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

STATISTICAL SCIENCES 4521G/9521B
Advanced Financial Modelling (Financial Modelling II)
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: **ss4521gw14** Password: **BSM1973jpe**

Please visit the site before coming to the lecture.

Office Hours: 10:45 – 11:50 Mon, Wed and Fri

Send a brief email stating your intent to make an appointment, the nature of queries and the time you're dropping by.

Lectures: Tuesday 11:30-12:20 and Thursday 11:30-13:20 in WSC 248.

Prerequisites: A minimum mark of 60% in Statistical Sciences 3520A/B.

If you do not have the above prerequisites, you may enroll by **special permission.**

Description: Continuous-time models, Brownian motion, stochastic integrals, Ito's lemma. Black-Scholes-Merton market model, arbitrage and market completeness, Black-Scholes PDE, risk-neutral pricing and martingale measures. Greeks and hedging, extensions of Black-Scholes model, implied volatility, American option valuation. Vasicek and Cox-Ingersoll-Ross interest rate models.

Main Text: John Hull (2012). *Options, Futures, and Other Derivatives*, 8th edition. Pearson Prentice Hall. **[JH]**

Jaksa Cvitanic and Fernando Zapatero (2004). *Introduction to the Economics and Mathematics of Financial Markets*. MIT Press, Cambridge, Massachusetts. [JCFZ]

Weekly summary of lectures will be provided by the instructor in the course website.

Midterm Exams: Two 2-hour mid-term tests will be given on **13 February 2014 (Thursday)** and **13 March 2014 (Thursday).**
Time: 11:30-13:30 Venue: TBA

Evaluation: Students will be assessed on the basis of 3 assignments (20%) 2 midterms (40%) and a 3-hour sit-in final examination (40%). The assessment is **fixed** since this course can be used (in combination with SS 3520A/B) to get exemption in the CIA exam, provided an individual mark of 80% or better is obtained.

Assignments: There will be three assignments in this course to be given every 3-4 weeks. Each assignment will be posted in the course website one week before the due date. These due dates are: ***30 January 2014*** for Assignment #1; ***04 March 2014*** for Assignment #2; and ***03 April 2014*** for Assignment #3. **<u>Submit your assignments in class on the due date</u>. Under no circumstances will late assignments be accepted.**

Final Exam: To be scheduled by the Registrar's office and will be held in April 2014.

Missed Assignments and Midterm tests:	**<u>There will be no make-up for missed assignments and midterm exams.</u>** For those who are unable to hand in an assignment or write an exam, the standard practice will be that the weight of the missed course requirement will be transferred to the final exam. Supporting documentation must be provided.
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. If you are an AUDIT student, you have the option not to submit assignments but write the final exam instead and must obtain a mark of 70%. Otherwise, an audit mark cannot be granted.

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

Statistical Sciences 4521G
(Winter 2014)
Specific topics to be covered with relevant readings

JH-John Hull's text 8th ed.

JCFZ-J Cvitanic & F Zapatero's textbook

❖ Recap of certain pricing/valuation concepts from Stats 3520. Basic elements of stochastic processes, Brownian motion, Itô's lemma, risk-neutral/martingale measure, Black-Scholes PDE, risk-neutral valuation and the connection between pricing PDE and conditional expectation under the martingale measure. **Relevant readings:** Chapter 13 and sections 14.1-14.8 in JH; and 7.2 in JCFZ

❖ Extension of Black-Scholes to the pricing of options on stock indices, currencies and futures. **Relevant readings:** Sections Chapter 16 in JH and sections 7.4.2, 7.5.1, 7.5.2 in JCFZ

❖ Introduction to the basics of Monte-Carlo methods in finance. Simulation of correlated assets. **Relevant readings:** Sections 13.3, 20.6 in JH and section 11.2.1 in JCFZ

❖ Recap of American options and their valuation. **Relevant readings:** Sections 12.5-12.9 in JH and section 7.3 in JCFZ

❖ The "Greeks" and hedging in practice. **Relevant readings:** Chapter 18 in JH and sections 9.3.1-9.3.5, 9.3.7, 9.3.8 in JCFZ

❖ Volatility smiles/smirks, skews and volatility surfaces. **Relevant readings:** Chapter 19 in JH. No relevant materials from JCFZ.

❖ Estimating Volatilities (ARCH/GARCH). **Relevant readings:** Chapter 22 in JH and section 7.8 in JCFZ

❖ Exotic options. **Relevant readings:** Chapter 25 in JH; and sections 7.5.3 and 7.6 in JCFZ.

❖ Basic introduction to stochastic interest rate models (Vasicek and Cox-Ingersoll-Ross models) and term-structure derivatives. **Relevant readings:** Sections 30.1-30.8 in JH.

The End of Course Outline