THE UNIVERSITY   **OF HONG KONG**

Institute of Mathematical Research
Department of Mathematics

COLLOQUIUM

Changes of reference probability measures in the valuation of an investment guarantee and calibration of HMMs

Rogemar S. Mamon

Faculty Scholar and Professor
University of Western, Ontario, Canada

Abstract

The global insurance markets have become more sophisticated in recent years in response to the evolving needs of populations that tend to live longer. Policy holders now desire the benefits of longevity/mortality protection whilst taking advantage of investment growth opportunities in the equity markets. As a result, insurers incorporate payment guarantees in the design of new insurance products. These products come in the form of equity-linked contracts, whose values are dependent on the prices of risky assets, and they provide a guaranteed minimum maturity benefit (GMMB). We develop an integrated pricing framework for a GMMB focusing on segregated fund contracts. In particular, we construct hidden Markov models (HMMs) for the dynamics of a stock index, interest rate and mortality rate. The dependence between these risk factors are characterised explicitly. We assume that the stock index follows a Markov-modulated geometric Brownian motion whilst the interest and mortality rates are governed by Markov-driven affine models. A series of measure changes is employed to obtain a semi-closed form solution for the GMMB price. The Fourier-transform method is applied to numerically approximate the prices more efficiently. Recursive HMM filtering is used in our model calibration. Numerical investigations in our paper demonstrate the accuracy of GMMB prices and an extensive analysis is included to examine systematically how the risk factors affect the value of a GMMB.

Date:	**July 8, 2019 (Monday)**
Time:	**3:00 – 4:00pm**
Venue:	**Room 210, Run Run Shaw Bldg., HKU**

All are welcome