

## Abstract: "A primal-dual algorithm for backward SDEs"

Numerical methods for backward stochastic differential equations (BSDEs) typically consist of two steps. In a first step a time discretization is performed, which leads to a backward dynamic programming equation. In the second step this dynamic program has to be solved numerically. This second step requires to approximate high order nestings of conditional expectations, which is a challenging problem in particular when the BSDE is driven by a high-dimensional Brownian motion. In this talk we present a method to construct confidence intervals on the value of the dynamic program, and hence on the solution of the time-discretized BSDE. This method generalizes the primal-dual approach, which is popular and well-studied for Bermudan option pricing problems. In a nutshell, the idea is to derive a maximization problem and a minimization problem such that the value process of both problems coincides with the solution of the dynamic program and such that optimizers can be represented in terms of the solution of the dynamic program. Using an approximate solution to the dynamic program, which can be precomputed by any algorithm, then leads to ‘close-to-optimal’ controls for these optimization problems and to ‘tight’ lower and upper bounds for the time-discretized BSDE, provided that the algorithm for constructing the approximate solution was ‘successful’. We illustrate the method numerically for several nonlinear option pricing problems, which can be formulated in terms of BSDEs.

The talk is based on joint work with N. Schweizer, J. Zhuo, and C. Gärtner.