

Adaptive Multilevel Stochastic Approximation of the Value-at-Risk and Expected Shortfall

Azar Louzi

LPSM, CNRS, Université Paris Cité

`louzy@lpsm.paris`

Coauthor(s): Stéphane Crépey, Noufel Frikha, Jonathan Spence

[1] introduces a multilevel stochastic approximation algorithm to compute the value-at-risk and the expected shortfall of a given financial loss that can only be simulated by a nested Monte Carlo. For a prescribed accuracy $\varepsilon > 0$, this algorithm achieves an optimal complexity of order $\varepsilon^{-2-\delta}$, where $\delta > 0$ is a parameter depending on the integrability degree of the loss. We extend this work by leveraging an adaptive Monte Carlo technique in order to further reduce the optimal complexity of such an algorithm to an order of $\varepsilon^{-2} |\ln \varepsilon|$ on average.

- [1] Crépey, Stéphane, Noufel Frikha, & Azar Louzi (2023). A multilevel stochastic approximation algorithm for value-at-risk and expected shortfall estimation.