Jean-François CHASSAGNEUX
Département de mathématiques
Université d'Evry-Val-d'Essonne

Numerical approximation of BSDEs

In this course, we present the main results concerning the approximation of Backward Stochastic Differential Equations (BSDEs) and Reflected BSDEs. In Finance, these equations are linked to the pricing and hedging of European and American contingent claims.
This is the practical part of J.P. Lepeltier's theoretical course on BSDEs.

1) Introduction - some applications of BSDEs:
We first recall here the link between BSDEs and the pricing and hedging problem in Finance. Secondly, we present the link between BSDEs and PDEs, by proving a non-linear Feynman-Kac formula.

2) Euler schemes for BSDEs under Lipschitz condition:
We give here the definition of the main schemes used to discretize BSDEs. Before presenting the convergence results, we study the regularity of the solution of the BSDEs.

3) Approximation of Reflected BSDEs:
We first give some applications of Reflected BSDEs in finance. We then present a discrete-time approximation scheme for Reflected BSDEs and study the convergence of the scheme.

4) Implementation in practice:
We review some methods to compute the conditional expectation involved in the discretization scheme.

5) Extensions:
a word on: BSDEs with non-Lipschitz terminal condition, higher order discretization scheme or quadratic BSDEs.