

Faculty of Science Course Syllabus
Department of Mathematics and Statistics
Financial Mathematics, MATH 3900 / ECON 3900
Winter Term 2019

Instructor: John Rumsey, John.Rumsey@Dal.ca A13 6206 University Ave (Economics)

Office Hours: Tuesdays 2:30 - 3:30

Lectures: Tuesdays Thursdays 1:00 - 2:30

Course Description

This course is an introduction to derivative pricing. Topics include: binomial tree model, stochastic calculus, Itô calculus, Black-Scholes model, market price of risk, log-normal models.

Course Prerequisites

MATH 2060.03 and (MATH 2120.03 or MATH 2135.03)

Course Objectives / Learning Outcomes

A student who is successful in this course should be able to:

- Derive the process for the price of a derivative security, given the process for the price of the underlying.
- Derive the non-stochastic PDE for the price of a derivative security.
- Create an algorithm for pricing a derivative security using a binomial model.
- Compute an approximate price for a derivative security using “Delta Hedging” at discrete time intervals.
- Compute the “market price of risk” of the underlying.

Course Materials

Lecture notes will be available on the MATH3900 BrightSpace site for the course. The text, *The Mathematics of Financial Derivatives* by P. Wilmott, S. Howison & J. Dewynne; Cambridge University Press, 15th printing, 2009, is a suitable reference.

Course Assessment

Component	Weight	Date	
Assignments	20%		There will be four assignments sets. Each problem set will have the same weight, 5% of the total 20%. The assignments will be due approximately every two weeks. The Midterm be held during regular class time on Thursday, 14 February, 1:00 pm to 2:30 pm . The date of the final exam will be set by the registrar and will take place during the regular April examination period.
Midterm	35%	14 Feb 2019	
Final Exam	45%		

Assignments must be done individually and handed in before or on the due date. Only hard copy is acceptable.

Conversion of numerical grades to Final Letter Grades

$(89.5, 100] \rightarrow A^+$	$(84.5, 89.5] \rightarrow A$	$(79.5, 84.5] \rightarrow A^-$	$(76.5, 79.5] \rightarrow B^+$
$(72.5, 76.5] \rightarrow B$	$(69.5, 72.5] \rightarrow B^-$	$(64.5, 69.5] \rightarrow C^+$	$(59.5, 64.5] \rightarrow C$
$(54.5, 59.5] \rightarrow C^-$	$(49.5, 54.5] \rightarrow D$	$[0, 49.5] \rightarrow F$	

Course Policies

Late assignments will not be accepted. Missed assignments will be given a score of zero. There are no make-up tests for missed tests. If a class is cancelled (due to weather, for example) on the day when the in-class tests is scheduled, the test will be rescheduled. If a class is cancelled on a non-test day, the decision to make up the class will depend on circumstances. Senate has approved a new policy for missed or late academic requirements due to student absence, which came into effect Jan 1, 2018 (winter term). The link to the policy is:

http://www.dal.ca/dept/university_secretariat/policies/academic/missed-or-late-academic-requirements-due-to-student-absence.html

Approximate Schedule / List of Topics

<i>Week</i>	<i>Topic</i>	<i>References</i>
1,2	Wiener processes – Itô's Lemma	Notes §1,2; WHD 2.1, 2.2, 2.3
3	Derivative Securities	Notes §3; WHD 1.1 - 1.6
4	The Black-Scholes-Merton PDE	Notes §4; WHD 3.5, 3.6, 3.7, 3.8
5	The Diffusion Equation	Notes §5.1-§5.3; WHD 4.1, 4.2, 4.3
6	The Black-Scholes Formula	Notes §5.4-§5.6; WHD 3.8, 5.3, 5.4, 5.6
7	Variations of the Black-Scholes Formula	Notes §6; WHD 6
8	American Options	Notes §7; WHD 7
9	Binomial Pricing	Notes §8; WHD 10
10	Exotic Options	Notes §9; WHD 11, 12, 14
11	Option Replication	Notes §10; WHD 16
12	Interest-Rate Derivatives	Notes §11; WHD 17

"Notes" refers the the Lecture Notes posted on *BrightSpace*

"WHD" refers the the text by Wilmott, Howison & Dewynne