BerkeleyHaas

HAAS SCHOOL OF BUSINESS
UNIVERSITY OF CALIFORNIA, BERKELEY

MFE 230A: Investments and Derivatives

Spring 2024

Instructor: **Professor Eben Lazarus**
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Office hours: Thursdays, 4–5PM, F686 or Zoom [or by appointment]
Zoom link: https://berkeley.zoom.us/my/eben.lazarus
Exceptions: 3/21 (4:30–5:30PM), 4/4 (by appointment)

Class times: **Tuesdays, 10:30AM–12:30PM, F320**
Thursdays, 10:00AM–12:00PM, F320

GSI: Vinicio de Sola
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Sections: Fridays, 4:00PM–5:30PM, on Zoom
Zoom link: https://berkeley.zoom.us/j/92201758255
Office hours: Fridays, 5:30PM–6:30PM, on Zoom [or by appointment]

Overview: The first part of the course provides an intermediate introduction to investments and asset pricing. We start with a foundational approach to financial markets, covering questions related to portfolio choice and the determination of prices and returns of financial and some real assets. We next analyze investor preferences and decision-making under risk, covering expected utility, mean-variance utility, and other preference specifications, risk aversion, and risk rankings. We then analyze the general portfolio choice problem in mean-variance and more general settings. Building on these results, then we study some workhorse asset-pricing models: the Capital Asset Pricing Model (CAPM), the Arrow-Debreu economy, the Lucas economy, the consumption CAPM, and Arbitrage Pricing Theory (APT). We relate these models to real markets and discuss market efficiency, asset-pricing puzzles and anomalies, and factor models. Our main focus is on stocks and bonds, but we also discuss other asset classes, including real estate. We also discuss implications of the general valuation formulas for real investments in publicly and privately held companies, providing a link to corporate finance.

The second part of the course analyzes financial derivatives markets. We cover forwards, futures, swaps, and options, with a focus on how to price these assets using arbitrage theory. These instruments allow one to tailor the

amount and kind of risk one takes, including those associated with changes in interest rates, exchange rates, stock prices, commodity prices, default probabilities, and inflation. We discuss how derivatives can be used to achieve various hedging and speculative objectives and study several applications of derivative-pricing techniques, within and outside of derivatives markets. This part of the course has some overlap with MFE230Q, which provides a more technical treatment of arbitrage theory, whereas our focus in this course is more on intuition and actual pricing formulas. A more advanced treatment of practical implementation and more complex model is offered in MFE230D.

Course material: We will use bCourses for course logistics, announcements, and grades. All other course materials, including lecture notes, slides, and problem sets, will be uploaded to Box. The course Box folder can be found at the following link: https://berkeley.box.com/s/qm3dsy6zzg4us279d1m1xu02pg3k22ur.

Required texts: Johan Walden, *Quantitative Finance*, 2023 (PDF).

Jean-Pierre Danthine & John B. Donaldson, *Intermediate Financial Theory*, 3rd ed., 2014 (Academic Press).

John C. Hull, *Options, Futures, and Other Derivatives*, 10th or 11th ed., 2017/2021 (Pearson).

Recommended: John Y. Campbell, *Financial Decisions and Markets*, 2017 (Princeton).

Optional texts: John H. Cochrane, *Asset Pricing*, 2005 (Princeton).

Kerry E. Back, *Asset Pricing and Portfolio Choice Theory*, 2nd ed., 2017 (Oxford).

Jonathan E. Ingersoll, *Theory of Financial Decision Making*, 1987 (Rowman & Littlefield).

Tomas Björk, *Arbitrage Theory in Continuous Time*, 4th ed., 2020 (Oxford).

Mark Rubinstein, *Rubinstein on Derivatives*, 2000 (Risk).

Zvi Bodie, Alex Kane, & Alan Marcus, *Investments*, 12th ed., 2021 (McGraw Hill).

Grading: Course requirements include attendance and participation in class, four assignments, a midterm exam, and a final exam. Questions about the grading of any exam or assignment, including regrade requests, must be made in writing within one week of the time that the exam or assignment is returned to you. Except for questions related to the final exam, all questions should be directed to the GSI. The following weights will be used to determine grades:

5%	Attendance & participation
20%	Assignments
25%	Midterm exam
50%	Final exam

Grade option: In addition, students have the option of dropping the midterm grade and having the final count for 75% of the course grade. In other words, students who are unhappy with their midterm exam grade are able to substitute the final exam grade in place of the midterm grade. This option is **automatically** invoked at the end of the course if and only if it will benefit the student. Midterm participation is **mandatory** in order for this option to be invoked; you cannot miss the midterm exam.

Attendance: Please attend all classes, and be in your seats and ready to work at the beginning of the scheduled lecture time. Naturally, a few students might miss class or arrive late on rare occasions due to illness or family emergencies. Please inform the instructor and GSI with a short email, beforehand if possible, if such an occasion arises. You should not in general expect a response to these emails.

The use of laptops, smartphones, or other devices during class is prohibited. If you need an exception (due, for example, to an approved accommodation), then please email the instructor and GSI to ask for permission.

Students who attend class regularly (missing no more than one or two lectures) and participate attentively should expect full credit for the attendance and participation portion of the course grade.

Assignments: There are four written problem sets. Students are allowed to work in small groups of no more than four people total. A group should turn in a single copy of their work with names of all group members listed. While you may work together, each of you should fully understand how to solve each problem; this is the best way to prepare for the exams. Late assignments will not receive credit. The assignments are due on the following dates, at the beginning of class:

- Assignment 1: March 28
- Assignment 2: April 9
- Assignment 3: April 25
- Assignment 4: May 7

Midterm: There is an in-class midterm exam on **Tuesday, April 16, 10:30AM–12:30PM**. All students must take the exam at this time — no exceptions (even if you think you might drop the midterm grade). The exam is closed book, but you may bring two pages of notes (double-sided, and either handwritten or typed) for the midterm. You will need a calculator that can compute natural logarithms.

Final: There is a three-hour final exam scheduled on **Wednesday, May 15, 10:30AM–1:30PM**. All students must take the exam at this time — no exceptions. The exam is closed book, but you may bring four pages of notes (double-sided, and either handwritten or typed) for the final exam. The exam location will be announced when it is available.

Accommodations: If you have a disability, or think you may have a disability, you can work with the Disabled Students' Program (DSP) to determine any accommodations you may need to ensure that you have equal access to this course. If you do have any accommodation needs (particularly for taking exams), please submit your DSP letters of accommodation as soon as possible, as accommodations are not retroactive and it may not be possible to accommodate last-minute requests.

If you anticipate or experience any barriers to learning in this course, please feel welcome to discuss your concerns with me, with the GSI, or with the program office.

Ethics: Students who take this class are bound by the Berkeley Honor Code. In certain situations — namely, for homework assignments — students may work together in small groups of no more than four. Even in these cases, each student is still responsible for submitting, understanding, and being able to complete the problem set on his or her own. Students are allowed to consult all the material provided in the course (slides, lecture notes, course books, etc.), but are not allowed to use any external material that resembles a "solution" to an assignment, or any online tools that might serve as aids in generating such a solution. If you have any questions about this policy, please contact the professor. Students are also allowed to discuss course material, including assignments, with each other. However, outside of one's own small group, any such help must stop far short of hinting at or providing the solution to an assignment. Any test or assignment submitted by you and that bears your name is presumed to be your own original work.

We ask students to refrain from behavior that has been demonstrated to interfere with a positive classroom experience. This especially includes holding any type of side conversation (whether voice or electronic). Further, as above, the use of devices (including laptops, tablets, or smartphones) is prohibited, with the exception of students with accommodation-related needs or other particular circumstances. If you have obtained approval to use a device in class given such accommodation needs, you should refrain from using it for any purpose other than note-taking.

Schedule: Below is an outline of the material we will cover in this course. For each lecture's listed readings, you should read the assigned chapters in advance of the given lecture. Chapters refer to Walden (W), Danthine and Donaldson (DD), and Hull (H). Topics are listed as discrete units specific to a given lecture for simplicity, but some topics may run over to the next classes. We may accordingly fall behind the listed schedule at some points and catch up thereafter. Given this, it is possible that **assignment due dates may change during the semester**. I will let you know in advance if this is the case.

Course schedule outline

Part 1: Investments

Class 1 (3/19)	**Topics**	Introduction to investments, preferences
	Reading	(W) Chapter 2, 3.1 Class notes
Class 2 (3/21)	**Topics**	Preferences • Expected utility, risk aversion, CRRA, CARA • Ranking of risks
	Reading	(W) Ch. 3 (remainder) (DD) Ch. 3–4
Class 3–5 (3/26–4/2)	**Topics**	Portfolio choice • Modern portfolio theory • Portfolio separation theorems • Long-term investments under uncertainty • Universal portfolios
	Reading	(W) Ch. 4 (DD) Ch. 5–7
	Assignments	Assignment 1 due 3/28
Class 6–8 (4/4–11)	**Topics**	Asset pricing • CAPM, Black-Litterman model • Lucas economy, CCAPM, APT *Note: Lecture will end early (around 11:15) on 4/4.*
	Reading	(W) Ch. 5.1–5.4 (DD) Ch. 8–11, 14
	Assignments	Assignment 2 due 4/9
Class 9 (4/16)	**Midterm exam**	
Class 10 (4/18)	**Topics**	Asset pricing wrap-up (continuing from classes 6–8)
	Reading	Same as for classes 6–8

Course schedule outline *(continued)*

Part 2: Derivatives

Class 11–12 (4/23–25)	**Topics**	Introduction to derivatives markets • Forwards, futures • Swaps • Vanilla stock options
	Reading	(W) Ch. 10.6 (H) Ch. 2–7, 10–12
	Assignments	Assignment 3 due 4/25
Class 13–14 (4/30–5/2)	**Topics**	Derivatives pricing • Black-Scholes model • Binomial model • Option Greeks and applications
	Reading	(W) Ch. 9.5 (H) Ch. 13–15, 19
Class 15 (5/7)	**Topics**	Extensions & advanced topics • Jumps • Stochastic volatility
	Reading	(W) Ch. 13 (H) Ch. 27
	Assignments	Assignment 4 due 5/7
Final (5/15, 10:30AM)	**Final exam**	