MAFS521 – Mathematical Models of Investment (Summer 2007)

Course objective
This course is directed to those students who would like to acquire an introduction to the fundamental principles of portfolio theory, capital asset pricing models, factor models and credit derivatives.

Prerequisite and exclusion
No prior knowledge in finance is required. Some knowledge in probability theory will be useful.

Class hours and venue
Class hours: MWF 10:30am – 11:50am and 14:30pm – 15:50pm; Room 4475

Instructor Prof. Kwok Yue-Kuen
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Office hours: 16:30pm - 18:00pm (Monday, Wednesday and Friday, or by appointment)

Reference texts
1. "Introduction to Mathematical Finance," S.R. Pliska.
2. "Finance theory," R.A. Jarrow.
3. "Theory of financial decision making," J. Ingersoll
4. "Credit derivatives pricing models," Philip Schonbucher
5. "Quantitative risk management," A.J. McNeil, R. Frey and P. Embrechts
6. "Credit risk modeling," D. Lando

Course topics
1. Mean-variance portfolio theory
    - Markowitz mean-variance formulation
    - Two-fund theorem
    - Inclusion of a risk free asset: One-fund Theorem
    - Addition of risk tolerance factor
    - Asset-liability model
2. Capital asset pricing model and factor models
    - Capital asset pricing model and beta values
    - Interpretation and uses of the capital asset pricing model
    - Arbitrage pricing theory and factor models
3. Utility theory, risk preference and stochastic dominance
    - Optimal long-term investment criterion – log utility
    - Axiomatic approach to the construction of utility functions
    - Maximum expected utility criterion
    - Characterization of utility functions
    - Choices of a probability distribution on consequences
    - Stochastic dominance
    - Two-asset portfolio analysis

4. Nature of credit risk and credit derivatives
    - Nature of credit risk: Default risk and spread risk
    - Hazard rate function and reduced form approach
    - Product nature of credit derivatives
    - Bond price based and hedge based pricing of credit derivatives
5. Modeling of default correlation
    - Binomial models
    - Copula approach
    - Contagion models