

CENTRE FOR COMPUTATIONAL FINANCE AND ECONOMICS AGENTS (CCFEA)

CF907-7-SP (15 credits): Fixed-Income Asset Pricing, Default Risk, and Credit Ratings – 2008/09

Supervisor:	Professor Sheri Markose (scher@essex.ac.uk)
Lecturer:	Damiano Brigo, Fitch Solutions 3 hour lecture per week for 5 weeks commencing 14 January 2009 Professor Sheri Markose 2 weeks of lectures 11 and 18 March 2009
Lab Sessions	Jenny Castellanos 3 weeks commencing 18 February 2009
Location:	CCFEA lab 4.304

Teaching commences in week 16 (w/c 12 January 2009)

Aims and Objectives

This CCFEA laboratory based module aims to equip students with expertise in fixed-income products and credit derivatives pricing. Recent events which have resulted in the credit crunch have arisen from the development and sale of structured products like collateralized debt obligations (CDOs) and credit default swaps (CDS). Some critical insights into the workings of these products and the flaws in their structure will be pointed out. The topics covered include: introduction to fixed-income products, term structure modelling, credit risk, pricing of interest rate derivatives, securitization and overview of the recent credit crisis.

This year, we are proud to announce that Dr Damiano Brigo, one of the best known experts in this field will be giving an intensive 5 week lecture course. This will be followed by 3 weeks of Lab sessions which will be given by Jenny Castellanos. The final two lectures will be given by Professor Sheri Markose.

Teaching and Learning Methods

The workshop module is conducted in a laboratory environment. The lecturer having presented theoretical results will proceed to implementing the results numerically. The students receive instructions on how to set up (or programme where necessary) and run Matlab programmes for many of the topics.

Recommended Reading

- J. Hull: Options, Futures and Other Derivatives, 6th ed. Prentice Hall,
- D. Brigo and F. Mercurio (2001) Interest Rate Models: Theory and Practice. Springer-Verlag.
- F. Fabozzi: The Handbook of Fixed Income Securities, 7th ed. McGraw-Hill
- D. Lando: Credit Risk Modelling: Theory and Applications, Princeton Series in Finance

Assessment

30% coursework and 70% examination.

SYLLABUS

Damiano Brigo from Fitch Solutions will be giving 5 guest lectures (Wednesdays from 2pm-6pm) commencing 14 January 2009

Material from the test book by Brigo and Mercurio will be used for this part of the course.

Topic 1- Single name credit derivatives; (1.5h)

- Defaultable (corporate) zero coupon bonds; Defaultable coupon bonds.
- Defaultable floaters; Credit Default Swaps (CDS); CDS rates; CDS and Floaters; Constant Maturity CDS.

Topic 2- Single name models: Reduced Form; (2h)

- Poisson processes; Default as first jump; Intensity as credit spread.
- Cox Processes; Intensity diffusion coefficient as credit spread volatility.
- Deterministic intensity: piecewise constant or linear; Calibration: Bonds and CDS's with examples.
- Pricing and default simulation.
- Stochastic intensity: CIR++ and SSRD model; Calibration and pricing; Simulation.
- Hints at market models for CDS options, constant maturity CDS, etc.

Topic 3 - Single name models: Structural. (2h)

- General remarks: Reduced form vs Structural.
- Merton's model; Black and Cox model.
- Extension of the Black Cox model and exact CDS calibration.
- Other structural models.

Topic 4- Multi name credit derivatives; (2h)

- First to default; N-th to default; CDO tranches; CDO squared. CPDO.
- Indices: DJ-i-Traxx and related tranches.

Topic 5- Multi name reduced form models and copulas; (2.5h)

- Introducing dependence in defaults.
- Correlating intensities: why doesn't it work.
- Correlating threshold times variables: copulas.
- Introduction to copula functions; Gaussian copula; Archimedean copula.
- Survival copula; Copula simulation.
- First and n-th to default with copulas.
- CDO's with copulas and Factor copulas.
- Implied correlation in index tranches. Compound correlation.
- Interpolating correlation: base correlation. Correlation smile and skew.
- Pricing with the copula model.

Topic 6- Beyond parametric copulas (1h)

- Implied expected tranche loss: model independent information contained in tranches.
- Top down Loss models: Hint at GPL model for simultaneous tranche calibration across attachments AND maturity.

Topic 7- Counterparty Risk Valuation (1h)