealth process and trading strategies simultaneously, which is solved by stochastic control theory as well as matrix optimization techniques; while the other one takes background risk into consideration (formulating a robust model) and then is tackled by quantile optimization techniques.

Intertemporal optimal portfolio choice based on labor income within shadow costs of incomplete information and short sales

Detao Zhang, School of Economics, Shandong University

Abstract

This paper examines the optimal portfolio choice in the presence of risky labor income, retirement horizon and shadow costs of incomplete information and short sales. The optimal allocation to stocks is larger for employed investors than for retired investors within idiosyncratic labor income risk, incomplete information and short sales. Investors' willingness to save is increased when increasing idiosyncratic labor income risk in the presence of incomplete information and short sales, while it is decreased when retired investors still keep partial of their income flow. Hence, they reduce their stock portfolio allocation towards the level of retired investors. The presence of a positive correlation between labor income and stock returns reduces stockholdings below the level of retired investors within the assumptions of the existence of shadow costs of incomplete information. Our results generalize previous findings in the literature by accounting for the additional impact of information costs and short sales constraints. This paper is a joint work with Professor Mondher Bellalah and Dr. Yaosheng Xu.