



The Hong Kong University of Science and Technology

Department of Mathematics

Seminar on Financial Mathematics

Value Adjustments for Derivatives Prices

by

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ABSTRACT: Since the financial crisis of 2008, it has become imperative for practitioners to include in derivatives prices the cost of funding and counter party risk. This is mainly handled by adding so-called "value adjustments" (XVAs) to derivative prices. In the current talk, we will give an overview on value adjustments and present a unified, replication-based framework based on for computing the total valuation adjustment of a European claim accounting for funding costs, counterparty credit risk, and collateralization. Based on no-arbitrage arguments, we derive backward stochastic differential equations (BSDEs) associated with the replicating portfolios of long and short positions in the claim. This leads to the definition of buyer's and seller's XVA, which in turn identify a no-arbitrage interval. In the case that borrowing and lending rates coincide, we provide a fully explicit expression for the unique XVA, expressed as a percentage of the price of the traded claim, and for the corresponding replication strategies. In the general case of asymmetric funding, repo and collateral rates, we study the semilinear partial differential equations (PDE) characterizing buyer's and seller's XVA and show the existence of a unique classical solution to it. We present numerical results how funding costs, repo rates, and counterparty risk contribute to determine the total valuation adjustment. If time permits, we will also discuss how one can account in this framework for the possibility of financial crises and their effects due to freezing repo markets.

Bio: Stephan Sturm is Associate Professor of Mathematical Sciences at Worcester Polytechnic Institute (WPI) in the US and currently Adjunct Associate Professor in Systems Engineering & Engineering Management at the Chinese University of Hong Kong. After obtaining his PhD in Mathematics from TU Berlin (Germany), he became a Postdoctoral Research Associate and Lecturer at the Department of Operations Research and Financial Engineering at Princeton University (USA) before joining WPI as faculty member. Sturm's research covers mainly different areas of financial mathematics, but he is interested in stochastic modeling in general, such as applications to climate science. In finance, his work is devoted in particular in questions of value adjustments for derivative securities (XVAs), optimal portfolio selection and systemic risk in financial markets.

Date: ***Thursday, 17 October 2019***

Time: ***4:30pm – 5:30pm***

Venue: ***LT E, Academic Building
(near Lift 22), HKUST***

All are welcome!