

# Fixed Income and Credit Risk

Fall Semester 2012

Professor	Assistant	Program
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## **Purpose of the Course**

The purpose of this course is to present methodologies and models to determine the "no-arbitrage price" of fixed income securities with and without "credit risk" as well as fixed income derivatives and credit derivatives.

The course will be divided in two parts. The first (main) part deals with the problem of pricing default free fixed income securities and derivatives such as zero-coupon bonds, coupon bonds, forward and futures.

The second part of the course will be developed, joint with Christopher Finger (MSCI, formerly RiskMetrics Group), over two lectures. The first lecture (by C. Finger) will cover models for assessing credit quality of individual corporate issuers, and will then present model of portfolio credit risk.

The second lecture (by F. Pegoraro) presents an introduction to credit risk and to the pricing of defaultable zero-coupon bonds in discrete-time.

## **Organization and Evaluation**

The course will be based on seven lectures with the instructor and associated exercise sessions with the assistant (see time schedule, below). Your final grade, based on the grade of the midterm examination (D, say) and the final examination (F, say), will be determined according to the formula:

$$\text{Final Grade} = \max(F, (F+D)/2).$$

The final grade will be rounded to the nearest half point. If you need to retake the exam, your grade will be based only on the makeup exam. The midterm exam no longer count.

## Course Schedule

The lecture sessions will take place on Monday in Room 122 at Internef. Hours : 8:30 - 12:00 / 13:15 - 15:00. The time schedule of the lectures is as follows:

- 24 / 09 (Fixed Income)
- 08 / 10 (Fixed Income)
- 22 / 10 (Fixed Income)
- 05 / 11 (Fixed Income)
- 19 / 11 (Fixed Income)
- 03 / 12 (Credit Risk)
- 17 / 12 (Credit Risk, by Christopher Finger)

The exercise sessions (with Roberto Marfè) will take place in Room 122 at Internef. Hours: 08:30-10:00. The time schedule is:

- 01 / 10 ; 15 / 10 ; 29 / 10 ; 12 / 11 ; 26 / 11 ; 10 / 12 ;
- the last exercise session will take place during the week of the last lecture: hours and room to be fixed with Roberto Marfè.

## Course Documents

The slides used during the lecture sessions along with the associated exercises (and solutions) will be made available on the web.

## References

The course (and its slides) will be mainly based on the following books and working papers:

- Baz, J., and Chacko, G. (2004), *Financial Derivatives*, Cambridge University Press.
- Bingham, N. H., Kiesel, R. (2004), *Risk-Neutral Valuation*, Springer Finance.
- Cairns, A. J. G. (2004), *Interest Rate Models : An Introduction*, Princeton University Press.
- Filipovic, D. (2009), *Term Structure Models - A Graduate Course*, Springer Finance.
- Munk, C. (2008), *Fixed Income Modelling*, forthcoming Oxford University Press.
- Veronesi, P. (2010), *Fixed Income Securities: Valuation, Risk, and Risk Management*, John Wiley and Sons, Inc.
- Monfort, A., and Pegoraro, F. (2007), *Multi-Lag Term Structure Models and Stochastic Risk Premia*, available online at: <http://www.crest.fr/pageperso/pegoraro/pegoraro.htm>.
- Bertholon, H., Monfort, A., and Pegoraro, F. (2008), *Econometric Asset Pricing Modelling*, *Journal of Financial Econometrics*, 6(4), 407-458. The working paper version is available online at: <http://www.crest.fr/pageperso/pegoraro/pegoraro.htm>.

Other useful references are :

- Altman, E., ed. (2010), *The Z-Metrics Methodology*, available online at [www.riskmetrics.com/publications/working\\_papers/z-metrics](http://www.riskmetrics.com/publications/working_papers/z-metrics)
- Baxter, M., and Rennie, A. (2002), *Financial Calculus : An Introduction to Derivative Pricing*, Cambridge University Press.
- Bjork, T. (2004), *Arbitrage Theory in Continuous Time*, Oxford University Press.
- Campbell, J., Lo, A., and MacKinlay, A. C. (1997), *The Econometrics of Financial Markets*, Princeton University Press.
- Duffie, D. (2002), *Dynamic Asset Pricing Theory*, Princeton University Press.
- Duffie, D. (2002), *Credit Risk Modelling with Affine Processes*, available online at: [www.stanford.edu/~duffie/pisa.pdf](http://www.stanford.edu/~duffie/pisa.pdf).
- Duffie, D., and Singleton, K. (2003), *Credit Risk*, Princeton University Press.
- Finger, C., ed. (2002). *CreditGrades Technical Document*, available online at [www.riskmetrics.com/publications/techdoc.html](http://www.riskmetrics.com/publications/techdoc.html)
- Gouieroux, C., and Tiomo, A. (2007), *Risque de Crédit: Une Approche Avancée*, Economica.
- Gupton, G., Finger, C. and Bhatia, M. (1997), *CreditMetrics Technical Document*, available online at [www.riskmetrics.com/publications/techdoc.html](http://www.riskmetrics.com/publications/techdoc.html)

- Lando, D. (2004), Credit Risk Modelling, Princeton University Press.
- Privault, N. (2008), An Elementary Introduction to Stochastic Interest Rate Modeling, World Scientific.
- Singleton, K. (2006), Empirical Dynamic Asset Pricing - Model Specification and Econometric Assessment, Princeton University Press.
- Shreve, S. (2008), Stochastic Calculus for Finance II: Continuous-Time Models, Springer Finance.
- Wu, L. (2009), Interest Rate Modeling - Theory and Practice, Chapman and Hall.

## **Course Outline**

### **PART I : Discrete-Time Yield Curve Models and Interest Rate Derivatives**

**Lecture 1. Introduction to Bond Markets.**

**Lecture 2. Extracting Yield Curves from Bond Prices.**

**Lecture 3.1. General Theories of Interest Rates.**

**Lecture 3.2. No-Arbitrage Asset Pricing Theory in Discrete-Time.**

**Lecture 4. Discrete-Time Univariate and Multivariate Gaussian Term Structure Models.**

**Lecture 5.1 Discrete-Time Univariate Positive Term Structure Models.**

**Lecture 5.2 Interest Rate Derivatives.**

### **PART II : Credit Risk and Credit Derivatives**

**Lecture 6. An Introduction to Credit Risk Modeling and Pricing in Discrete-Time.**

**Lecture 7. Empirical Models of Corporate Credit Quality – Single-name and Portfolio Approaches.**