First Banco Santander Financial Engineering School

Centre de Recerca Matemàtica, Barcelona.

XVA Analysis

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Since 2008, investment banks compute various X-valuation adjustments (XVAs) to assess counterparty risk and its funding and capital implications. XVAs deeply affect the derivative pricing task by making it global (portfolio-wide), nonlinear, and entity dependent. A proper financial understanding of even first generation XVAs (CVA, DVA, and FVA, where C sits for credit, D for debt, and F for funding) points out to the notion of shareholder valuation, which mathematically goes to enlargement of filtration (or singular probability change). Second generation XVAs involve not only conditional expectations (i.e. prices), but also conditional risk measures (value-at-risk and expected shortfall) for MVA (margin valuation adjustment) and KVA (capital valuation adjustment) computations. The course will provide an up-to-date covering of the XVA universe for both bilateral and centrally cleared portfolios, from the triple angle of finance (wealth transfers), stochastic analysis (enlargement of filtration and backward SDEs), and computations (nested Monte Carlo and nonparametric neural net regressions).

Outline:

1 The XVA cost-of-capital approach in a static setup
2 The XVA cost-of-capital approach in continuous time
3 XVA metrics for bilateral trade portfolios
4 Path-wise XVAs computational strategies
5 XVA metrics for centrally cleared portfolios

References:

1. S. Crépey. Positive XVAs. **Working paper**, 2021
2. C. Albanese, S. Crépey, R. Hoskinson, and B. Saadeddine. XVA analysis from the balance sheet. **Quantitative Finance** 21 (1), 99-123, 2021.
3. C. Albanese, Y. Armenti, and S. Crépey. XVA metrics for CCP optimization. **Statistics & Risk Modeling** 37(1-2), 25–53, 2020.

Also: Part IV (mainly) of

4. S. Crépey and T. Bielecki (with an introductory dialogue by D. Brigo). **Counterparty Risk and Funding–A Tale of Two Puzzles**. Chapman and Hall / CRC, Financial Mathematics Series, 2014.

and more related material on **https://www.lpsm.paris/pageperso/crepey/**

Prerequisites:

Stochastic analysis, mathematical finance, and numerical finance (including basic machine learning skills) at a good MSc level. Some knowledge of corporate finance is also useful but will be recalled during the course.

Functioning and practical organization: *(previsional)*

Beamer slides that will be distributed after the course.