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Course title and number:     **MATH 425-501**  
Term:                             Fall 2020  
Class times and location:     TR 11:30 am - 12:45 pm in HELD 109

## INSTRUCTOR INFORMATION

Name:	<b>Patricia Alonso Ruiz</b>
e-mail address:	<b>use Canvas</b> (if not course-related use <a href="mailto:paruiz@tamu.edu">paruiz@tamu.edu</a> )
Office hours:	TR. 2:30 pm - 3:30 pm via zoom
TA:	Jong Jun Lee ( <a href="mailto:leejj82@tamu.edu">leejj82@tamu.edu</a> )
Grader:	Jingtong Huang ( <a href="mailto:hjtong_kaya@tamu.edu">hjtong_kaya@tamu.edu</a> )

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## COURSE DESCRIPTION AND PREREQUISITES

**Description:** The course is an introduction to the mathematical modeling of asset price dynamics. Among others, we discuss binomial tree pricing models, the Black-Scholes model, hedging procedures, volatility estimation, implied volatility trees and implied binomial trees.

**Prerequisites:** MATH 172 or equivalent; MATH 308 or equivalent; basic probability.

**Format:** This course is delivered in a blended format. Regular classes are held face-to-face and synchronously offered via zoom for those joining remotely. In both cases a laptop or equivalent electronic device will be necessary during class. More details available in the [course website](#).

## LEARNING OBJECTIVES

As a student in this course you will:

- Recognize and recall the main definitions and results explained in the course.
- Develop quantitative, mathematical-modeling and problem-solving skills.
- Read and produce payoff and profit diagrams of option spreads.
- Identify and reproduce the theoretical framework underlying the mathematical model of asset pricing, portfolio lemma.
- Be able to set up and use binomial tree models to price derivatives; use basic techniques of stochastic calculus and hedging.
- Be expected to understand definitions and theoretic statements as well as the proofs of the main theorems.

## TEXTBOOK AND/OR RESOURCE MATERIAL

The course will mainly follow the lecture notes from Prof. G. Berkolaiko, available in the (Canvas) [course website](#). Other helpful but not required resources:

- *An Introduction to Financial Option Valuation*, by D. J. Higham, Cambridge University Press, (available online in the library);

- *Derivatives Markets*, by R.L. McDonald, Pearson;

Please note that the lectures will NOT follow any text verbatim. Further resources may be available in the (Canvas) [course website](#).

## COURSE TOPICS

- **Tentative approximate schedule:** Options, basic properties and estimates (2 weeks); binomial trees (2 weeks); probability review (2 weeks); asset price model and tree parameters (2 weeks); Itô formula and stochastic calculus (2 weeks); Black-Scholes-Merton equation (2 weeks).
- A weekly updated schedule will be maintained in the (Canvas) [course website](#).

## GRADING POLICIES

The final grade will be based on the results of weekly homework, quizzes, 1 midterm and 1 final exam.

- **Homework:** Homework is due on **Tuesday every two weeks** (starting on Tu. 09/01) by 11:30 am. No late homework will be accepted, but you may submit it earlier if preferred. The assigned homework will appear in the Assignments section of the Canvas page. All assigned problems are subject to appear in the the exams. Solutions to the corresponding homework will appear each Wednesday after the due date. There will be the possibility to hand-in homework in (randomly selected) pairs.
- **Quizzes:** An online quiz will be given **every Thursday** (except during the midterm exam week). It will start at 11:30 am, take about 6 minutes, and cover the class notes from the previous week that will be available on Canvas the Tuesday before.
- **Excused absences:** Attendance (in person or online) is expected and may affect your grade. For excused absences your are referred to the Student Rule 7, see <https://student-rules.tamu.edu/rule07/>. Excuses for absences must be substantiated by appropriate documentation. As far as possible, you should inform me and provide the pertinent documentation before a quiz, an exam or a class period is missed.
- **Make-up exams:** Will only be allowed due to documented excused absences and the timeline discussed following the Student Rules.
- **Exams Timeline:**

Exam	Date	Points
Midterm	Oct. 15 (online, 11:30 am - 12:45 pm)	300
Homework	Bi-weekly	150
Quizzes	Weekly	150
Final Exam	Dec. 1 (online, 11:00 am - 1:30 pm)	400
<b>TOTAL</b>		<b>1000</b>

- **Grading Scale**

Range	Grade
$900 \leq \text{pts}$	A
$800 \leq \text{pts} < 900$	B
$700 \leq \text{pts} < 800$	C
$600 \leq \text{pts} < 700$	D
$\text{pts} < 600$	F

## ADDITIONAL COURSE INFORMATION AND POLICIES

- **HW questions:** If you encounter difficulties or have questions concerning HW, there are many options to solve them: ask me (in class or during office hours), post your question in Canvas or ask your mates. Questions to HW problems will NOT be responded via e-mail.
- **Exam guidelines:** You are allowed to bring  $n$  pages of handwritten notes (one-sided 8 x 11 paper) to the  $n$ th exam held. These, your writing utensils and an easy calculator (e.g. phone) for numerical computations will be the only items allowed on the exam. The final exam will be cumulative (comprehensive) and is required for all students. If your final exam grade is higher than your midterm exam score, the minimum between your final and that midterm's median will replace your midterm grade in the course grade computation. (E.g. you score 6 points in the midterm 1 and the median in midterm 1 is 7. If you score 6.5 in the final, this will replace your midterm grade. If you score 7.5 in the final, your score in the midterm will be replaced by 7).
- **Final Exam requisite:** Taking the final exam will require the submission (prior to or on the exam date) of a mini-project simulating hedging with real data. The project may only have a positive effect (bonus) in your final exam grade. However, the final exam can only be taken if the mini-project is timely submitted.
- **Extra credit:** There will be the possibility to earn extra credit for programming examples from class in Python.
- **Grade Appeals:** If you believe an error has been made in grading, you have until the next class period after the exam, quiz, or assignment has been handed back to let me know. Otherwise, you must accept the grade you received.
- **Copyright:** All printed handouts and web-materials are protected by US Copyright Laws. No multiple copies can be made without written permission.

## UNIVERSITY POLICIES

- **Academic Integrity**

**“An Aggie does not lie, cheat, or steal, or tolerate those who do.”**

“Texas A&M University students are responsible for authenticating all work submitted to an instructor. If asked, students must be able to produce proof that the item submitted is indeed the work of that student. Students must keep appropriate records at all times. The inability to authenticate one's work, should the instructor request it, may be sufficient grounds to initiate an academic misconduct case” ([Section 20.1.2.3, Student Rule 20](#)).

You can learn more about the Aggie Honor System Office Rules and Procedures, academic integrity, and your rights and responsibilities at <http://aggiehonor.tamu.edu>.

In this course students can discuss homework assignments and solutions. However, it is NOT permissible to copy homework solutions from another student. It is NOT permissible to use any electronic device during quizzes or exams. It is NOT permissible to discuss any aspect of any quiz or examination until ALL students have completed the quiz or the exam. The penalties for violating this policy will range from an F on an assignment or test, to failing in the course.

- **Americans with Disabilities Act (ADA)**

Texas A&M University is committed to providing equitable access to learning opportunities for all students. If you experience barriers to your education due to a disability or think you may have a disability, please contact Disability Resources in the Student Services Building or at (979) 845-1637 or visit [disability.tamu.edu](http://disability.tamu.edu). Disabilities may include, but are not limited to attentional, learning, mental

health, sensory, physical, or chronic health conditions. All students are encouraged to discuss their disability related needs with Disability Resources and their instructors as soon as possible.

Please, inform me in case you need any accommodations so we can make the best possible arrangements in a timely manner.

- **Attendance Policy**

The university views class attendance and participation as an individual student responsibility. Students are expected to attend class and to complete all assignments. Please refer to [Student Rule 7](#) in its entirety for information about excused absences, including definitions, and related documentation and timelines.

Please refer to [Student Rule 7](#) in its entirety for information about makeup work, including definitions, and related documentation and timelines.

“Absences related to Title IX of the Education Amendments of 1972 may necessitate a period of more than 30 days for make-up work, and the timeframe for make-up work should be agreed upon by the student and instructor” ([Student Rule 7, Section 7.4.1](#)).

- **Makeup Work Policy**

Students will be excused from attending class on the day of a graded activity or when attendance contributes to a student’s grade, for the reasons stated in [Student Rule 7](#), or other reason deemed appropriate by the instructor.

- **Statement on Mental Health and Wellness**

Texas A&M University recognizes that mental health and wellness are critical factors that influence a student’s academic success and overall wellbeing. Students are encouraged to engage in proper self-care by utilizing the resources and services available from [Counseling and Psychological Services \(CAPS\)](#). Students who need someone to talk to can call the TAMU Helpline (979-845-2700) from 4:00 p.m. to 8:00 a.m. weekdays and 24 hours on weekends. 24-hour emergency help is also available through the National Suicide Prevention Hotline (800-273-8255) or at [suicidepreventionlifeline.org](http://suicidepreventionlifeline.org).

- **Title IX and Statement on Limits to Confidentiality**

Texas A&M University is committed to fostering a learning environment that is safe and productive for all. University policies and federal and state laws prohibit gender-based discrimination and sexual harassment, including sexual assault, sexual exploitation, domestic violence, dating violence, and stalking. With the exception of some medical and mental health providers, all university employees (including full and part-time faculty, staff, paid graduate assistants, student workers, etc.) are Mandatory Reporters and must report to the Title IX Office if the employee experiences, observes, or becomes aware of an incident that meets the following conditions (see [University Rule 08.01.01.M1](#)):

- The incident is reasonably believed to be discrimination or harassment.
- The incident is alleged to have been committed by or against a person who, at the time of the incident, was (1) a student enrolled at the University or (2) an employee of the University.

Mandatory Reporters must file a report regardless of how the information comes to their attention – including but not limited to face-to-face conversations, a written class assignment or paper, class discussion, email, text, or social media post. Although Mandatory Reporters must file a report, in most instances, you will be able to control how the report is handled, including whether or not to pursue a formal investigation. The University’s goal is to make sure you are aware of the range of options available to you and to ensure access to the resources you need.

Students wishing to discuss concerns in a confidential setting are encouraged to make an appointment with [Counseling and Psychological Services \(CAPS\)](#).

Students can learn more about filing a report, accessing supportive resources, and navigating the Title IX investigation and resolution process on the University's [Title IX webpage](#).

## COVID-19 TEMPORARY AMENDMENT

### • Campus Safety Measures

To promote public safety and protect students, faculty, and staff during the coronavirus pandemic, Texas A&M University has adopted policies and practices for the Fall 2020 academic term to limit virus transmission. Students must observe the following practices while participating in face-to-face courses and course-related activities (office hours, help sessions, transitioning to and between classes, study spaces, academic services, etc.):

- Self-monitoring: Students should follow CDC recommendations for self-monitoring. **Students who have a fever or exhibit symptoms of COVID-19 should participate in class remotely and should not participate in face-to-face instruction.**
- Face Coverings: [Face coverings](#) (cloth face covering, surgical mask, etc.) must be properly worn in all non-private spaces including classrooms, teaching laboratories, common spaces such as lobbies and hallways, public study spaces, libraries, academic resource and support offices, and outdoor spaces where 6 feet of physical distancing is difficult to reliably maintain. Description of face coverings and additional guidance are provided in the [Face Covering policy](#) and [Frequently Asked Questions](#) (FAQ) available on the Provost website.
- Physical Distancing: Physical distancing must be maintained between students, instructors, and others in course and course-related activities.
- Classroom Ingress/Egress: Students must follow marked pathways for entering and exiting classrooms and other teaching spaces. Leave classrooms promptly after course activities have concluded. Do not congregate in hallways and maintain 6-foot physical distancing when waiting to enter classrooms and other instructional spaces.
- To attend a face-to-face class, students must wear a face covering (or a face shield if they have an exemption letter). If a student refuses to wear a face covering, the instructor should ask the student to leave and join the class remotely. If the student does not leave the class, the faculty member should report that student to the [Student Conduct office](#) for sanctions. Additionally, the faculty member may choose to teach that day's class remotely for all students.

### • Personal Illness and Quarantine

Students required to quarantine must participate in courses and course-related activities remotely and **must not attend face-to-face** course activities. Students should notify their instructors of the quarantine requirement. Students under quarantine are expected to participate in courses and complete graded work unless they have symptoms that are too severe to participate in course activities.

Students experiencing personal injury or illness that is too severe for the student to attend class qualify for an excused absence ([See Student Rule 7, Section 7.2.2.](#)) To receive an excused absence, students must comply with the documentation and notification guidelines outlined in Student Rule 7. While Student Rule 7, Section 7.3.2.1, indicates a medical confirmation note from the student's medical provider is preferred, **for Fall 2020 only, students may use the Explanatory Statement for Absence from Class form in lieu of a medical confirmation. Students must submit the Explanatory Statement for Absence from Class within two business days after the last date of absence.**

### • Operational Details for Fall 2020 Courses

For additional information, please review the [FAQ](#) on Fall 2020 courses at Texas A&M University.