IEOR E4731 : CREDIT DERIVATIVES

An introduction to credit risk modeling and pricing models for credit derivatives

General Course Information:
Thursday 09:10A-11:40A  
Classroom: MUDD 303

Instructor Information:
Rama Cont  
Office Address: Mudd 316  
E-mail: Rama.Cont@columbia.edu

Teaching assistant :

Course description
Credit risk is a fundamental component of the risk of financial institutions. Since the mid 1990s, a new class of financial instruments -credit derivatives- has been introduced in order to allow to transfer and hedge credit risk. This course is an introduction to quantitative modeling of credit risk, with a focus on the pricing of credit derivatives. The first part of the course will focus on the pricing of single-name credit derivatives (namely credit default swaps), while the second part will mainly focus on Collateralized Debt Obligations (CDOs).

OUTLINE of topics covered in this course:

1. Default risk and credit risk  
2. Common indicators of credit risk: credit spreads, credit ratings, recovery rates.  
3. Credit derivatives and the securitization of credit risk.  
4. Arbitrage pricing and martingale methods in pricing theory.  
5. Default times, survival probabilities and hazard rates. Stopping times and intensities.  
8. Reduced form models for single-name credit risk. Poisson processes and Cox processes.  
10. Collateralized Debt Obligations (CDOs) I : definitions, cash flow structure and basic arbitrage relations.  
11. Collateralized Debt Obligations (CDOs) II : the Gaussian copula model.  
12. Collateralized Debt Obligations (CDOs) III : factor models and copulas.  
13. Multi-name default barrier models.  
14. Multi-name reduced form models: stochastic intensity models.  
15. The top-down approach : modeling portfolio loss distributions.
Prerequisites
IEOR E4701: Stochastic Models for Financial Engineering (or an equivalent course on stochastic processes)

IEOR E4707: Financial Engineering: Continuous-Time Asset Pricing

Students following the course shall be assumed to be familiar with basics of option pricing theory at the level of the Black Scholes model.

For the second part of the course on continuous-time models, basic knowledge about the Poisson process and Markov chains will be assumed, at the level of IEOR E4701.

References

We will not follow exactly any of the following books but they are useful reading guides:

R Bruyere, R Cont, Ch Jaeck, L Fery (2005): Credit Derivatives and Structured Credit Products, Wiley. 
Especially: Chapter 6.

Especially: Chapter 2.


http://www.defaultrisk.com/ - Web repository of various articles related to credit risk modeling and credit derivatives.