

MATH685R – Credit risk: Models, pricing and implementation (Spring 2005)

Course objective

Credit risk is the most intensely studied topics in quantitative finance in the past few years. With the new BASEL Accord II, banks and financial institutions in Hong Kong are required to build their internal credit monitoring systems starting 2005. This course is directed to those students who would like to acquire an introduction to the modeling aspects of credit risks and the different pricing methods of credit derivatives. The mathematics to understand the structural models and reduced form models will be addressed. The importance of default correlation will be emphasized.

Background knowledge

Prior exposure to the martingale theory of option pricing and mathematical theories on stochastic processes will be very useful.

Class hours and instructor

Monday and Wednesday - 11:00am – 12:20pm

Dr. Kwok Yue-Kuen, Office Room Number: 3447, Tel: 2358-7418; E-mail: maykwok

Textbooks

1. “Credit risk modeling,” David Lando, Princeton University Press (2004).
2. “Credit derivative pricing models”, Philip J. Schonbucher, Wiley (2003).
3. “Credit risk: Modeling, valuation and hedging,” T. Bielecki and M. Rutkowski, Springer (2002).

Course outline

1. Nature of credit risk and credit derivatives
 - 1.1 Default risk and spread risk: credit spread and hazard rate function
 - 1.2 Product nature of credit derivatives – transfer of credit risk
 - 1.3 Bond price based and hedge based pricing of credit derivatives
2. Structural models
 - 2.1 Merton model and its variants: debts as contingent claims
Inter-temporal default, stochastic interest rate
 - 2.2 Industrial implementation: KMV code
 - 2.3 Optimal capital structure and strategic debt service
3. Intensity modeling
 - 3.1 Mathematics of default times and intensity; rating based modeling
 - 3.2 General formulation for pricing defaultable claims
 - 3.3 Modeling of counterparty risks: contagion models
4. Default correlation
 - 4.1 Asset value correlation and intensity correlation
 - 4.2 Copula approach
 - 4.3 Industrial code: Credit Risk+

Grading policy

Two 100-minute tests; 4 homework sets