

STEVENS INSTITUTE OF TECHNOLOGY

FE-680: Advanced Derivatives

Syllabus (Spring 2018)

- Instructor:** Dragos Bozdog
Office: Babbio 429A
Email: dbozdog@stevens.edu
Phone: (201) 216-3527
- Schedule:** FE-680-A
Wednesday (10:00am-12:30pm)
Hanlon Financial Systems Lab (Babbio 4th floor)
- Office Hours:** By appointment
- Objective:** This course will address the practical and theoretical issues for interest rate models, credit models, and hybrid instruments.
- Prerequisite:** FE 620 – Pricing and Hedging
- Textbooks:** Damiano Brigo, *Interest Rate Models - Theory and Practice: With Smile, Inflation and Credit*, Springer Finance (ISBN 978-3662517437)
- Dominic O'Kane, *Modelling Single-name and Multi-name Credit Derivatives*, Wiley (ISBN: 978-0-470-51928-8)
- Other References:** John Hull. *Options, Futures, and Other Derivatives*. 10th Edition. Pearson. (ISBN: 978-0134472089)
- Lixin Wu, *Interest Rate Modeling: Theory and Practice*, Chapman and Hall/CRC Financial Mathematics Series, 1st Edition. (ISBN: 978-1420090567)
- Jan De Spiegeleer, Wim Schoutens, Cynthia Van Hulle, *The Handbook of Hybrid Securities: Convertible Bonds, CoCo Bonds and Bail-In*, Wiley (ISBN: 978-1-118-44999-8)
- 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.
- The second part of the course will be focused on credit models: Default event and survival probabilities. Risk neutral and realized default probabilities, CDS, CDO, Gaussian copula model, base correlation and CVA. Hybrid Securities will be introduced and modeling issues will be discussed.

Grading: Assignments 60%
Final 40%

FE 680 - Course Schedule (Tentative)

	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). Bootstrapping Yield Curve.
Week 2	Interest Rate Derivatives (Convexity, Timing, Quanto Adjustment)
Week 3	Interest Rate Derivatives: The Standard Market Model
Week 4	Interest Rate Derivatives: Models of the Short Rate
Week 5	Interest Rate Derivatives: HJM and LMM
Week 6	No Class (Stevens – Monday Class Schedule)
Week 7	Swaps Revisited
Week 8	Credit models: Default event and survival probabilities. Risk neutral and realized default probabilities. Cash flows conditional on default and survival probabilities. Forward default intensity curve. Clean par credit curve. Pricing credit default swaps. Survival probability and recovery values.
Week 9	No Class (Spring Break)
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	Hybrid Securities: Convertible Bonds, CoCo Bonds and Bail-In
Week 14	Modeling Hybrids Securities: Advanced Issues
	Final Exam