STEVENS INSTITUTE OF TECHNOLOGY

FE-680: Advanced Derivatives

Syllabus (Fall 2015)

Instructor:	Dragos Bozdog Office: Babbio 429A Email: dbozdog@stevens.edu Phone: (201) 216-3527
Time:	Friday (10:00am-12:30pm)
Room:	Babbio 319
Office Hours:	By appointment
Objective:	This course will address the practical and theoretical issues for interest rate models and credit models.
Prerequisite	FE 620 – Pricing and Hedging
Required Textbooks:	Antoon Pelsser, *Efficient Methods for Valuing Interest Rate Derivatives*, Springer (ISBN 978-1-85233-304-1) Dominic O'Kane, *Modelling Single-name and Multi-name Credit Derivatives*, Wiley (ISBN: 978-0-470-51928-8)
Other Refererences:	John Hull. *Options, Futures, and Other Derivatives.* 2012. Eighth Edition. Prentice Hall. ISBN: 978-0132164948
Course Outline:	In the first part of the course we will discuss the methodology and principles behind Interest rate models: Hull White , HJM, Markovian HJM models. Mortgage derivatives and prepayment models will be discussed as an application of the interest rates models. Vanilla models SABR, (local volatility and stochastic volatility) Dupire and Gatheral's formula. The second part of the course will be focused on credit models: building discount curves for credit models estimation of default probability and credit spread from equity prices. We will discuss Gaussian copula model, base correlation and CVA.
Grading:	Assignments 40% Midterm 30% Final 30%

	Topic
Week 1	Static curves: Construction of discount factors, zero coupon rates, forward rates. Pricing bonds and interest rates swaps. Bond price sensitivity to interest rates moves(duration, DV01,convexity)
Week 2	Interest Rate Derivatives: The Standard Market Model
Week 3	Interest Rate Derivatives: Models of the Short Rate
Week 4	Interest Rate Derivatives: HJM and LMM
Week 5	Swaps Revisited
Week 6	Vanilla models SABR, (local volatility and stochastic volatility) Dupire and Gatheral's formula.
Week 7	Midterm Exam
Week 8	Mortgage Backed Securities pricing
Week 9	Credit models: Default event and survival probabilities. Risk neutral and realized default probabilities. Cashflows conditional on default and survival probabilities. Forward default intensity curve. Clean par credit curve. Pricing credit default swaps. Survival probability and recovery values.
Week 10	CDO's: introduction, Gaussian copula models, Large portfolio Approximation
Week 11	Base Correlation framework ; Merton's Asset Value Model
Week 12	Counterparty Credit Risk and Credit Value Adjustment
Week 13	Numerical Methods In Finance
Week 14	Final Exam