

國立政治大學應用數學系演講

Department of Mathematical Sciences, National Chengchi University

Speaker: 鄧惠文副教授 (國立交通大學財務金融研究系)

Title: On accelerating Monte Carlo integration using orthogonal projection

Time: 16:10 - 17:00, Monday, December 28, 2020

Venue: Room 070221, 2F, Zhi Xi Building(志希樓 2 樓 e 化教室)

Refreshment: Refreshments will be served in the Faculty Lounge 30 minutes before the talk.

Abstract

Monte Carlo integration is an indispensable tool in calculating high-dimensional integrals, but it is notoriously known for its slow convergence. Variance reduction techniques seek alternative unbiased estimators having less variances than the standard estimator. However, the amount variance reduction of a specific variance reduction method is difficult to obtained theoretically. To solve this problem, this paper first uses the concepts of orthogonal projections and groups to analyze the amount of variance reduction and efficiency. Second, a novel variance reduction technique, called the projection estimator associated with a group of symmetries of the probability measure, is proposed. An interesting result is provided that the average variance and efficiency ratio is related to the cardinality of the group and the dimensions of the function spaces and projected function. We provide a variety of examples to confirm our theoretic claims, and apply the projection estimator to price the Asian option under GARCH model. This is a joint work with Ming-Hsuan Kang at National Chiao Tung University.