



## **Spring School on XVA modeling - A Pricing Framework for Valuation Adjustments**

Here, we report on the first ABC-EU-XVA Event. The Spring School took place in Bologna (Italy) at the Department of Mathematics, on May 16-17, 2019. The invited speakers of the school were Andrea Pallavicini (Banca IMI and Imperial College, London) and Marco Francischello (Imperial College, London).

The aim of the school was to provide self-contained lectures on XVA modeling. Besides the ESRs, the school was open to a limited number (30) of academics and researchers as well as practitioners and business people.

The school gave a detailed analysis of the valuation of derivative products in presence of default risk, collateral agreements, funding costs, and capital constraints. The courses offered both a theoretical and an applied perspective, developing a pricing framework and showing its applications and links with the current market practices regarding valuation adjustments.

Starting from credit and default risk, the concepts of Credit and Debt Valuation Adjustments (CVA and DVA) were introduced. Collateralization as a natural way to reduce default risk was discussed and applications of our valuation framework to Wrong Way Risk and Gap Risk were shown.

To make models more realistic, funding costs and the associated Funding Valuation Adjustment (FVA) were introduced. The lecturers discussed the funding strategies available to an investment bank and highlighted the economic arguments behind the FVA. Furthermore, the framework was linked to different market practices regarding discount rates and netting sets evaluation. Finally, Backward Stochastic Differential Equations were derived from the valuation equation and some numerical implementations were presented.

The courses also illustrated how initial margins and capital constraints influence the valuation of derivative products. The last part dealt with initial margins and their role in the valuation of a derivative product and their relation with the Margin Valuation Adjustment (MVA). Pallavicini showed a model for regulatory capital constraints and how banks alter their investment decisions to abide to these constraints. Finally, he illustrated how the model gives a novel interpretation to what the industry calls Capital Valuation Adjustment (KVA).

### **Course Program**

- **An overview of valuation adjustments**
  - Counterparty credit risk: a bilateral tale
  - Collateral procedures
  - Funding costs and non-linear pricing
  - Capital charges and regulatory impacts



- **Arbitrage-free asset pricing in presence of counterparty credit risk**

- Securities, derivatives and trading strategies
- Perfect collateralization approximation
- Numerical applications to Wrong Way Risk
- Numerical applications to Gap Risk

- **Funding costs and treasury policies**

- Martingale pricing with funding costs
- Accounting of funding adjustments
- Numerical investigations on FVA
- Numerical investigations on differential rates and close-out impact

- **Additional impacts**

- Initial margins in bilateral, centrally cleared contracts
- Capital constraints
- Numerical applications to MVA
- Numerical applications to KVA

**Andrea Pallavicini** is the head of equity, FX and commodity models at Banca IMI, Milan, and visiting professor at the Department of Mathematics of Imperial College, London. He holds a Ph.D. in Theoretical and Mathematical Physics from the University of Pavia for his research activity at CERN. Over the years he published several papers in financial modelling, theoretical physics and astrophysics. He is the author of the books "Credit Models and the Crisis: a journey into CDOs, copulas, correlations and dynamic models", Wiley (2010), and "Counterparty Credit Risk, Collateral and Funding with pricing cases for all asset classes", Wiley (2013).

**Marco Francischello** is Research Assistant of Mathematical Finance at Imperial College London, after having studied there for his PhD under the supervision of Prof. Damiano Brigo. His research focuses on how to incorporate market imperfections such as default risk, funding costs, collateral agreements, and capital constraints into the valuation of derivative products.



Some photos regarding the Bologna Spring School:

