PHYS 85200-SCIENCE OF FINANCE

Lecture: Monday 6:30pm-9:30pm

Location: Graduate Center Rm #8405 (tentative)

Professor: Olympia Hadjiliadis, ohadjiliadis@brooklyn.cuny.edu,

Grading: 30% midterm, 35% project, 35% Final.
Possible topics for projects: The term structure of interest rates and terms structure models, Jump models for asset pricing, the CAPM model, energy and weather derivatives, Measures of risk including value-at-risk and path-dependent measures such as drawdowns, static vs dynamic replication of derivative securities, numerical methods of PDEs how they are used in option pricing, assessment and modeling of credit risk and credit-related instruments. I am also open to your suggestions

A project outline between 1-2 pages should be handed in by February the 28th. The project should be about 6-8 pages. The re will be a 30 minute presentation for each project and questions will follow.

The topics that will be covered are:

Introduction, binomial pricing model Vol I. Chapter 1
Binomial pricing model (contd.), options Vol I. Chapter 1
Discrete cond. expectations and martingales Vol I. Chapters 2.1-2.4
Change of Measure Vol I. Chapters 3.1-3.2
American options in the binomial model Vol I. Chapter 4
American options in the binomial model (contd.) Vol I. Chapter 4
Continuous cond. expectations and martingales Vol II. Chapters 1-2
Brownian motion Vol II. Chapter 3
Brownian motion (contd.) Vol II. Chapter 3
Stochastic integrals Vol II. Chapters 4.2-4.3
It?o formula Vol II. Chapters 4.4
Change of measure, risk-neutral pricing Vol II. Chapters 5.2-5.3
Fundamental theorems of asset pricing Vol II. Chapter 5.4
Partial differential equations Vol II. Chapters 6.2-6.4
Black-Scholes formula Vol II. Chapter 4.5
Exotic options, American options Vol II. Chapters 7-8
Summary of numerical pricing methods
Change of numeraire Vol II. Chapters 9.2-9.3
Bonds and interest rates Vol II. Chapters 6.5, 9.4
Term-structure models Vol II. Chapter 10
Poisson process Vol II. Chapter 11.2
Introduction to credit risk models

The main textbooks used will be - Shreve, S. E. (2004): Stochastic Calculus for Finance I,

Other books used will include:
J. Vecer Stochastic Finance
J. Hull: Options, Futures & other derivative securities (6\textsuperscript{th}, 7\textsuperscript{th} ed.)
S. Shreve: Stochastic Calculus for Finance I and II