

Polytechnic Institute of New York University

[Name of Department]

Course Outline [6491] [Credit Derivatives and Credit Risk]

[Q4] [2015]

Professor Frederic Siboulet

Monday 18:00 EST ; [Building], [Room #]

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Office hours: by appointment

Course Pre-requisites

Basic understanding of interest rates, stochastic calculus, and simple derivative pricing (e.g. Black and Scholes).

Course Description

The course gives a high level understanding of credit instruments, from a qualitative and quantitative point of view, and specifically for credit derivatives and credit risk. It introduces structural and intensity models, structured products, how credit is priced and risk managed in a deterministic and stochastic framework. Also explain the roles of market participants, the new market structure with margining, RWA and CVA, and the clearing of derivatives.

Course Objectives

Understanding the world of credit, market participants, their roles, instruments from simple corporate bonds or credit default swaps to complex structured products.

Ability to price credit derivatives with Merton and intensity models

Course Structure

Structured presentations and class discussion in and around the presentation flow

Readings

The required text for the course is:

- Text book: Philipp Schonbucher, Credit Derivatives Pricing Models.

An optional and recommended text is:

- Paul Wilmott, on Quantitative Finance 3 Volume Set (2nd Edition)
- Paul Wilmott Frequently Asked Questions in Quantitative Finance (Wiley 2009)

Course requirements

- Class presentation provided ahead of the class, brief reading recommended
- Three or four homework assignment in group (50%)
- Final individual assignment (50%)
- Assignment include
 - o Team work,
 - o MS-Word/Latex/MathType report writing
 - o Limited and easy programing (recommended Matlab or Mathematica, or any other student preference)

Grading

Open book project and report; Excel or basic programming skills for a small credit risk example. Possibility to use Matlab, R or Mathematica, or others such as C++ for the enthusiasts.

Course Content

Introduction to Credit and Credit Risk: role of issuers and buyers, protection buyers and sellers, Rating agencies. Instrument and their pricing, specifically corporate bonds and credit default swaps (CDS), Total Return Swaps (TRS), credit spread options (CSO), indices (iTraxx and CDX), credit linked notes (CLN) and collateral debt obligations (CDO). Credit Risk modeling: expert systems, rating systems (Moody's, S&P, Fitch), credit scoring (Altman's Z-score) Qualitative and quantitative review and comparison of "Structural" and "Intensity" models (Merton, Black & Cox, Jarrow & Turnbull, Duffie & Singleton).

Quantitative methods: Probability of Default (PoD) and Survival, Recovery Rate (RR), Loss Given Default (LGD). Application to pricing IPOs and corporate recapitalization.

Understanding an exploration of Credit Value Adjustment (CVA), Debt Value Adjustment (DVA), Funding Value Adjustment (FVA), including Expected Exposures (EE) and Potential Future Exposure (PFE), Right and Wrong Way Risk (WWR), Basle II & III and the new regulation on integrated market and credit risk.

Pricing of credit instruments, such as CDS, Basket CDS, CDO. Introduction to Poisson process and application to credit intensity models. Risk neutral valuation, risk neutral expectation of present value of expected pay off in a credit risky context, yield spread, forward rate spread, implied default probability, example of the two factor Vasicek bond pricing equation, exploration of the general affine solution. Introduction to Copulas and their application to structured finance, specifically CDOs. Understanding of correlation and dependence.