1 Course objectives

This course provides an overview of the field of asset pricing. The emphasis of this course is on the theoretical underpinnings of the field and the evaluation of models built to address the empirical regularities observed in the US (and to some extent international) securities data. The emphasis will largely be on discrete-time models, though we will deal with continuous-time methods in some places. The topics covered include: the law of one price and the stochastic discount factor, consumption asset pricing, recursive preferences, habit formation, measuring cash flow and discount rate news, market frictions and transaction costs, disaster risk models, empirical evidence on stock returns, and issues in fixed income and currency pricing.

This is not an econometrics course, nor an empirical asset pricing course. We will cover empirical results to the extent that they provide context for the theory. We will also work with data (a little bit) when it helps to elucidate theoretical concepts. Finally, we will do numerical analysis of some of the models we cover, which will require some programming. Numerical analysis of models is so standard in the field, that you might as well get used to these tools at an early stage.\footnote{I recommend either R or Python. Matlab is a good choice also, but it isn’t an open source package, which is probably a disadvantage in the long-term. We will do our in-class examples in R.}

The course is designed for second year doctoral students in finance. Economics doctoral students and other finance doctoral students are also welcome. Other students may take this course if they have previously taken at least one PhD-level finance course on asset pricing and one PhD-level course on statistics or econometrics.
2 Logistics

Class schedule

Classes are held Fridays from 2:15-5:30pm in TBD, with a 15 minute break in the middle. What better way to kick off the weekend than with 3 hours spent pondering asset pricing? Table 1 shows the class dates, the anticipated class topics, and the assignment due dates.

Office hours and TA

Office hours are by appointment. Please email me first (hm2646@columbia.edu). Our TA will be Cristina Tessari (CTessari21@gsb.columbia.edu). He will have office hours on TBD in TBD.

Grading

There will be 6 homeworks (the last homework may be replaced with an in-class presentation) which will represent 40% of the grade and an in-class final with is worth 60% of the grade. Homeworks will go out roughly every two weeks. Tentative homework topics are in Table 2.

Student presentations

We will devote most of the final three classes to students presentations of recent (or some classic) research papers that build on concepts we will have covered in class. Presentations will be done in groups of three people. Those presenting will not have to hand in homework 6, but will still be responsible for understanding the material homework 6 covers.

Final exam

We will have an in-class three hour final. There will be a handout with many questions (and solutions) that I will give out at the end of the semester. This will be good practice for the final exam. In the past, we have been able to allow more time for the final for students who did not finish in three hours. Though the exam is intended to take less than three hours, I don’t want people to get stressed because of time pressure. The final exam will be during exam week, on [During exam week] at TBD in TBD.
3 Materials

The course is self-contained and not based on any one book. The one that comes closest:

* John Campbell’s (fantastic) new book called Financial Decisions and Markets (henceforth FDM).

If you buy only one book for the course, buy FDM. The following books are directly relevant in parts. Cochrane’s book is very close to the early part of the course flow.

- John Cochrane’s book Asset Pricing deals with many of the theoretical underpinnings of the course – SDF’s, Hansen-Jagannathan bounds, Euler equations – but spends less time on the newer extensions of the standard model, like habits, recursive preferences, and so on. If you get only two books, get this one and Campbell’s.

- Ljungqvist and Sargent, Recursive Macroeconomic Theory for coverage of dynamic programming, as well as two excellent chapters on asset pricing.

The following books are useful references:

- Back, Asset Pricing and Portfolio Choice Theory as a backup reference for the Cochrane book (with slightly more technical details).


- Duffie, Dynamic Asset Pricing for continuous time methods.

- Harrison, Brownian Motion and Stochastic Flow Systems for an excellent introduction to stochastic calculus.

- LeRoy and Werner, Principles of Financial Economics for coverage of the CAPM and aspects of the stochastic discount factor.

- Stokey and Lucas with Prescott, Recursive Methods in Economic Dynamics is the classic book on dynamic programming in economics. The presentation in Ljungqvist and Sargent is much more readable, but L&S simply refer the reader here for most of the technical details.
4  Logical evolution

Markowitz, JF, 1952
CAPM (Treynor, Sharpe, Lintner, Mossin) 1960’s
Ross, 1973, “Return, risk, and arbitrage” (discrete states)
Ross 1978 (infinite state space), Harrison and Kreps 1979 (multiperiod and EMM)
Hansen and Richard 1987; Hansen and Jagannathan 1991
Extensions (recursive preferences, long-run risks, habits, disasters, incomplete risk sharing, etc.) 1990’s
Option pricing (Black-Scholes and Merton) 1970’s
Lucas 1978 (rational expectations)
Premium puzzle (Hansen and Singleton 1983, Mehra and Prescott 1985)
Other asset classes (bonds, currencies, dividend strips) 2000’s

5  Topics

1. Introduction
   - Overview of course topics
   - Arrow-Debreu state prices with finite states
   - Development of Euler equation and kernel representation
   - Connection to CAPM
   - Empirical review

References


*Cochrane, J., 2017, “Macro-finance,” Review of Finance, 945–985. (I recommend you read this fantastic paper at the end of the semester. It will provide great context for many of the models we will have worked on over the next few months.)


2. Law of one price and principle of no-arbitrage

- Kernel representation: $P(X) = E[MX]$
- Hansen-Jagannathan bounds
- SDF and the mean-variance frontier

References


Harrison, J.M. and D. Kreps, 1979, “Martingales and arbitrage in multiperiod securities markets,” Journal of Economic Theory, 20, 381–408. (Among many other contributions, they show that with infinite state space, no-arbitrage implies the existence of an equivalent martingale measure (EMM), which through the Radon-Nikodym theorem implies the existence of a non-negative stochastic discount factor.)

3. Consumption asset pricing

- Dynamic programming
- $M \sim U'(C)$
- The consumption Euler equation
- The equity premium puzzle
- Bond pricing introduction
- Empirical failure of the standard model

References


4. Recursive preferences

- Separating risk aversion and intertemporal substitution
- Epstein-Zin preferences
- Campbell’s version of the ICAPM

References


This and the Yogo (2004) paper argue the IES is close to zero (or 0.2) in the US. The value of the IES plays a large role in the Bansal-Yaron long run risks model.


5. Long-run risks

- Bansal-Yaron paper
- Log-linear approximation of the pricing kernel
- Empirical evidence and applications
- Validity of approximation

References


6. Habit formation
• External habit model of Campbell and Cochrane

• Introduction to continuous time methods (the Kerry Back book is a good reference for the finance stuff, and the Harrison book for the math stuff)

• External habit model of Menzly, Santos and Veronesi

References


7. Discount rate and cash flow innovations

• Log-linearization of the returns $R_{t+1}$ equation

• Value and growth firms: a reduced form SDF approach

• Dividend strips

• Euler equation errors

References
Bansal, R., S. Miller, D. Song, and A. Yaron, “The term structure of equity risk premia,” *NBER Working Paper No. 25690.* (This is a counterpoint to the dividend-strip anomaly literature.)


8. Market frictions

- Incomplete markets, uninsurable income heterogeneity, and empirical evidence

References


Luttmer, E.G.J., 1999, “What level of fixed costs can reconcile consumption and stock returns?” *Journal of Political Economy,* 7 (5), 969–1033. (This is a classic paper about the effect of transaction costs in asset pricing. We will not get to it this semester.)


- Disaster risk (and dynamic models of disaster risk?)

References


9. Properties of the pricing kernel [slightly tentative]


10. Fixed income and currencies
• Fixed income models

References


• Currencies

References


11. Student presentations

- Students will form groups and submit a ranked list of 3 papers that they would like to present. I will assign papers to groups from their lists.
- In the presentation, you should focus on the paper’s modeling contribution and any empirical tests related to this. Make sure to go over the important derivations in the paper (try not to skip steps so your classmates will understand the material). Some papers have sections dealing with continuous time models – you can skip over these (or discuss them if you feel comfortable). Each group will have 1 hour to present. People are strongly encouraged to ask questions during the presentations.

**Consumption-based pricing models**


A habit model with exogenous shocks, i.e., variation in habit unrelated to consumption growth.


Combines Constantinides and Duffie (1996) with recursive preferences.


If you present the Gabaix paper, you can focus on the part that deals with power utility. The part on Epstein-Zin preferences (in Section V) can be skipped.
Jorda, O., A. Schularick, and A. Taylor, 2019, “The total risk premium puzzle,” *NBER working paper No. 25653*.


**Characteristics of SDF**


**Applications to non-equity or to international asset classes**


**Insights from log-linearization**


*Cross-sectional and other empirical tests*


*Consumption-based cross-sectional tests*


### Table 1: Schedule.

<table>
<thead>
<tr>
<th>Class</th>
<th>Fall 2019</th>
<th>Topic</th>
<th>Assign</th>
<th>Due Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Fri Sep 06</td>
<td>Introduction: CAPM, SDF, empirical evidence, writing good code</td>
<td>1</td>
<td>Fri Sep 20</td>
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<tr>
<td>02</td>
<td>Fri Sep 13</td>
<td>Law of one price and the stochastic discount factor</td>
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<tr>
<td>03</td>
<td>Fri Sep 20</td>
<td>Consumption asset pricing</td>
<td>2</td>
<td>Fri Oct 04</td>
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<tr>
<td>04</td>
<td>Fri Sep 27</td>
<td>Empirical shortcomings of the standard model; recursive preferences</td>
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<tr>
<td>05</td>
<td>Fri Oct 04</td>
<td>Recursive preferences and long-run risks</td>
<td>3</td>
<td>Fri Oct 25</td>
</tr>
<tr>
<td>06</td>
<td>Fri Oct 11</td>
<td>Habit formation and continuous time basics</td>
<td></td>
<td></td>
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<tr>
<td>07</td>
<td>Fri Oct 25</td>
<td>Continuous time basics and disaster risk</td>
<td>4</td>
<td>Fri Nov 08</td>
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<tr>
<td>08</td>
<td>Fri Nov 01</td>
<td>Incomplete markets, discount rates and cash flows, application to</td>
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<td></td>
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<td>other markets</td>
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<tr>
<td>09</td>
<td>Fri Nov 08</td>
<td>Fixed income and currencies</td>
<td>5</td>
<td>Fri Nov 29</td>
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<tr>
<td>10</td>
<td>Fri Nov 15</td>
<td>Currencies and student presentations</td>
<td>6†</td>
<td>Fri Dec 06</td>
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<tr>
<td>11</td>
<td>Fri Nov 22</td>
<td>Student presentations</td>
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<tr>
<td>12</td>
<td>Fri Dec 06</td>
<td>Student presentations</td>
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<tr>
<td></td>
<td>[During exam week]</td>
<td>Final exam held in TBD at TBD</td>
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</tbody>
</table>

†HW6 to be handed in only by those not doing in-class presentations.

### Table 2: Homework topics.

1. Stochastic discount factor
2. Dynamic programming
3. Bonds and generalized preferences
4. Habits and long-run risks
5. Disaster risk and log-linearization
6. Fixed income and currencies