

The University of Iowa
College of Liberal Arts and Sciences
Department of Statistics and Actuarial Science
ACTS:4380 (22S:183) Mathematics of Finance II
1:30 - 2:20PM MWF 102 MH Spring Semester 2014

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Office Hours: Tuesday(1:30–2:20), Thursday(1:30–2:20), Friday(2:30–3:20), or by appointment
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Prerequisites: Grade of C+ or higher in 22S:174 (ACTS:4130), and grade of C+ or higher in
22S:180 (ACTS:3080) or 22S:179 (ACTS:3085)

This course is intended for students who want to master the material in Exam MFE (Models for Financial Economics) of the Society of Actuaries (SOA). The **required textbook** is R.L. McDonald, *Derivatives Markets*, 3rd edition, Pearson. You may find it useful to bring the book to every class. The course will cover Chapters 9 to 14, 18, 20, 25, and parts of Chapters 19, 21, 23, and 24. Pearson has also published *Student Solutions Manual to Derivatives Markets* which provides solutions to even-numbered end-of-chapter questions in the textbook.

Optional textbook J. Hull, *Options, Futures, and Other Derivatives*, Pearson. It is a textbook for a later SOA examination; earlier editions of it can be obtained cheaply.

There will be three Friday evening examinations, to be held on February 28, March 28, and April 25 in 40 SH. **You are to use an official CAS/SOA calculator during exams.** Tentatively, the final grade (H.W. 7% + Midterms 3×21% + Final 30%) will be assigned as follows:

Undergrads F[0, 40); D–[40, 45); D[45, 50); D+[50, 55); C–[55, 60); C[60, 65);
C+[65, 70); B–[70, 75); B[75, 80); B+[80, 85); A–[85, 90); A[90, 95); A+[95, 100]

Graduate students F[0, 46); D–[46, 50.5); D[50.5, 55); D+[55, 59.5); C–[59.5, 64); C[64, 68.5);
C+[68.5, 73); B–[73, 77.5); B[77.5, 82); B+[82, 86.5); A–[86.5, 91); A[91, 95.5); A+[95.5, 100]

In 2014, the dates for Exam MFE are March 7-13, July 10-16, and November 13-19.

The University of Iowa
ACTS:4380 (22S:183) HW Set 1

Due at the beginning of class on Friday, January 24, 2014

Write legibly. Show your steps. Explain your reasoning. Simplify your answers.

1. A stock pays dividends continuously. Between time t and time $t+dt$, dividends of amount $0.03S(t)dt$ will be paid, where $S(t)$ denotes the price of one share of the stock at time t .

(Note that if the stock price is stochastic, the dividend payments are also stochastic.)

The current stock price is 100.

What is the current price for the (stochastic) stream of dividends to be paid in the next 8 years?

Hint: Chapter 5 of McDonald (2013).

2. The following is a variation of formula (14.16) on page 424 of McDonald (2013). (We shall derive this result later.)

$$V(s_1, s_2) = s_1 e^{-\delta_1 T} N \left(\frac{\ln \left[\frac{s_1 e^{-\delta_1 T}}{s_2 e^{-\delta_2 T}} \right] + \frac{1}{2} \sigma \sqrt{T}}{\sigma \sqrt{T}} \right) - s_2 e^{-\delta_2 T} N \left(\frac{\ln \left[\frac{s_1 e^{-\delta_1 T}}{s_2 e^{-\delta_2 T}} \right] - \frac{1}{2} \sigma \sqrt{T}}{\sigma \sqrt{T}} \right),$$

where T , δ_1 , δ_2 and σ are positive constants, and $N(x)$ is the cumulative standard normal distribution,

$$N(x) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^x e^{-z^2/2} dz.$$

Calculate the partial derivatives $\frac{\partial}{\partial s_1} V(s_1, s_2)$ and $\frac{\partial}{\partial s_2} V(s_1, s_2)$.

Hint: The variable s_1 appears in three places on the RHS of the formula for V . Hence, when you differentiate V with respect to s_1 , there will be three terms. However, the three terms can be simplified to one term because of a formula like the one on the very last line on page 379.

The partial derivative $\frac{\partial}{\partial s_2} V$ also only has one term as answer.

Administrative Home

The College of Liberal Arts and Sciences is the administrative home of this course and governs matters such as the add/drop deadlines, the second-grade-only option, and other related issues. Different colleges may have different policies. Questions may be addressed to 120 Schaeffer Hall, or see the CLAS [Academic Policies Handbook](#).

Electronic Communication

University policy specifies that students are responsible for all official correspondences sent to their University of Iowa e-mail address (@uiowa.edu). Faculty and students should use this account for correspondence ([Operations Manual, III.15.2](#). Scroll down to k.11).

Accommodations for Disabilities

A student seeking academic accommodations should first register with Student Disability Services and then meet privately with the course instructor to make particular arrangements. See www.uiowa.edu/~sds/ for more information.

Academic Honesty

All students taking CLAS courses have, in essence, agreed to the College's [Code of Academic Honesty](#): "I pledge to do my own academic work and to excel to the best of my abilities, upholding the [IOWA Challenge](#). I promise not to lie about my academic work, to cheat, or to steal the words or ideas of others; nor will I help fellow students to violate the Code of Academic Honesty." Any student committing academic misconduct is reported to the College and placed on disciplinary probation or may be suspended or expelled (CLAS [Academic Policies Handbook](#)).

CLAS Final Examination Policies

The date and time of every final examination is announced by the Registrar generally by the tenth day of classes. **No exams of any kind are allowed during the last week of classes.** All students should plan on being at the UI through the final examination period. It is the student's responsibility to know the date, time, and place of the final exam.

Making a Suggestion or a Complaint

Students with a suggestion or complaint should first visit with the instructor (and the course supervisor), and then with the departmental DEO. Complaints must be made within six months of the incident (CLAS [Academic Policies Handbook](#)).

Understanding Sexual Harassment

Sexual harassment subverts the mission of the University and threatens the well-being of students, faculty, and staff. All members of the UI community have a responsibility to uphold this mission and to contribute to a safe environment that enhances learning. Incidents of sexual harassment should be reported immediately. See the [UI Comprehensive Guide on Sexual Harassment](#) for assistance, definitions, and the full University policy.

Reacting Safely to Severe Weather

In severe weather, class members should seek appropriate shelter immediately, leaving the classroom if necessary. The class will continue if possible when the event is over. For more information on Hawk Alert and the siren warning system, visit the [Public Safety website](#).