Daniel Greenwald, Eben Lazarus, Adrien Verdelhan Fall 2019

Syllabus

15.472 Advanced Asset Pricing

This course focuses on theoretical and empirical tools and results in macro-finance, asset pricing, and portfolio choice. The lectures will be a blend of asset pricing theory, econometric methods, and a critical review of empirical studies. With an emphasis on empirical and computational methodology, the course will broadly cover cross-sectional and time-series models in asset pricing; consumption-based models; intermediary asset pricing; and an introduction to continuous-time finance. Please see "Course Schedule and Readings" for the precise topics to be covered in the course this year. The course is designed to jump-start PhD dissertations; there is no final exam, but there is a term paper and a presentation requirement.

Class Schedule

The class meets twice per week: T, TH 2:30 – 4:00pm, E62-687.

Recitations

The TA will hold recitations where class material will be reviewed and additional applications and exercises presented. The TA is Mary Gong, fgong@mit.edu. Recitation sessions will take place on Mondays (check schedule with TA) in room E51-372.

Course Website

The course website is on Canvas (https://canvas.mit.edu/courses/1535) and all teaching materials will be posted on this site. In addition, class announcements will be posted there.

Office Hours

Eben Lazarus: Thursday, 4:00pm – 5:30pm in E62-633.
Daniel Greenwald: Wednesday, 10:30am – 12pm in E62-641.
Adrien Verdelhan: Tuesday, 10:30am – 12pm in E62-624.
Mary Gong: TBD in TBD.

Administrative Assistant

Jonathan Cowin, E62–631, 617-324-7023, jcowin@mit.edu.

Prerequisites

This course is intended for M.I.T. finance and economics Ph.D. students. The students who are taking this course should have already taken econometrics, microeconomics and introductory financial economics. In particular, we will assume familiarity with large-sample theory for least-squares, generalized method of moments, and maximum likelihood estimation methods. Knowledge of continuous-time asset pricing models will be helpful, but not required. The numerical work for this class will be done in Matlab. Prior experience working with Matlab is not required, but willingness to learn Matlab is.

Course Requirements and Grading

There is no final exam. The following weighting scheme will be used to determine each student's course grade:

- Regular attendance and class participation: 20%.
- Empirical assignments: 40%.
- Research project: 40%. (Topic of term paper approved by October 26; paper due on December 1st; in-class presentations in the last week of class in December.)

Course Materials

Class Notes, Problem Sets, and Recitation Notes: These will be available on the course website.

Textbook: The recommended textbooks for this course are

- Cochrane, *Asset Pricing*, Revised Ed., Princeton University Press, 2005.
- Campbell, *Financial Decisions and Markets: A Course in Asset Pricing*, Princeton University Press, 2017.
- Duffie, *Dynamic Asset Pricing Theory*, 3rd Ed., Princeton University Press, 2001.

Sloan Values

You are responsible for upholding Sloan's code of conduct, which mandates zero tolerance for cheating and plagiarism. For more details on Sloan's academic policies, please read the document "Classroom Values in Practice," which is available on the course website.

Course Schedule

This is an approximate schedule for the course; some material may take longer or shorter to cover than the time allotted.

1) Introduction --- Date: September 5.

Instructor: Adrien Verdelhan

Topic: Euler equation

Readings:

- Required: Cochrane (Chapter 1),
- Recommended: Cochrane (Chapters 3, 4, 5, and 6 for review)

2) Stylized Facts --- Date: September 10.

Instructor: Adrien Verdelhan

Topic: Time-series and cross-sectional stylized facts on equity, bond and currency returns

Readings:

- Required: Cochrane (2011)
- Recommended: Cochrane (Chapter 20), Goyal and Welch (2008)

3) Preference-free Results --- Date: September 12.

Instructor: Adrien Verdelhan

Topic: Model-free characterization of SDFs (Hansen-Jagannathan bounds, permanent and temporary components of SDFs)

Readings:

- Required: Cochrane (Chapter 2)
- Recommended: Hansen and Jagannathan (1991), Alvarez and Jermann (2005)

4) Computational Methods (I/III) --- Date: September 17. Assignment 1 due on September 17.

Instructor: Daniel Greenwald

Topic: Numerical methods (functional approximation, differentiation, integration), computational methods for structural models.

Readings:

- Recommended: Judd, *Numerical Methods in Economics*, Miranda and Fackler, *Applied Computational Economics and Finance*.

5) Consumption-Based Asset Pricing --- Dates: September 19, 24.

Instructor: Adrien Verdelhan

Topic: Stock, bond, and currency returns with habit preferences, Epstein-Zin preferences, or disaster risk.

Readings:

- Required: Cochrane (2017), Campbell and Cochrane (1999), Bansal and Yaron (2004).
- Recommended: Bansal, Kiku, and Yaron (2012), Beeler and Campbell (2012)

6) Incomplete Markets and Aggregation --- Date: September 26.

Instructor: Adrien Verdelhan

Topic: Complete consumption insurance and the asset market implications of incompleteness

Readings:

- Required: Attanasio and Davis (1996), Constantinides and Duffie (1996), Lucas and Heaton (1996), Guvenen (2009)
- Recommended: Mankiw (1986), Parker (2001), Storesletten, Telmer, and Yaron (2004)

7) Term Structure Models --- Date: October 1. Assignment 2 due on October 1st.

Instructor: Daniel Greenwald

Topic: Term structure models in discrete time

Readings:

- Required: Cochrane and Piazzesi (2005), Lettau and Wachter (2007).
- Recommended: Lettau and Wachter (2011).

8) Estimation (I/II) --- Date: October 3. Assignment 3 due on TBD.

Instructor: Daniel Greenwald

Topic: GMM

Readings:

- Required: Cochrane (Chapters 10 and 11)

9) Estimation (II/II) --- Dates: October 8, 10. [No lecture on October 15, Columbus Day vacation]

Instructor: Daniel Greenwald

Topic: Cross-sectional asset pricing tests, estimation of linear factor models

Readings:

- Required: Cochrane (Chapters 12 and 13)
- Recommended: Lettau and Ludvigson (2001), Lewellen and Nagel (2006)

10) Computational Methods (II/III) --- 22, 24. Assignment 4 due on TBD.

Instructor: Simon Scheidegger

Topic: Sparse Grids, Adaptive Sparse Grids, and high-dimensional model representation to solve large-scale dynamic models

Readings:

- Required: Using adaptive sparse grids to solve high-dimensional dynamic models, Brumm & Scheidegger (2017)
- Recommended: Judd, *Numerical Methods in Economics (Chapters 12 and 17)*

11) Asset Pricing in Continuous Time (I/III) --- Dates: October 29, 31.

Instructor: Eben Lazarus

Topic: Mathematics of continuous-time models

Readings:

- Required: Back (2017), Chapter 12. Duffie, Appendix D, E.
- Recommended: Oksendal, Stochastic Differential Equations, 6th Ed., Springer.

12) Computational Methods (III/III) --- Dates: November 5, 7, and 12.

Instructor: Simon Scheidegger

Topic: Using machine learning techniques to solve dynamic stochastic models

Readings:

- Required: Bishop (2006), Chapters 1, 5, 6.
- Recommended: Constantine (2015), Bühler et. al (2018), Scheidegger & Bilionis (2019)

13) Asset Pricing in Continuous Time (II/III) --- Dates: November 14, 19.

Instructor: Eben Lazarus

Topic: Arbitrage and martingales, Black-Scholes, portfolio choice

Readings:

- Required: Duffie, Chapters 5, 6, 9.
- Recommended: Merton (1973), Black and Scholes (1973), Cox and Huang (1989), Carpenter (2000), Liu and Longstaff (2004), Piazzesi (2010), Merton (1974), Chen (2010), Martin (2013)

14) Asset Pricing in Continuous Time (III/III) --- Date: November 21.

Instructor: Eben Lazarus

Topic: Intermediary asset pricing

Readings:

- Required: He and Krishnamurthy (2013), Garleanu and Pedersen (2011)
- Recommended: Brunnermeier, Eisenbach, and Sannikov (2013), Brunnermeier and Sannikov (2014), Hansen, Huang, Khorrami, and Tourre (2018), He and Krishnamurthy (2018)

15) Students' Research Presentations --- Dates: December 3, 10. [No meeting on November 26 for Thanksgiving holiday]