



THE HONG KONG UNIVERSITY OF SCIENCE & TECHNOLOGY

Department of Mathematics **Department of Industrial
Engineering & Decision Analytics**

**JOINT SEMINAR
ON FINANCIAL MATHEMATICS**

**A Framework of State-dependent Utility
Optimization with General Benchmarks**

by

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Abstract

Benchmarks in the utility function have various interpretations, including performance guarantees and risk constraints in fund contracts and reference levels in cumulative prospect theory. In most literature, benchmarks are a deterministic constant or a fraction of the underlying wealth variable; thus, the utility is still a function of the wealth. In this paper, we propose a general framework of state-dependent utility optimization with stochastic benchmark variables, which includes stochastic reference levels as typical examples. We provide the optimal solution(s) and investigate the issues of well-definedness, feasibility, finiteness, and attainability. The major difficulties include: (i) various reasons for the non-existence of the Lagrange multiplier and corresponding results on the optimal solution; (ii) measurability issues of the concavification of a state-dependent utility and the selection of the optimal solutions. Finally, we show how to apply the framework to solve some constrained utility optimization problems with state-dependent performance and risk benchmarks as some nontrivial examples.

Biography

Yang Liu (刘杨) is an assistant professor in financial mathematics in the School of Science and Engineering (SSE) at The Chinese University of Hong Kong, Shenzhen (CUHKSZ). Before this, he was a postdoc in the Department of Management Science and Engineering at Stanford University and a postdoc in the Department of Statistics and Actuarial Science at the University of Waterloo. He received his doctoral and bachelor's degrees in mathematics at Tsinghua University. His research area includes financial mathematics, actuarial science, operations research, and applied probability. He has published articles in leading journals such as *Mathematical Finance*, *Finance and Stochastics*, and *SIAM Journal on Control and Optimization*.

Date : 24 April 2024 (Wednesday)

Time : 10:30a.m.-11:30a.m.

Venue : Room 5501 (Lifts 25/26)

All are Welcome!