

ISE 563 Financial Engineering - Spring 2023

Time Mondays 6:40 – 9:20 PM
Professor Gordon Delianedis, Ph.D.
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Office : TBD
Office Hours : Wed 6-7 PM (PST) (On-line)

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Textbooks Required

Hull, J *Options, Futures, and Other Derivatives*, 11th ed., Prentice Hall, 2020

Grading

Homework	30%
Midterm	30%
Final	40%

Software

Any structured programming language such as VBA, Python, R, Matlab,

Examples will be give in Matlab

Course Objectives

To familiarize the student with the financial background and mathematical tools necessary to analyze and solve financial investment problems. Problems will include the use of derivatives for hedging financial risk, valuation of financial products, and evaluation of financial strategies and risk control.

Week	Date	Topic	Readings
1	1/9/2023	Basics	H: Ch 4, 6, 7
		- Discount curves and basic fixed income	
		- Term structure construction (Bootstrapping)	
		- Option Basics	
2	1/16/2023	MLK Holiday	
3	1/23/2023	Futures-Forwards-Options	H: Ch 2, 3, 5, 11, 12
		- Definitions and properties	
		- Parity relationships/ Strategies	
4	1/30/2023	Binomial Model	H: Ch 13, 21.1-21.5, 27.4
		- Spot and futures	
		- Time varying parameters/ Analytic Rep	
5	2/6/2023	Black-Scholes Framework	H: Ch 14, 15, 21.6-21.7, 27.8,28
		- Black-Scholes Model derivation	
		- Spot and futures options	
		- Generalized Black-Scholes framework	
6	2/13/2023	Black-Scholes Framework	H: Ch 14, 15, 17, 21.6-21.7, 27.8,29
		- Monte-Carlo Methods (Euro & Amer)	
		- Standard B-S Greeks	
7	2/20/2023	MLK Holiday	
8	2/27/2023	Black-Scholes: Implied Volatility\ Hedging	H: Ch 17, 18, 19
		- Static and dynamic hedging	
		- Implied Volatility	
9	3/6/2023	Midterm	
10	3/13/2023	Spring Recess	HW1 Due
11	3/20/2023	Exotic Options	H: Ch 20, 26, 27.1-27.3, 27.6 - 27.8, 30.4
		- Asian/Barrier/Quantos/...	
		- Variance swaps	
12	3/27/2023	Interest Rate Derivatives	H: Ch 29, 31
		- Black's model	
		- Caps, Floors, Swaptions	
		- Convexity/Timing Adjustments	
	4/3/2023	Interest Rate Models	H: Ch 30, 32, 33
		- No arbitrage models	
		- Forward rate models (HJM/LMM)	
13		- Trinomial tree methods	
	4/10/2023	Credit Risk	H: Ch 24
		- Credit risk measures (Rating agency)	
		- Historic Default and credit migration	
		- Merton model of the firm	
14	4/17/2023	Credit Derivatives	H: Ch 30, 32, 33
		- Credit Default Swaps (CDS)	
		- Credit Derivatives (CDS options, FTD,	
		- Structured Credit	
15	4/24/2023	Real World Applications	H: Ch 22, 23, 35
		- Volatility modeling	
		- Value at Risk (VaR)	
16	5/1/2023	Study Days	HW2 and HW3 Due
17	5/8/2023	Final Exam	

Statement for Students with Disabilities

Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations is from DSP. Please be sure I receive the letter as early in the semester as possible. DSP is located in STU 301 and is open 8:30 a.m.–5:00 p.m., Monday through Friday. Website and contact information for DSP:

http://sait.usc.edu/academicsupport/centerprograms/dsp/home_index.html, (213) 740-0776 (Phone), (213) 740-6948 (TDD only), (213) 740-8216 (FAX) ability@usc.edu.

Statement on Academic Conduct and Support Systems

Academic Conduct:

Plagiarism – presenting someone else's ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in SCampus in Part B, Section 11, “Behavior Violating University Standards” policy.usc.edu/scampus-part-b. Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on scientific misconduct, policy.usc.edu/scientific-misconduct.

Support Systems:

Student Health Counseling Services - (213) 740-7711 – 24/7 on call

engemannshc.usc.edu/counseling

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

National Suicide Prevention Lifeline - 1 (800) 273-8255 – 24/7 on call

suicidepreventionlifeline.org

Free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week.

Relationship and Sexual Violence Prevention Services (RSVP) - (213) 740-4900 – 24/7 on call

engemannshc.usc.edu/rsvp

Free and confidential therapy services, workshops, and training for situations related to gender-based harm.

Office of Equity and Diversity (OED) | Title IX - (213) 740-5086

equity.usc.edu, titleix.usc.edu

Information about how to get help or help a survivor of harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants. The university prohibits discrimination or harassment based on the following protected characteristics: race, color, national origin, ancestry, religion, sex, gender, gender identity, gender expression, sexual orientation, age, physical disability, medical condition, mental disability, marital status, pregnancy, veteran status, genetic information, and any other characteristic which may be specified in applicable laws and governmental regulations.

Bias Assessment Response and Support - (213) 740-2421

studentaffairs.usc.edu/bias-assessment-response-support

Avenue to report incidents of bias, hate crimes, and microaggressions for appropriate investigation and response.

The Office of Disability Services and Programs - (213) 740-0776

dsp.usc.edu

Support and accommodations for students with disabilities. Services include assistance in providing readers/notetakers/interpreters, special accommodations for test taking needs, assistance with architectural barriers, assistive technology, and support for individual needs.

USC Support and Advocacy - (213) 821-4710

studentaffairs.usc.edu/ssa

Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

Diversity at USC - (213) 740-2101

diversity.usc.edu

Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

USC Emergency - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call

dps.usc.edu, emergency.usc.edu

Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

USC Department of Public Safety - UPC: (213) 740-6000, HSC: (323) 442-120 – 24/7 on call
dps.usc.edu

Non-emergency assistance or information.

In case of a declared emergency if travel to campus is not feasible, USC executive leadership will announce an electronic way for instructors to teach students in their residence halls or homes using a combination of Blackboard, teleconferencing, and other technologies. Please activate your course in Blackboard with access to the course syllabus. Whether or not you use Blackboard regularly, these preparations will be crucial in an emergency. USC's Blackboard learning management system and support information is available at blackboard.usc.edu.

Desire2learn

Class notes are available at <http://courses.usc.edu>. For general instructional support assistance please contact the Instructional Support Center office at denisc@usc.edu or (213) 821-1421. For any other technical support issue, please contact the Technical Support Center at dentsc@usc.edu or (213) 821-1321.