Department of Statistical & Actuarial Sciences
The University of Western Ontario
London, Ontario, Canada

FINANCIAL MODELLING 9561B
(Fixed-income modelling)
Winter 2014

Instructor: Dr Rogemar S Mamon
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Course Website: Announcements and certain course materials will be posted in the course website. You can find the URL link from this address:
http://www.stats.uwo.ca/faculty/rmamon
Username: **fm9561bw14** Password: **HJM1992Econ**

Please visit the site before coming to the lecture.

Office Hours: 10:45 – 11:50 Mon, Wed and Fri. Please send a brief email as other students may already have made appointments at certain times you also wish to see me. Alternative days and times can be arranged.

Lectures: Monday, Wednesday and Friday 09:30-10:20 in WSC 248.

Prerequisites: A minimum mark of 60% in Statistical Sciences 3520A/B or AM 3613A/B or consent of instructor. FM 9590A (Stochastic Processes with Applications in Actuarial Science and Finance) is strongly recommended.

Description: This course aims to provide a rigorous analysis of fixed income instruments and term structure derivatives. In particular, we shall cover the stochastic modelling of interest rate dynamics and basic intro to credit risk modelling (if time permits).

Main Text: Tomas Björk (2009), 3rd edition. *Arbitrage Theory in Continuous Time.* Oxford University Press, Oxford. Note that this textbook will be used only as a guide. The instructor will use his own set of course notes during the lecture.

Other References:

- Steven Shreve (2005). Stochastic Calculus for Finance I: The Binomial Asset Pricing Model, Springer Finance.
- Steven Shreve (2005). Stochastic Calculus for Finance II: Continuous Time Models, Springer Finance.

Evaluation: Students will be assessed on the basis of 3 assignments (50%) and an unseen 3-hour sit-in final examination (50%).

Assignments: There will be three assignments in this course. Each assignment will be posted in the course website one week before the due date. These due dates are: ***03 February 2014*** for Assignment #1; ***07 March 2014*** for Assignment #2; and ***02 April 2014*** for Assignment #3. **Submit your assignments in class before the lecture begins on the due date**. **Under no circumstances will late assignments be accepted.**

Final Exam: 07 April 2014, from 9:30am to 12:30pm (based on course notes and assignments). The purpose of the exam is to ascertain/test mastery of knowledge and skills learnt in class.

Missed Assignments: **<u>There will be no make-up for missed assignments</u>.** For those who are unable to hand in an assignment and provide the required supporting documentation, the standard practice will be that the weight of the missed assignment will be transferred to the final exam.

Info for Audit Students: If you are auditing this course, you must submit ALL assignments and obtain an average assignment mark of 70% or above to have the AUDIT reflected in your transcript. Audit students are NOT required to write the final exam.

Caveat: If you are auditing and miss to submit an assignment (but have valid excuse(s)), you will be required to take the final exam. The minimum mark you must obtain is as follows: 24% for one missing assignment, 47% for two missing assignments and 70% for three missing assignment(s). This is assuming you have 70% average in the submitted assignments.

VERY IMPORTANT: Students in this course must read carefully the course outline and ensure they read the sections on:

(i) Student's responsibility when unable to submit assignments of write the final exam due to illness or other extenuating circumstances.

(ii) E-mail policy to set-up an appointment or clarifying assignment questions requiring only brief responses.

(iii) Plagiarism – what constitute plagiarism and possible penalties.

(iv) Mutual expectations of students and instructor

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Specific topics to be covered with relevant readings

Reference: TB-T Bjork's text (3rd ed)

❖ Mathematical background from stochastic calculus presented in a heuristic manner. This includes Brownian motion, variation of paths, stochastic integrals, Itô differentiation rule, Girsanov theorem (without proof), Feynman-Kac formula and Euler discrertisation scheme for simulation.

Relevant readings: Chapters 4 and 5; sections 11.2, 11.3 and 11.4

❖ Martingale pricing results. Self-financing and replicating strategies. Equivalent martingale probability measure. Arbitrage theory. Market completeness.

Relevant readings: Sections 6.1, 6.2, 7.1, 7.2, 7.3, 7.4; chapter 8; chapter 10; chapter 26

❖ The theory of bond pricing. Analysis of diffusion-based term structure models such as Vasicek, Cox-Ross-Ingersoll and Hull-White model. Exponential-affine class of interest rate models and other extensions.
Relevant readings: Chapter 22

❖ The forward rate approach of Heath, Jarrow and Morton. The forward measure. Relating the short rate approach to the forward rate approach.
Relevant readings: Chapters 23 and 24

❖ The BGM/LIBOR Market Model
Relevant readings: Chapter 25

The End of Course Outline