Atelier de recherche du laboratoire ACT&RISK

Titre : Modeling Winning Streaks in Financial Markets and Sample Recycling Method for Nested Stochastics

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Date : Mercredi 8 mai 2019, à 15h
Lieu : Université Laval, Pavillon Paul-Comtois, Local CMT-3102

Résumé

I will present two different topics both arising from the study of equity-linked insurance. However, both extend beyond insurance modeling.

Topic 1: A new class of stochastic processes, termed sticky extrema processes, is proposed to model common phenomena of winning and losing streaks in financial markets including equity, commodity, foreign exchange, etc. Most stochastic process models for financial market data in the current literature focus on stylized facts such as fail tailedness relative to normality, volatility clustering, mean reversion, etc. However, none of existing financial models captures a frequently observable extrema clustering feature that most financial indices often report record high or low in concentrated periods of time. The lack of extrema clustering feature in a stochastic model for asset valuation can have a grave impact on the pricing and risk management of path-dependent financial derivatives. Especially those with payoffs dependent on optimal (maximum or minimum) underlying market values can be severely misestimated.

Topic 2: Nested stochastic modeling has been on the rise in many fields of the financial industry. Nested stochastic models refer to stochastic models embedded inside other stochastic models. Examples can be found in principle-based reserving for long term insurance liabilities. Reserves and capitals for interest and market risk sensitive financial products are often determined by stochastic valuation. In the projection of cash flows, further simulations are necessary to evaluate risk management action, such as a hedging program, at each point of time. The computational demand grows exponentially with the layers of nested stochastic modeling and points of evaluation. Most of existing techniques to speed up nested simulation are based on curve fitting, which is to establish a functional relationship between inner loop estimator and economic scenarios and to replace inner loop simulations with the fitted curve. This work presents a non-conventional approach, termed sample recycling method, which is to run inner loop estimation for a small set of outer loop scenarios and find estimates under other outer loop scenarios by recycling inner loop paths. This new approach can be very efficient when curve fittings are difficult to achieve.

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