Non Linear Valuation accounting for Initial and Variation Margins (IniVarMargin)

Supervised by S. De Marco and E. Gobet
Ecole Polytechnique and Chaire Risques Financiers
Project CEMRACS 2017

The paradigm of linear risk-neutral pricing rules of financial contracts has changed in the last years, influenced by the regulators, and nowadays banks and financial institutions have to cope with posting collateral to a clearing house in order to secure their positions.

Everyday, the clearing house requires that each member posts a certain capital, reflecting the exposure of their OTC contracts. The initial margin and variation margins correspond to posting a collateral in order to, respectively, cover a new trade, or cover the daily change in market value of the contract. Under some simplifying modeling assumptions, the problem boils down, as a first approximation, to a linear pricing equation depending on the interest rate proposed by the clearing house.

In this project, we aim at accounting for two non-linear phenomena that occur in practice. First, the variation margins are submitted to thresholds, in the sense that these margins are not required when daily adjustments are too small: this leads to a non-linear pricing equation taking the form of a Backward Stochastic Differential Equation with a small non-linear term. Second, the deposit can depend also on the VaR of the portfolio projected over 10 days, giving rise to an equation including a McKean-type term (a term that depends on the law of the solution). The aim of this project is to develop and test advanced computational methods (perturbation methods, regression Monte-Carlo, interacting particle systems, branching processes) to tackle these two issues.

This project is funded by Chaire Risques Financiers (Ecole Nationale des Ponts et Chaussées, Ecole Polytechnique, Société Générale, Université Pierre et Marie Curie) from the Risk Foundation.

References


