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The Hong Kong University of Science and Technology

Department of Mathematics

Seminar on Applied Mathematics

**Moment Matching Machine Learning Methods for Risk
Management of Large Variable Annuity Portfolios**

by

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Abstract

Variable annuity (VA) with embedded guarantees have rapidly grown in popularity around the world in recent years. Valuation of VAs has been studied extensively in past decades. However, most of the studies focus on a single contract. These methods can be extended neither to value nor to manage the risk of a large variable annuity portfolio due to the computational complexity. In this paper, we propose an efficient moment matching machine learning method to solve this problem. This method is proved to be a good candidate for risk management in terms of the speed of and the complexity of computing the annual dollar deltas, VaRs and CVaRs for a large variable annuity portfolio whose contracts are over a period of 25 years. There are two stages for our method. First, we select a small number of contracts and propose a moment matching Monte Carlo method based on the Johnson curve, rather than the well known nested simulations, to compute the annual dollar deltas, VaRs and CVaRs for each selected contract. Then, these computed results are used as a training set for well known machine learning methods, such as regression tree, neural network and so on. Afterwards, the annual dollar deltas, VaRs and CVaRs for the entire portfolio are predicted through the trained machine learning method. Compared to other existing methods, our method is very efficient and accurate. Finally, our test results support our claims.

Date: Thursday, 23 November 2017

Time: 2:00p.m. – 3:00p.m.

***Venue: Room 5506, Academic Building
(near Lifts 25 & 26), HKUST***

All are welcome!