
MA 547 – Financial Mathematics

Section 001, Spring 2019, 3 Credit Hours

Course Description

- Introduction to financial derivatives. Pricing and hedging problems.
- One-period and multi-period models. The essential concepts and tools in discrete cases.
- Review of discrete probability spaces and fundamental results on martingale theory.
 - Optimal stopping problem applied to American options.
- Limit theorems: from discrete to continuous time models.
- Brownian motion and the associated Ito's Stochastic Calculus.
- Pricing derivatives (European, American, Asian, etc.) in the context of continuous models such as Black-Scholes.
- Relation with PDE's and numerical issues.

Learning Outcomes

By the end of the course, the students should be able to:

1. Calculate the risk-neutral probability measures for discrete time models;
2. Derive the equivalent risk-neutral measure for continuous time models;
3. Use no-arbitrage principle to calculate the fair prices of financial derivatives such as forward and options.
4. Construct the replicating portfolio for hedging;
5. Apply stochastic calculus tools to solve derivative pricing problems;
6. Derive the Black-Scholes formula and PDE for European options.
7. Apply the Feymann-Kac formula to turn an expectation into a solution of a PDE.

Instructors

Dr Tao Pang (tpang) - *Instructor*

Email: tpang@ncsu.edu

Web Page: <http://www4.ncsu.edu/~tpang/>

Phone: 919-513-2110

Office Location: SAS Hall 4116

Office Hours: T, Th, 4-5pm or by appointments.

Dr. Wei Chen—*Guest Instructor*

Email: wchen15@ncsu.edu

Office Location: SAS Hall 3126

Office Hours: TBD

Course Meetings

Lecture

Time: Tu., Th. 8:30am - 9:45am **Location:** SAS Hall 2102.

Course Materials

Textbooks

A Course in Financial Calculus - Alison Etheridge

Edition: 1 **ISBN:** 978-0521890779

Web Link: <https://www.amazon.com/Course-Financial-Calculus-Alison-Etheridge/dp/0521890772>

This textbook is required.

Requisites and Restrictions

Prerequisites

Introduction to Probability and Stochastic Processes (MA (ST) 546) or basic probability theory and calculus. Some knowledge of MATLAB is welcome but not required.

Grading

Grade Components

| Component | Weight | Details |
|-------------------|---------------|--------------------------------------|
| Homework | 20 | |
| Test 1 | 25 | Tuesday, February 12, 2019 |
| Test 2 | 25 | Tuesday, March 26, 2019 |
| Final Exam | 30 | 8:00-11:00am, Tuesday April 30, 2019 |

Requirements for Credit-Only (S/U) Grading

Performance in research, seminar and independent study types of courses (6xx and 8xx) is evaluated as either "S" (Satisfactory) or "U" (Unsatisfactory), and these grades are not used in computing the grade point average. For credit only courses (S/U) the requirements necessary to obtain the grade of "S" must be clearly outlined.

Requirements for Auditors (AU)

Information about and requirements for auditing a course can be found at <http://policies.ncsu.edu/regulation/reg-02-20-04>.

Policies on Incomplete Grades

If an extended deadline is not authorized by the Graduate School, an unfinished incomplete grade will automatically change to an F after either (a) the end of the next regular semester in which the student is enrolled (not including summer sessions), or (b) by the end of 12 months if the student is not enrolled, whichever is shorter. Incompletes that change to F will count as an attempted course on transcripts. The burden of fulfilling an incomplete

grade is the responsibility of the student. The university policy on incomplete grades is located at <http://policies.ncsu.edu/regulation/reg-02-50-03>. Additional information relative to incomplete grades for graduate students can be found in the Graduate Administrative Handbook in Section 3.18.F at http://www.fis.ncsu.edu/grad_publicns/handbook/

Late Assignments

Late homework may not be accepted or only get half credit.

Attendance Policy

For complete attendance and excused absence policies, please see <http://policies.ncsu.edu/regulation/reg-02-20-03>

Makeup Work Policy

No make-up exams unless there are emergencies during the regular exam times.

Academic Integrity

Academic Integrity

Students are required to comply with the university policy on academic integrity found in the Code of Student Conduct found at <http://policies.ncsu.edu/policy/pol-11-35-01>

Academic Honesty

See <http://policies.ncsu.edu/policy/pol-11-35-01> for a detailed explanation of academic honesty.

Honor Pledge

Your signature on any test or assignment indicates "I have neither given nor received unauthorized aid on this test or assignment."

Accommodations for Disabilities

Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, students must register with the Disability Services Office at Suite 2221, Student Health Center, Campus Box 7509, 919-515-7653. For more information on NC State's policy on working with students with disabilities, please see the Academic Accommodations for Students with Disabilities Regulation (REG02.20.01) (<https://policies.ncsu.edu/regulation/reg-02-20-01/>).

Non-Discrimination Policy

NC State University provides equality of opportunity in education and employment for all students and employees. Accordingly, NC State affirms

its commitment to maintain a work environment for all employees and an academic environment for all students that is free from all forms of discrimination. Discrimination based on race, color, religion, creed, sex, national origin, age, disability, veteran status, or sexual orientation is a violation of state and federal law and/or NC State University policy and will not be tolerated. Harassment of any person (either in the form of quid pro quo or creation of a hostile environment) based on race, color, religion, creed, sex, national origin, age, disability, veteran status, or sexual orientation also is a violation of state and federal law and/or NC State University policy and will not be tolerated. Retaliation against any person who complains about discrimination is also prohibited. NC State's policies and regulations covering discrimination, harassment, and retaliation may be accessed at <http://policies.ncsu.edu/policy/pol-04-25-05> or http://www.ncsu.edu/equal_op/. Any person who feels that he or she has been the subject of prohibited discrimination, harassment, or retaliation should contact the Office for Equal Opportunity (OEO) at 919-515-3148.
