Data-driven regression Monte Carlo

Emmanuel Gobet

(in collaboration with Gang Liu[1] and Jorge Zubelli[2])

Centre de Mathématiques Appliqués, Ecole Polytechnique, Paris-Saclay University, 91128 Palaiseau cedex, France

Our goal is to solve certain dynamic programming equations associated to a given Markov chain X, using a regression-based Monte Carlo algorithm. This type of equation arises when computing price of American options or solving non-linear pricing rules. More specifically, we assume that the model for X is not known in full detail and only a root sample of size M of such process is available. We are investigating a new method that by-passes the calibration step. By a stratification of the space and a suitable choice of a probability measure ν, we design a new resampling scheme that allows to compute local regressions (on basis functions) in each stratum. The combination of the stratification and the resampling allows to compute the solution to the dynamic programming equation (possibly in large dimensions) using only a relatively small set of root paths. To assess the accuracy of the algorithm, we establish non-asymptotic error estimates in $L_2(\nu)$. Our numerical experiments illustrate the good performance, even with $M = 20$ - 40 root paths.

References

[1] Gobet E., Liu G. and Zubelli J. A non-intrusive stratified resampler for regression Monte Carlo: application to solving non-linear equations *Preprint hal-01291056*, 2016.