

Department of Systems Engineering and Engineering Management

Seminar Series

Distributionally Robust Shortfall Risk Optimization Model and Its Approximation

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Date	10 November 2017 (Friday)
Time	3:00pm - 4:00pm
Venue	P7303, Yeung Kin Man Academic Building (AC1)

Abstract

Utility-based shortfall risk (SR) measure is proposed by Follmer and Schied (2002) and has received increasing attention over the past few years for its potential to quantify more effectively the risk of large tail losses than conditional value at risk. In this talk, we revisit the subject by considering a situation where the true probability distribution is unknown but it is possible to obtain some partial information through empirical data, subjective judgements or computer simulation to identify a range (ambiguity set) containing or approximating the true probability distribution.

We propose a distributionally robust version of the shortfall risk (DRSR) measure where the worst distribution from the ambiguity set is used to evaluate the SR. It is shown that the DRSR is a convex risk measure and under some special circumstance a coherent risk measure.

As an application, we consider an optimization problem with the objective of minimizing the DRSR of a random function and investigate numerical tractability of the optimization problem with the ambiguity set being constructed in various ways including moment conditions, phi-divergence, Kantorovich metric and

mixture distribution. We demonstrate that under some specific circumstances where the loss function is piecewise linear and convex, the resulting robust optimization problems are numerically tractable.

Some approximation schemes for the ambiguity set are proposed for general cases and error bounds are derived under the Kantorovich metric. Quantitative convergence of the optimal values of the approximation problems is consequently established under moderate conditions. Some preliminary numerical test results are reported for the proposed modelling and computational schemes.

About the Speaker

Huifu Xu is a Professor of Operational Research in the School of Mathematical Sciences, University of Southampton. He obtained a BSc degree and MSc degree in computational mathematics from Nanjing University, China in 1980s. He worked at Ningbo University for a few years before moving to Australia to obtain a PhD degree in numerical optimization at University of Ballarat in 1996. Following three years postdoctoral research at Australian Graduate School of Management, he became a lecturer and then senior lecturer at the University of Southampton. His recent research is focused on decision making under uncertainty including stochastic optimization and distributionally robust optimization. He is currently the director of the Centre for Operational Research, Management Science and Information Systems (CORMSIS) <https://www.southampton.ac.uk/cormsis/>.

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