
Deep BSDE method for Quantile Hedging

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Abstract

We consider the popular Deep BSDE method of E-Han-Jentzen and tailor it to the quantile hedging problem in the weak stochastic target framework initiated by Bouchard–Élie–Touzi and Bouchard–Élie–Réveillac. The success probability state is modeled as a constrained martingale with square integrable unbounded controls. We combine piecewise constant controls with a projected Euler time discretization and an endogenous stopping rule to preserve the constraint, yielding an implementable discrete time control problem. Within the policy timestep framework of Krylov - Jakobsen–Picarelli–Reisinger , we provide a convergence study tailored to the state constraint and unbounded controls.

Unlike previous works that focus mainly on pricing, our approach outputs both the value function and the associated quantile hedging strategy within the same solver. On classical benchmarks, numerical experiments are consistent with the Föllmer–Leukert results and confirm the accuracy and interpretability of the method. This is a joint work with Cyril Bénézet and Sergio Pulido.

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