上海财经大学 数学学院

概率论与数理金融研讨会

会议手册

主办单位：

中国工业与应用数学学会金融数学与工程和精算保险专业委员会

上海财经大学数学学院

中国 上海 2024 年 4 月 19 日

会议组织

会议组织者

徐定华（上海财经大学数学学院）

何萍（上海财经大学数学学院）

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资助单位

上海财经大学数学学院、国家自然科学基金委员会

位置信息

报到时间地点

4 月 18 日 上海粤海酒店

4 月 19 日 上海财经大学数学学院 红瓦楼 726 室

会议地点

上海财经大学数学学院 红瓦楼 726 室

住宿安排

上海粤海酒店 地址：虹口区逸仙路 328 号，电话：21-55589888

用餐

早餐：酒店提供；午餐：会议工作餐

交通信息

会议日程

2024/4/19（五）	报告人
Session 1 (9:00~9:45) 主持：曾旭东	池义春，中央财经大学中国精算研究院
合影、中间休息	
Session 2 (10:15~11:45) 主持：马俊美	赵慧，天津大学数学学院 钱晓松，苏州大学金融工程研究中心
午休	
Session 3 (13:30~15:00) 主持：何萍	黄兴，天津大学数学学院 吕吴俊，东华大学理学院
中间休息	
Session 4 (15:30~17:00) 主持：马俊美	博士生报告 王英立，上海财经大学数学学院 王辰，上海财经大学数学学院
Session 5 (17:00~18:00)	自由讨论

题目及摘要：（按报告顺序）

池义春，yichun@cufe.edu.cn

Optimal risk management with reinsurance and its counterparty risk hedging

In this talk, we revisit the study of an optimal risk management strategy for an insurer who wants to maximize the expected utility by purchasing reinsurance and managing reinsurance counterparty risk with a default-free hedging instrument, where the reinsurance premium is calculated by the expected value principle and the price of the hedging instrument equals the expected payoff plus a proportional loading. Different to previous studies, we exclude ex post moral hazard by imposing the no-sabotage condition on reinsurance contracts and derive the optimal strategy analytically. We find that the stop-loss reinsurance is always optimal, but the form of the optimal hedging payoff depends on the cost difference between reinsurance and hedging instrument. We further show that full risk transfer is optimal if and only if both reinsurance pricing and the hedging price are fair. Finally, numerical analyses are conducted to illustrate the effects of some interesting factors on the optimal risk management strategy.
(This is a joint work with Tao Hu and Yuxia Huang.)

赵慧，zhaohuimath@tju.edu.cn

Time-consistent Open-loop Solutions for Linear Quadratic Stackelberg Differential Games and Its Application in Pension Management

This paper formulates a general time-inconsistent linear quadratic mean-field Stackelberg differential game. We define the equilibrium strategies for the follower and the leader, which are two open-loop controls. The sufficient conditions for equilibrium controls are derived via two flows of forward-backward stochastic differential equations. Finally, we consider a stackelberg game between a pension manager and policy holders as an application. Applying the general sufficient condition, we obtain explicit equilibrium strategies for the pension manager and policy holders.

钱晓松，qianxs@suda.edu.cn

Indifference price of defaultable claims under relative performance criteria

This paper studies an equilibrium indifference pricing problem within the framework of an n-agent game and the corresponding mean field game. Our focus lies in examining portfolio optimization problems under relative performance criteria for investors possessing CDSs and the underlying defaultable bonds. Based on the constant Nash equilibrium result of the portfolio games, we derive the explicit formulas of indifference prices of defaultable bonds and CDSs and we investigate the impact of risk aversion and competitive attitude on the indifference prices. Finally, in a bond market without CDS, we offer insights into the formation of market equilibrium prices of defaultable bonds utilizing indifference pricing approach and market-clearing condition.

黄兴，xinghuang@tju.edu.cn

Long Time Propagation of Chaos in Total Variation Distance for Mean Field Interacting Particle System

In this paper, the long time quantitative convergence in total variation distance for mean field interacting particle system is investigated, where the initial distribution of interacting particle system converges to that of the limit equation in L^1-Wasserstein distance. Moreover, by using the method of coupling, the results are applied in Brownian motion and $\alpha(\alpha>1)$ stable noise case.

吕吴俊，lvwujun@dhu.edu.cn

GLOBAL SOLUTIONS TO STOCHASTIC BURGERS EQUATIONS WITH FRACTIONAL NOIS

This paper considers the stochastic coupled nonlinear Burgers equations driven by a cylindrical Brownian motion with Hurst parameter H>1/4. Initially, we establish the regularities of the solution to the linear stochastic problem corresponding to the stochastic Burgers equations. Subsequently, we obtain the existence and uniqueness of the global solution for the stochastic Burgers equations. Our approach primarily relies on a maximum principle of deterministic parabolic equations to overcome the difficulties arising from higher-order norms.

王英立，20223101119@163.sufe.edu.cn

On the Limiting Behavior of the INAR(\infty) Process: Precise Deviations and Scaling Limits

The INAR(\infty) process, as a discrete-time version of the Hawkes process, exhibits many similar properties to its continuous-time counterpart. This report delves into the limiting behavior of the INAR(\infty) process, dividing the discussion into two main research outcomes. Firstly, we apply the mod-phi convergence theory to demonstrate the precise deviations of the INAR(\infty) process, including precise large and precise moderate deviations. This is a joint work with my advisor Prof. Ping He.
Secondly, we explore the scaling limits of heavy-tailed nearly unstable INAR(\infty) processes, proving that they can be characterized through the integration of a fractional-order CIR process. This is a joint work with Dr. Chunhao Cai and my advisor Prof. Ping He.

王辰，wangchen0092@126.com

Local and Global Quadratic Hedging under GARCH Models via Willow tree

GARCH models have risen in popularity for modeling and valuing financial instruments in discrete time. We introduce a new lattice method, the Willow Tree (WT) method, designed for both affine and non-affine GARCH models. The WT method offers versatility, being applicable to LRM and GRM under the physical measure. Additionally, unlike other lattice methods, the WT method imposes no restrictions on the GARCH parameters, making it easily adaptable to parameters calibrated from real data. Furthermore, the WT method exhibits high accuracy while demanding significantly less computational time compared to the Monte Carlo (MC) method. Lastly, owing to its lattice structure, the WT method extends its applicability to pricing path-dependent derivatives and effectively handling financial problems involving optimal stopping times.