Wharton Finance PhD Program of Study

Effective 2023, The Wharton Finance PhD Program is now STEM certified.

Two Phases of the Program

The program is divided into two phases: **Pre-Candidacy** and **Candidacy**. Upon satisfying all pre-candidacy requirements and with the program coordinator's approval, status changes from Pre-Candidacy to Candidacy.

First Phase: Pre-Candidacy

The first stages of pre-candidacy in the program require the successful completion of the below requirements:

1. **Eighteen Course Unit Requirement**:
   - Up to 4 courses per semester may be counted toward the overall requirement of 18 course units.
   - 8 core courses completed by students in their 1st year in the program consist of:
     - 2 Microeconomic Theory courses
     - 2 Econometrics or Statistics courses
     - 4 Finance courses

2. **Qualification Examination**:
   - All students are required to take the qualification examination immediately following their 1st year in the program. The exam will occur once a year and be taken over the course of two consecutive days.
   - Exam questions pertain to the material covered in the four Finance courses taken during the first year (FNCE 9110, FNCE 9120, FNCE 9210 and FNCE 9240).

Eighteen Course Unit Requirement

Finance Core Courses

1st Year Fall Semester:

1. **ECON 7100**: Microeconomic Theory I
2. ***ECON 7300**: Econometrics I (Fundamentals) OR **STAT 5200**: Applied Econometrics I
3. **FNCE 9110**: Financial Economics
   - This course will cover basic theories in finance: asset pricing and portfolio choice.
4. **FNCE 9240**: Intertemporal Macroeconomics and Finance
   - This course will cover topics at the intersection of finance and macro.

1st Year Spring Semester:

1. **ECON 6110**: Game Theory and Applications OR **ECON 7110**: Microeconomic Theory II
2. ***ECON 7310**: Econometrics II (Methods) OR **STAT 5210**: Applied Econometrics II
3. **FNCE 9120**: Corporate Finance and Financial Institutions
   - This course will cover basic theories in corporate finance, financial institutions, and financial markets.
4. **FNCE 9210**: Introduction to Empirical Methods in Finance
   - This course will cover empirical asset pricing and empirical corporate finance.

* Required graduate level sequence in **ECON 7300/7310** or **STAT 5200/5210**. Must be passed with a "B Minus" grade or better.

Finance Electives

Each student is expected to develop proficiency in specialized areas in preparation for dissertation and research. Thus, 4 or more finance electives are required from the following courses over the 2nd and 3rd year:

1. **FNCE 9230**: Financial Economics Under Imperfect Information
2. **FNCE 9250**: Topics in Asset Pricing
3. **FNCE 9260**: Empirical Methods in Corporate Finance
4. **FNCE 9320**: Topics in Corporate Finance
5. **FNCE 9330**: International Finance
6. **FNCE 9340**: Empirical Methods in Asset Pricing
7. **FNCE 9360**: Household Finance (0.5 CU)
   - In conjunction with **REAL 9480** – Advanced Topics in Urban Economics: Household Real Estate Decision-Making
8. **FNCE 9370**: Topics in Macro Finance

Additional Course Credits

With 8 core and 4 elective courses in Finance, students will need 6 additional course credits to satisfy the program requirement. Students can satisfy these additional credits in the following ways:

1. Transfer credits.
2. Electives from other departments: Economics, Statistics, Accounting, Mathematics, etc.
3. Seminar courses (FNCE 9500): students should limit seminar courses to a maximum of 3. These credits require students to attend the weekly seminar and write referee reports. A permit is required, and the program coordinator must approve before a permit is issued.

Transfer Credits

Students may receive up to 6 course credits of the required 18 for graduate work at other universities.

A student who seeks to apply credit for previous coursework should submit a written request to the program coordinator during their 1st year in the program.

The program coordinator will decide whether to grant credit based on the standards of the previous work and its relevance to the student's program of study.

Grades

To graduate, a student must maintain a GPA of 3.0 or better. A failing grade may result in program dismissal.

You will not be able to graduate if a GR/NR/I appear as a grade for any one of the 18 required courses.

Qualification Examination

The qualification examination is given once each year, usually in June, after the student's first year in the program. All students enrolled in the Wharton PhD Program in Finance must take the qualification examination.

If a student fails the exam, they may retake one or more sections of it the following year. The exam committee will dictate which sections must be retaken, but the student may retake additional sections at their discretion.

For sections that are retaken, scores from the second year will replace the previous year's scores. For sections that are not retaken, scores from the first year will carry forward. If, based on the combined performance across all four sections, a student fails the examination twice, the student will not normally be allowed to continue in the program as a PhD student.

If the failing student is dismissed from the PhD program, they will have the option to complete the below requirements for the Master's Degree in Finance at the discretion of the examination committee.

Master's Degree in Finance

Finance PhD students may apply for the Master's Degree in Finance if the following requirements are met:

1. Qualification examination passed at the master's level or above.
2. Successful completion of a substantial paper can substitute for a master's thesis. Passing the second-year paper (approved by two Finance faculty advisors) fulfills this requirement.
3. Eight core course requirements must have at least a "B" GPA with no non-grades of I, I*, GR, or NR.

Additional Pre-Candidacy Requirements

After completing course requirement and the qualification exam, the below requirements must also be met:

1. English Fluency Test
2. Econ 897 Math Institute or Wharton Math Camp.
3. Teaching Assistant Training
4. Communication Workshop
5. Third-Year Reorientation
6. Research Fellowships
7. Teaching Fellowships
8. First-Year Paper
9. Second-Year Paper Proposal and Presentation
10. Third-Year Paper Proposal and Presentation

English Fluency

International students whose native language is not English must pass this fluency test during their 1st year.

Applicable students are not permitted to do any TA work or hold office hours until successfully passing.

ECON 897 Math Institute

Penn Economics' Summer Math Camp is offered from July – August and is held five days per week.

New students are strongly encouraged to register for ECON 897 before their first semester. Proficiency in calculus and linear algebra is required and can be determined in two ways: a waiver exam that is usually given in August prior to the fall semester or take ECON 897 and pass the final examination.

Any admitted student opting out of this course must first discuss this decision with the program coordinator.

Wharton Math Camp

Wharton's Math Camp is held in August and covers the basic principles of mathematical analysis, optimization theory, and probability theory. The course is meant to introduce the necessary mathematical tools that are needed for the successful completion of the core courses in economics, operations, and statistics.

This is an alternative for those unable to attend ECON 897 and must be approved by the program coordinator.

Teaching Assistant Training

All students in the program are required to participate in Teaching Assistant Training. This training must be taken prior to the student becoming a teaching fellow or a teaching assistant. Students will be required to complete the three-day TA training held at the end of August, typically after their 1st year in the program.

The Center for Teaching and Learning will send the department results after training is completed in August.

Communication Workshop

The communication workshop is presented by the Wharton Communication Program and is held during the student's second year. This is a half-day workshop to assist with communications skills that are meant to educate the doctoral student and make them aware of areas of necessary improvement for their presentations.

This workshop is mandatory and is part of the introduction to Wharton's Doctoral Programs.

Third-Year Reorientation

This orientation helps students progress in their research. The one-hour workshop is designed to help with the transition from coursework to full-time research and includes faculty advice on the following topics:

- How to proceed in this phase (no longer taking courses, preparing to propose).
- Advice on how to find a topic.
- How to be efficient and motivated during this phase.
- Theoretical and empirical methods of research.
- Student perspective on third-year transition.
- Reminders of programs and resources available to students that are relevant to you at this stage.

Research Fellowships

Research fellowships involve semester-long work as a research assistant for approximately 10 hours per week.

Students are required to complete 2 research fellowships. The first may be completed in the summer after the 1st year in the program and may result in the 1st year paper.

Research assistant positions that are paid do not count toward the student's research fellowship requirement.

All research fellowships must be approved by the PhD Program Coordinator.

Teaching Fellowships

Teaching fellowships involve semester-long work as a TA for approximately 10 – 15 hours per week.

Students are required to complete 4 teaching fellowships (4 CUs). Teaching fellowships are generally completed in the student's 3rd and 4th year in the program.

All teaching fellowships and assistant positions must be approved by the PhD Program Coordinator.

First-Year Paper

All 1st year students are required to write and submit a 1st year paper by September 30th of their 2nd year.

This paper may result from a research fellowship or from a course taken in the 1st year.

Second-Year Paper Proposal and Presentation

Students must submit a 2nd year paper proposal by May 15th of their 2nd year in the program.

Presentation of the 2nd year paper must be completed by September 30th of their 3rd year in the program.

To better assist our students with paper writing, 2nd year papers must be reviewed by a writing coach. The 2nd year paper presentation cannot be passed without the writing coach's review and approval.

Third-Year Paper Proposal and Presentation

Students must submit a 3rd year paper proposal by May 15th of their 3rd year in the program.

Presentation of the 3rd year paper must be completed by September 30th of their 4th year in the program.

Second Phase: Candidacy

The candidacy phase is comprised of the preparation and defense of the dissertation proposal, doctoral dissertation, and final defense of the dissertation. With the addition of the 3rd paper, the proposal can be submitted in the pre-candidacy phase of the program, even though the paper is scheduled to be presented during the beginning of the candidacy phase of the program.

Upon advancement to candidacy, each student should have a dissertation committee consisting of three faculty members minimum (including at least two members of the Wharton graduate group), which may include the supervisor/advisor.

Dissertations based on joint work with other researchers are allowed, provided that, in such cases, a unique and separate dissertation is presented by each degree candidate. The candidate must include a concise account of their contribution to the whole work. Authorship of a dissertation by more than one candidate is not allowed.

All students applying for candidacy must remain in good standing within the PhD Program.

Dissertation Proposal Defense and Fifth-Year Funding

To be eligible for consideration for a 5th year merit-based grant, a student must successfully present a dissertation proposal by May 15th of the 4th year in the program. The program coordinator and department chair will determine the allocation of funds among eligible students.

Any compensation for teaching assistance is unrelated to this merit-based grant. Students who receive a merit-based grant may still receive compensation for teaching assistance.

NOTE: Students who do not successfully propose by September 30th of their 5th year will not be allowed to provide teaching assistance unless written approval is received from the program coordinator.

To the extent possible, we will provide partial funding during the 6th year assuming the student is making good progress in their studies.

Research Evaluation

The department sets a high standard for required papers, proposals, and dissertations. This is our main assessment of the progress of a student's research potential and, thus, we demand a high threshold for passing. The guidelines by which these papers are evaluated by a student's advisors are outlined in the below options.

1. **Pass** – the paper successfully demonstrates the student's ability to conduct and report on original and independent research.

2. **Conditional Pass** – the paper shows potential, and the student has made significant progress. However, there is room for minor revisions. Students will be given the required date for revision submission.

3. **Major Revision Required** – the paper shows potential, and the student has made some progress. However, there is room for thorough revisions. Students will be given the date required for revision submission and to present again.

4. **Fail** – the paper does not show a promising path forward. In some cases, this might trigger dismissal from the program. In other cases, the student will be asked to start identifying a new topic and will be given the date required to submit a new paper and present. Detailed guidance will be provided.

Program Restrictions

Time Limitations

Students must complete all course work, preliminary examinations, and the dissertation requirement within 16 semesters (excluding summer) from the date of their matriculation (excluding leaves of absence). Except in unusual circumstances, students will be expected to gain admission to candidacy status prior to the end of their fourth year in the program (excluding leaves of absence).

If a student has not completed all requirements for the PhD (including deposit of the dissertation) at the end of the 5th year after beginning dissertation candidacy, they must submit to the full dissertation committee, within two months of completing that fifth year, a copy of all written work completed to date on the dissertation. If the student is unable to construct such a committee, they can be dropped from the program.

Employment While in the Program

Students in the program are not allowed to accept employment without receiving approval from the program coordinator. The implications of not requesting and receiving approval can be severe. The student could lose their good standing status in the program, and this could result in being asked to leave the program immediately.

University of Pennsylvania
The Wharton School

FNCE 9110:
Foundations for Financial Economics

Prof. Winston W. Dou
Classes: Mondays 1:45–4:45 PM
Email: wdou@wharton.upenn.edu
Office hours: Mondays 4:45–5:45 PM

Fall 2023

Course Description

The objective of this course is to undertake a rigorous study of the theoretical foundations of modern financial economics. The course will cover the central themes of modern finance including individual investment decisions under uncertainty, stochastic dominance, mean-variance theory, capital market equilibrium and asset valuation, arbitrage pricing theory, option pricing and the potential application of these themes. Upon completion of this course, students should acquire a clear understanding of the major theoretical results concerning individuals' consumption and portfolio decisions under uncertainty and their implications for the valuations of securities.

Prerequisites

The prerequisites for this course are graduate level microeconomics (Economics 681 or Economics 701), matrix algebra, and calculus. The microeconomics courses may be taken concurrently.

Course Material

- The lecture notes are mainly based on those of Prof. Jessica Wachter
- The website for this course can be accessed through Canvas:

  `https://canvas.upenn.edu`.

  On this website you can find lecture notes, sample problems, announcements.
- All readings are optional, but may be helpful. The textbook is

C.F. Huang and R. Litzenberger, 1988, *Foundations for Financial Economics*, Prentice Hall.

On the syllabus, readings from the textbook are prefaced by HL. This textbook is out of print. You can find the chapters on the course website.

- Following each topic, there is a list of recommended articles which can also be found on the website.

Other reading

Some excellent texts that cover material related to this course are:

- K. Back, 2010, *Asset Pricing and Portfolio Choice Theory*, Oxford University Press.
- J. Y. Campbell, 2018, *Financial Decisions and Markets*, Princeton University Press. (See especially chapters 1–6)
- J. Cochrane, 2005, *Asset Pricing*, Revised Edition, Princeton University Press. (See especially chapters 1–9, 17–21)
- D. Duffie, 2001, *Dynamic Asset Pricing Theory*, 3rd edition, Princeton University Press. (See especially chapters 1–4)
- J. Ingersoll, 1987, *Theory of Financial Decision Making*, 1st edition, Rowman & Littlefield Publishers.

For background reading, the following textbooks may be useful:

- A. Mas-Colell, M. Whinston, and J. Green, 1995, *Microeconomics Theory*, Oxford University Press, New York.
- W. Rudin, 1976, *Principles of Mathematical Analysis*, McGraw Hill, New York.

Course Work and Grading

All times below are Eastern Time.

There will be two midterms, a final, and a class presentation. The midterms are each worth 20% of the grade. The presentation is worth 10%, and the final 50%.

- Midterm 1: available 8 AM on 10/4, due 8 AM on 10/5
- Midterm 2: available 8 AM on 11/8, due 8 AM on 11/9

- Final: available 8 AM on 12/19, due 8 AM on 12/20

All exams are open book/notes. They are to be taken under adherence to the University's honor code. Midterms are designed for a prepared student to complete them within 1 hour. The final is designed for a prepared student to complete within 2 hours.

Sample questions. For each topic, there will be sample questions and answers posted on Canvas. There will also be exams from previous years. Students are highly encouraged to work through these problems without looking at the answers as preparation for the quizzes and the final exam, and as the best way to learn the material.

Class presentation on 12/11. Each student will be asked to give a 10 minute presentation (with 5 additional minutes for questions, thus for a total of 15 minutes) on a problem from a problem set, or a previous exam question of their choosing. Students will be graded based on accuracy and clarity of these presentations (this is worth 10% of the total grade). Please seek approval of the question preparing it.

Teaching Assistant

The teaching assistant for this course is Chisom Onyishi. She can be reached by email at sovemba@wharton.upenn.edu.

Course Outline and Readings

Note: Dates are approximate.

I **Decision Making under Uncertainty** 9/11

- Outline
  - Expected utility representations
  - Risk aversion
  - Insurance premium
  - Portfolio choice
  - Useful utility functions
  - Stochastic dominance
- Readings:
  (a) Ingersoll book Chapter 1 (optional)
  (b) Back book Chapter 1 (optional)
  (c) HL Chapters 1, 2.1–2.10
  (d) Cass, D., and J. Stiglitz, 1970, The structure of investor preferences and asset returns, and separability in portfolio allocation: a contribution to the pure theory of mutual funds, *Journal of Economic Theory* 2, 122-160.
  (e) Pratt, J., 1964, Risk aversion in the small and in the large, *Econometrica* 32, 122-136.
  (f) Ross, S., 1981, Some stronger measures of risk aversion in the small and large with applications, *Econometrica* 49, 621-638.
  (g) HL Chapters 2.1–2.10
  (h) Rothschild, M., and J. Stiglitz, 1970, Increasing risk I: a definition, *Journal of Economic Theory* 2, 225-243.

II **Mean-Variance Portfolio Analysis** 9/18

- Outline
  - Notation and definitions
  - Characterization of minimum variance portfolios
  - Properties of minimum variance portfolios
  - The case with a riskless asset
- Readings
  (a) Ingersoll book Chapters 3 and 4 (optional)
  (b) Back book Chapters 2 and 5 (optional)
  (c) HL Chapter 3
  (d) Roll, R., 1977, A critique of the asset pricing theory's tests, *Journal of Financial Economics* 4, 129-176. (Pay special attention to the Appendix)

III **The Capital Asset Pricing Model (CAPM)** 9/25

- Outline
  - Back book Chapter 6 (optional)
  - Statement of the CAPM
  - First derivation of the CAPM
  - One and two-fund separation
  - Second derivation of the CAPM
- Readings
  (a) HL Chapters 4.1–4.17
  (b) Black, F., 1972, Capital market equilibrium with restricted borrowing, *Journal of Business* 45, 444-454.
  (c) Brennan, M., 1971, Capital market equilibrium with diverged borrowing and lending rates, *Journal of Financial and Quantitative Analysis* 1971, 1197-1205.
  (d) Fama, F., and K. French, 2004, The capital asset pricing model: Theory and evidence, *Journal of Economic Perspectives* 18, 25-46.
  (e) Ross, S., 1978, Mutual fund separation in financial theory: the separation distributions, *Journal of Economic Theory* 17, 254-286.
  (f) Sharpe, W., 1964, Capital asset prices: a theory of capital market equilibrium under conditions of risk, *The Journal of Finance* 19, 425-442.

IV **Arbitrage Pricing Theory** 10/2

- Outline
  - Linear factor model
  - An economy with one factor and no residual risk
  - An economy with multiple factors and no residual risk
  - An economy with multiple factors and residual risk
- Readings
  (a) Ingersoll book Chapter 7 (optional)
  (b) Back book Chapter 6 (optional)
  (c) HL Chapters 4.18–4.22
  (d) Huberman, G., 1983, A simplified approach to arbitrage pricing theory, *Journal of Economic Theory* 28, 1983-1991.
  (e) Ross, S., 1976, Arbitrage Theory of Capital Asset Pricing, *Journal of Economic Theory* 13, 341-360.

V **State-Contingent Claims** 10/9, 10/16

- Outline
  - Pareto-optimal allocations
  - Complete markets competitive equilibrium
  - Securities market equilibrium
  - Representative agent
- Readings
  (a) HL Chapter 5
  (b) Arrow, K., 1964, The role of securities in the optimal allocation of risk-bearing, *Review of Economic Studies* 31, 91-96.
  (c) Hansen, L., and S. Richard, 1987, The role of conditioning information in deducing testable restrictions implied by asset pricing models, *Econometrica* 55, 587-614.
  (d) Rubinstein, M., 1974, An aggregation theorem for securities markets, *Journal of Financial Economics* 1, 225-244.

VI **State Prices and Arbitrage** 10/23

- Outline
  - Definitions
  - Fundamental theorem of asset pricing
  - Complete markets
  - Option pricing in two periods
- Readings
  (a) HL Chapters 6.1–6.9
  (b) Dybvig, P., S. Ross, 2003, Arbitrage, state prices, and portfolio theory, in *Handbook of the Economics of Finance*, G. Constantinides, M. Harris, and R. Stulz (eds.), North-Holland, Amsterdam, The Netherlands.

VII **Multi-Period Securities Markets** 10/30

- Outline
  - Description of the economy
  - Pareto optimal allocations and complete markets
  - Rational expectations equilibrium
  - Dynamic completeness
  - Securities market equilibrium
- Readings
  (a) Ingersoll book Chapter 10, 11 (optional)
  (b) Back book Chapter 8, 9 (optional)
  (c) HL Chapters 7.1–7.8, 7.11-7.15
  (d) Kreps, D., 1982, Multiperiod securities and the efficient allocation of risk: A comment on the Black-Scholes option pricing model, in *The Economics of Uncertainty and Information*, J. McCall (ed.), University of Chicago Press, Chicago, Illinois.

VIII **Characterizing Optimal Consumption and investment policies: Dynamic Programming** 11/6

- Outline
  - Markov property
  - Value function
  - Euler equation
  - Example: logarithmic utility
  - Infinite horizon recursive formulation
- Readings
  (a) HL Chapters 7.9, 7.10, 7.16, 7.19, 7.20, 7.22
  (b) Campbell, J., and L. Viceira, 1999, Consumption and portfolio decisions when expected returns are time-varying, *Quarterly Journal of Economics* 114, 433–495.
  (c) Epstein, L., and S. Zin, 1991, Substitution, risk aversion, and the temporal behavior of consumption and asset returns: An empirical analysis, *Journal of Political Economy* 99, 263–286.
  (d) Grossman, S., and R. Shiller, 1982, Consumption correlatedness and risk measurement in economies with non-traded assets and heterogeneous information, *Journal of Financial Economics* 10, 195–210.
  (e) Levhari, D., and T. N. Srinivasan, 1969, Optimal savings under uncertainty, *The Review of Economic Studies* 36, 153–163.
  (f) Samuelson, P., 1969, Lifetime portfolio selection by dynamic stochastic programming, *Review of Economics and Statistics* 51, 239–246.

IX **The Fundamental Theorem Revisited** 11/13, 11/20

- Outline
  - Notation and definitions
  - Martingale property of prices and no-arbitrage
  - Market completeness
  - Characterizing optimal consumption and investment policies: Martingale method
  - Example: The binomial model
- Readings
  (a) HL Chapter 8
  (b) Cox, J., and S. Ross, 1976, The valuation of options for alternative stochastic processes, *Journal of Financial Economics* 3, 145-166.
  (c) Cox, J., S. Ross, and M. Rubinstein, 1979, Option pricing: a simplified approach, *Journal of Financial Economics* 7, 229-263.
  (d) Duffie, D., 2003, Intertemporal asset pricing theory, in *Handbook of the Economics of Finance*, G. Constantinides, M. Harris, and R. Stulz (eds.), North-Holland, Amsterdam, The Netherlands.
  (e) Harrison, M. and D. Kreps, 1979, Martingales and arbitrage in multiperiod securities markets, *Journal of Economic Theory*, 20, 381-408.

X **Representative Agent Asset Pricing** 11/27, 12/4

- Outline
  - The iid lognormal model
  - The consumption CAPM
  - The yield curve
  - Equity strips
  - Rare events
- Readings
  (a) Barro, R., 2006, Rare disasters and asset markets in the twentieth century, *Quarterly Journal of Economics* 121, 823–866.
  (b) van Binsbergen, J., M. Brandt, and R. Koijen, On the timing and pricing of dividends, *American Economic Review* 102, 1596–1618.
  (c) Campbell, J., 2003, Consumption-based asset pricing, in *Handbook of the Economics of Finance*, G. Constantinides, M. Harris, and R. Stulz (eds.), North-Holland, Amsterdam, The Netherlands.
  (d) Lettau, M., and J. Wachter, 2007, Why is long-horizon equity less risk? A duration-based explanation of the value premium, *Journal of Finance* 62, 55–92.
  (e) Lucas, R., 1978, Asset prices in an exchange economy, *Econometrica* 46, 1426-1446.
  (f) Mehra, R., and E. Prescott, 1985, The equity premium puzzle, *Journal of Monetary Economics* 15, 145-161.
  (g) Tsai, J., and J. Wachter, 2015, Disaster risk and its implications for asset pricing, *Annual Review of Financial Economics* 7, 219–252.

UNIVERSITY OF PENNSYLVANIA
The Wharton School

FINANCE 912 – Corporate Finance and Financial Institutions

Itay Goldstein
Spring 2020

Course Objective:

The objective of the course is to provide an introduction to the theory of corporate finance, financial intermediation, and financial markets. The goal is to expose students to existing work and provide basic tools to do research in the area. While the course covers the theories in the area, it also provides essential tools in forming frameworks that can serve as a basis for empirical work.

Course Organization:

The course will consist of lectures, in which I will review papers from the literature. Some papers will be discussed in class in great depth, while others will be mentioned briefly and left for the students for further research. The general structure has three parts: corporate finance, financial intermediation, and financial markets. Each one consists of several lectures covering different theories and subtopics. A tentative list of topics and papers appears below. Topics and papers may be dropped or added, depending on progress.

Grades:

The final grade will be based on an exam and a final project. Both get equal weights.

The exam will be scheduled during the exam period immediately after the end of classes. The exam will cover all the material discussed in class. I will distribute all the previous exams I gave in this course including solutions to the problems. This will be the best source of practice for the exam.

The project will be due on Memorial Day weekend. You will be expected to write a short paper, where you develop and solve a simple model and describe the motivation and implications. Each project topic will have to be approved, and so you will need to schedule a meeting with me and discuss your ideas.

Course Materials:

The slides I use for class presentations are available online as lecture notes. Below, I provide details on which sets of lecture notes will be used for the different topics. I also provide details on the articles covered by the lecture notes. For a couple of topics, I will use simplified versions of articles based on the following books:

- Mas-Collel, Whinston, and Green (1995), *Microeconomic Theory*, Oxford University Press.
- Tirole (2006), *The Theory of Corporate Finance*, Princeton University Press.

Course Overview:

Here is a tentative list of topics and the lecture notes, articles, and book chapters that are covered in them:

1. Corporate Finance

1.a. Separation of Ownership and Control: Moral Hazard

Lecture Notes:

- "Moral Hazard"

Book Chapters:

- Mas-Collel, Whinston, and Green, Chapter 14.

Articles:

- Holmstrom, B., 1979, "Moral hazard and observability," *Bell Journal of Economics* 10, 74-91.
- Holmstrom, B., 1982, "Moral hazard in teams," *Bell Journal of Economics* 13, 324-340.
- Holmstrom, B., and P. Milgrom, 1991, "Multi-task principal agent analyses: linear contracts, asset ownership, job design," *Journal of Law, Economics, & Organization* 7, 24-52.
- Jensen, M., and W. Meckling, 1976, "Theory of the firm: managerial behavior, agency costs and ownership structure," *Journal of Financial Economics* 3, 305-360.

1.b. Capital Structure

Lecture Notes:

- "Capital Structure"

Book Chapters:

- Tirole, Chapters 3 and 6.

Articles:

- Brander, J., and T. Lewis, 1986, "Oligopoly and financial structure: the limited liability effect," *American Economic Review* 76, December, 956-70.
- Jensen M., 1986, "Agency costs of free cash flow, corporate finance and takeovers," *American Economic Review* 76, 323-329.
- Leland, H., and D. Pyle, 1977, "Information asymmetries, financial structure, and financial intermediation," *Journal of Finance* 32, 371-388.
- Miller, M., 1977, "Debt and taxes," *Journal of Finance* 32, 261-275.
- Modigliani, F., and M. Miller, 1958, "The cost of capital, corporation finance, and

the theory of investment," *American Economic Review* 48, 261-297.

- Myers, S., and N. Majluf, 1984, "Corporate financing and investment decisions when firms have information that investors do not have," *Journal of Financial Economics* 13, 187-221.

- Ross, S., 1977, "The determination of financial structure," *Bell Journal of Economics* 8, 23-40.

- Stulz, R., 1990, "Managerial discretion and optimal financing policies," *Journal of Financial Economics* 26, 3-27.

1.c. Financial Contracting

Lecture Notes:

- "Financial Contracting"

Book Chapters:

- Tirole, Chapter 10.

Articles:

- Aghion, P., and P. Bolton, 1992, "An incomplete contracts approach to financial contracting," *Review of Economic Studies* 59, 473-494.

- Bolton, P., and D. Scharfstein, 1996, Optimal debt structure and the number of creditors, *Journal of Political Economy* 104, 1-25.

- Dewatripont, M., and J. Tirole, 1994, "A theory of debt and equity: diversity of securities and manager-shareholder congruence," *Quarterly Journal of Economics* 109, 1027-1054.

- Gale D., and M. Hellwig, 1985, "Incentive compatible debt contracts: the one period problem," *Review of Economic Studies* 52, 647-63.

- Townsend R., 1979, "Optimal contracts and competitive markets with costly state verification," *Journal of Economic Theory* 21, 265-293.

1.d. Corporate Control

Lecture Notes:

- "Corporate Control"

Book Chapters:

- Tirole, Chapter 11.

Articles:

- Bagnoli, M., and B. Lipman, 1988, "Successful takeovers without exclusion," *Review of Financial Studies* 1, 89-110.
- Grossman, S., and O. Hart, 1980, "Takeover bids, the free rider problem and the theory of the corporation," *Bell Journal of Economics* 11, 42-64.
- Shleifer, V., and R. Vishny, 1986, "Large shareholders and corporate control," *Journal of Political Economy* 94, 461-488.

2. Financial Intermediation

2.a. Liquidity Provision and Runs

Lecture Notes:

- "Financial Intermediation and Crises"

Book Chapters:

- Tirole, Chapter 12.

Articles:

- Allen, F., and D. Gale, 2000, "Financial contagion," *Journal of Political Economy* 108, 1-33.
- Diamond, D., and P. Dybvig, 1983, "Bank runs, deposit insurance, and liquidity," *Journal of Political Economy* 91, 401-419.
- Goldstein, I., and A. Pauzner, 2005, "Demand deposit contracts and the probability of bank runs," *Journal of Finance* 60, 1293-1328.
- Morris, S., and H. S. Shin, 1998, "Unique equilibrium in a model of self-fulfilling currency attacks," *American Economic Review* 88, 587-597.

2.b. Monitoring and Credit Markets

Lecture Notes:

- "Financial Intermediation and Crises"
- "Financial Fragility"

Book Chapters:

- Tirole, Chapter 13.

Articles:

- Bebchuk, L., and I. Goldstein, 2011, "Self-fulfilling credit market freezes," *Review of Financial Studies* 24, 3519-3555.
- Diamond, D., 1984, "Financial intermediation and delegated monitoring," *Review of Economic Studies* 51, 393-414.
- Holmstrom, B., and J. Tirole, 1997, "Financial intermediation, loanable funds, and the real sector," *Quarterly Journal of Economics* 112, 663-691.

2.c. Short Term Debt and Incentives

Lecture Notes:

- "Short Term Debt and Incentives in Banks"

Articles:

- Allen, F., E. Carletti, I. Goldstein, and A. Leonello, 2018, "Government guarantees and financial stability," *Journal of Economic Theory* 177, 518-557.
- Calomiris, C., and C. Kahn, 1991, "The role of demandable debt in structuring optimal banking arrangements," *American Economic Review* 81, 497-513.
- Diamond, D., and R. Rajan, 2001, "Liquidity risk, liquidity creation and financial fragility: a theory of banking," *Journal of Political Economy* 109, 287-327.
- Eisenbach, T., 2017, "Rollover risk as market discipline: a two-sided inefficiency," *Journal of Financial Economics* 126(2), 252-269.

3. Financial Markets

3.a. Information and Trading in Financial Markets

Lecture Notes:

- "Financial Markets"

Articles:

- Glosten, L., and P. Milgrom, 1985, "Bid, ask and transaction prices in a specialist market with heterogeneously informed traders," *Journal of Financial Economics* 14, 71-100.
- Grossman, S., and J. Stiglitz, 1980, "On the impossibility of informationally efficient markets," *American Economic Review* 70, 393-408.

- Kyle, A., 1985, "Continuous auctions and insider trading," *Econometrica* 53, 1315-1336.

3.b. Financial Market Feedback

Lecture Notes:

- "Financial Markets, Information, and Real Investments"
- "Feedback Effects"

Articles:

- Bond, P., A. Edmans, and I. Goldstein, 2012, "The real effects of financial markets," *Annual Reviews of Financial Economics* 4, 339-360.

- Bond, P., I. Goldstein, and E. S. Prescott, 2010, "Market-based corrective actions," *Review of Financial Studies* 23, 781-820.

- Dow, J., I. Goldstein, and A. Guembel, 2017, "Incentives for information production in markets where prices affect real investment," *Journal of the European Economic Association* 15, 877-909.

- Edmans, A., I. Goldstein, and W. Jiang, 2015, "Feedback effects and the limits to arbitrage," *American Economic Review* 105, 3766-3797.

- Goldstein, I., and A. Guembel, 2008, "Manipulation and the allocational role of prices," *Review of Economic Studies* 75, 133-164.

- Goldstein, I., E. Ozdenoren, and K. Yuan, 2013, "Trading frenzies and their impact on real investment," *Journal of Financial Economics* 109, 566-582.

University of Pennsylvania
The Wharton School
Professor Nick Roussanov

Empirical Methods in Finance FNCE-921, Spring 2023

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I. OBJECTIVES

This course is designed to provide students with foundational knowledge of empirical methods in finance. The course will cover time-series and cross sectional properties of asset returns and tests of asset pricing models. The course will introduce and examine various empirical/econometric methods by focusing on classical and relevant recent papers. First-year PhD students in finance: please note that the material from this class will be included in the prelims!

II. Recommended Prerequisite

FNCE 911 and Econometrics 705 or Stats 520.

III. Lectures

Lectures: Thursdays SHDH 2401 or SHDH 116 3:30-6:30 PM

IV. Communication

The official information source for FNCE 921 is the class canvas. It will hold all lecture notes and assignments, and I will use it to make announcements.

V. Grading

The following components make up your course grade:

- **Assignments (25pts):**

  I will assign approximately 4 assignments. These assignments can be worked in groups of no more than 2 students. Group assignments should be submitted as a single submission. Assignments should be handed in before before the beginning of class on the day they are due. You should start working on the assignments as soon as possible. Some of the assignments could take several days to complete. Under no circumstances will I accept late homework.

  The assignments are designed to help you understand the material, digest the assigned papers that I do not cover in class, and familiarize yourself with empirical research.

Many/most problems will require the use of computers. You must know or quickly learn a statistical programming language. I recommend that you use Matlab, R, Gauss, although other software packages like SAS, STATA, EVIEWS may work. Of course, you may be a hard-core programmer and use C, C++, Fortran, or the more user friendly Fortan90; Python is particularly popular these days and might be a good choice if you or are interested in learning a new language (and you are welcome to use it if you already know it). I will only use Matlab for my solutions, however.

- **Presentation & Participation (20pts):**

  Each student will be required to provide an in class presentation of a paper from a subset of the papers listed on the reading list (the ones marked without a star). These presentation will be during class and most will be toward the end of the semester. Further details regarding what a presentation constitute will be given later in the course. However, students should present the questions, summarize the model/findings, and then provide critique and link to the literature. Allocations will be on a first come first serve basis–so the earlier you approach me the higher the likelihood you'll present the paper you want.

- **Quiz (15pts):**

  There will be a quiz examination of one hour. It will constitute one or two questions regarding the class material. I will announce the exact date later in the semester.

- **Paper/Final Project (40pts):**

  I'd like you to make use of the tools you acquired throughout the class or commit to acquire more tools. This should be done by either proposing and executing your own research project or taking an existing paper and essentially replicating it and possibly extending its analysis in someway (data/question/methodology). All papers/projects should be discussed with me ahead of time. The paper/project **proposal** which will outline the question, theory/methodology, and data utilized should be submitted by April 15^{th}. The completed paper/project can be part of or constitute all of your first year paper but **can not** serve as a topic/project for another class and should be submitted by August 15^{th}–that gives you time to work on and complete the project after the prelims.

VI. Class Participation

Finally, to make this class work everyone has to work through every assigned reading before class. I expect that you become an active participant in the class. You should ask questions, raise issues, contribute your knowledge, and challenge the opinions of others, including mine. This class will be a lot more enjoyable for everyone if you participate. I will use participation as a way to increase your grade in cases in which your grade is at the borderline.

VII. Texts & Readings

You should have access to the following books:

- Campbell, J., 2018, *Financial Decisions and Markets: A Course in Asset Pricing*, Princeton University Press.
- Campbell, J., A. Lo, and A.C. MacKinlay, 1997, *The Econometrics of Financial Markets*, Princeton University Press.
- Cochrane, J., 2001, *Asset Pricing*, Princeton University Press.
- Hamilton, J., 1994, *Time Series Analysis*, Princeton University Press.
- Singleton, K., 2006, *Empirical Dynamic Asset Pricing: Model Specification and Econometric Assessment*, , Princeton University Press.

In addition, I will ask you to watch some of the videos from John Cochrane's Asset Pricing course on YouTube, they are a great way to review some of the "background" material or get a brief introduction into some of the topics that we will discuss in depth, or from a somewhat different perspective.

This course will evolve throughout the semester. Here is a preliminary reading list for the semester. I realize this is a long list that provides you with an extensive (albeit still partial) exposure to the literature. Note, however, that I designated a $\star$ around a small subset of the list for the papers that are required reading. Some of the more recent topics will be updated as we go on as the literature evolves.

1 Introduction

1. ⋆ CLM (chapters 1-2)
2. ⋆ Campbell, John Y., 2000, Asset Pricing at the Millennium, Journal of Finance, LV (4), 1515–1567.
3. Fama, Eugene F., 1991, Efficient Capital Markets: II, Journal of Finance, XLVI (5), 1575–1617.

Recommended

1. Barberis, Nicholas, and Richard Thaler, 2002, A Survey of Behavioral Finance, In Handbook of the Economics of Finance, Forthcoming.
2. Cochrane, John H., 2005, Financial Markets and the Real Economy, NBER Working paper, W11193.
3. Cochrane, John H., 2001, Asset Pricing, Chapters 20 and 21

2 Return Properties

2.1 Basics

1. CLM Chapter 1-2
2. ⋆ Fama, E., and K. French, 1988a, "Permanent and Temporary Components of Stock Prices," Journal of Political Economy, 96, 246-273.
3. Lo, Andrew W., and A. Craig MacKinlay, 1990, "Data-Snooping Biases in Tests of Financial Asset Pricing Models, Review of Financial Studies, 3, 431 – 468.
4. Poterba J. and L Summers (1998), "Mean reversion in Stock prices: Evidence and implications," Journal of Financial Economics, 22, 27-59.
5. Shiller R. J. and P. Perron (1985), "Testing for random walk hypothesis: Power versus frequency of observations," Economic Letters,18, 381-386.
6. Working H. (1960) "Note on the correlation of first difference of averages in random chain," Econometrica, 28, 916-918.

2.2 Return Predictability

1. ⋆ CLM Chapter 7
2. ⋆ Campbell, J., and R. Shiller, 1988, "The Dividend-Price Ratio and Expectations of Future Dividends and Discount Factors," Review of Financial Studies 1, 195-228.
3. ⋆ Hodrick, R., 1992, "Dividend Yields and Expected Stock Returns: Alternative Procedures for Inference and Measurement," Review of Financial Studies 5, 357- 386.

4. ⋆ Stambaugh, Robert F., 1999, "Predictive Regressions, Journal of Financial Economics," 54, 375–421.

More recent contributions to this debate

5. Ang A. and Bekaert G. "Is Predictability there?," 2007, The Review of Financial Studies, Volume 20, Issue 3, 651–707.

6. Campbell, J., and R. Shiller, 1987, "Cointegration and Tests of Present Value Models," Journal of Political Economy 95, 1062-1087.

7. Boudoukh Jacob Matthew Richardson and Robert Whitelaw, 2008, "The Myth of Long Horizon Predictability," *Review of Financial Studies*.

8. Cochrane John, 2008, "The Dog that did not Bark: A Defense of Return Predictability", *Review of Financial Studies*.

9. ⋆ Cochrane John, 2011, "Presidential Address: Discount Rates," *Journal of Finance*.

10. Lamont, Owen, 1998, "Earnings and Expected Returns, Journal of Finance," 53, 1563 – 1587.

11. Lewellen, Jonathan W., 2004, Predicting Returns with Financial Ratios, Journal of Financial Economics, 74 (2), 209-235.

12. Welch Ivo and Amit Goyal, 2008, "A Comprehensive Look at the Empirical Performance of Equity Premium Prediction," *Review of Financial Studies*.

13. Larrain, B. and Moto Yogo, " Does firm value move too much to be justified by subsequent changes in cash flow?" Journal of Financial Economics, 2008

14. Golez Benjamin and Peter Koudijs, 2016, "Four centuries of return predictability", 2016, Stanford University.

15. Binsbergen, J. H. van, and R. S. J. Koijen, 2010, "Predictive regressions: A present-value approach." Journal of Finance 65:1439–71.

16. Lettau Martin and Sydney Ludvigson, 2001, "Consumption, Aggregate Wealth and Expected Stock Returns," Journal of Finance, LVI (3),815–849.

17. Cujean, J., and M. Hasler, 2017, "Why Does Return Predictability Concentrate in Bad Times? The Journal of Finance

18. Kelly, B., and S. Pruitt, 2013, "Market expectations in the cross-section of present values," The Journal of Finance, 68:1721–1756.

19. Pástor, L., and R. F. Stambaugh, 2009, "Predictive systems: Living with imperfect predictors," The Journal of Finance 64:1583–1628.

20. Gómez-Cram Roberto, 2018, "Stock Return Predictability: Riding the Risk Premium," Working paper, The Wharton School.

2.3 Volatility Models

1. Bollerslev, T., 1986, "Generalized Autoregressive Conditional Heteroscedasticity," Journal of Econometrics 31, 307-327.

2. Bollerslev, T., R. Chou, and K. Kroner, 1980, "ARCH Modeling in Finance: A Review of the Theory and Empirical Evidence," Journal of Econometrics 52, 5-59.

3. Hamilton, J., 1989, " New Approach to the Economic Analysis of Nonstationary Time Series and the Business Cycle," Econometrica 57, 357-384.

Recommended

1. Engle, R., 1982, "Autoregressive Conditional Heteroskedasticity with Estimates of the Variance of U.K. Inflation," Econometrica 50, 987-1008.

2. Nelson, D., 1991, "Conditional Heteroskedasticity in Asset Returns: A New Approach," Econometrica 59, 347-370.

3. Schwert, G.W., 1989, "Why Does Stock Market Volatility Change Over Time?," Journal of Finance 44, 1115-1153.

2.4 Conditional Means and Variances

1. ⋆ Bollerslev, T., R. Engle, and J. Wooldridge, 1988, "A Capital Asset Pricing Model with Time Varying Covariance," Journal of Political Economy 96,116-131.

2. ⋆ French, K., W. Schwert and R. Stambaugh, 1987, "Expected Stock Returns and Volatility," Journal of Financial Economics 19, 3-30.

Recommended

1. Campbell J. and Hentchell L. 1992, "No News is Good News: A Asymmetric changing Volatility in Stock Returns," Journal of Financial Economics 31, 281-318.

2. Lawrence R. Glosten, Ravi Jagannathan, David E. Runkle, 1993, "On the Relation between the Expected Value and the Volatility of the Nominal Excess Return on Stocks," The Journal of Finance, Vol. 48, No. 5, pp. 1779-1801

3. Whitelaw, R., 1994, "Time Variations and Covariations in the Expectation and Volatility of Stock Market Returns," Journal of Finance 49, 515-541.

3 Asset Pricing Models: Euler Equations, Consumption Based Models

3.1 Preferences & Equilibrium Endowment

1. ⋆ Hansen, L.P., and R. Jagannathan, 1991, "Implications of Security Market Data for Models of Dynamic Economies," Journal of Political Economy 99, 225 – 262.

2. ⋆ Hansen, L.P., and K. Singleton, 1982, "Generalized Instrumental Variables Estimation of Nonlinear Rational Expectation Models," Econometrica 50, 1269 – 1286.

3. Lucas Robert Jr., 1978, "Asset Prices in an Exchange Economy", Econometrica, 46, 1429-1446.

4. ⋆ Mehra, R., and E. Prescott, 1985, "The Equity Premium: A Puzzle," Journal of Monetary Economics 15, 145 – 161.

5. ⋆ Hansen, Lars, John Heaton, Junghoon Lee, and Nikolai Roussanov, "Intertemporal substitution and risk aversion," Handbook of econometrics 6, 3967-4056

6. Abel, Andrew B., 1999, Risk premia and term premia in general equilibrium, Journal of Monetary Economics 43, 3–33.

7. Alvarez, Fernando, and Urban Jermann, "Using asset prices to measure the persistence of the marginal utility of wealth," Econometrica, 2005

3.2 Habits

1. Abel, Andrew B., 1990, "Asset prices under habit formation and catching up with the Joneses," American Economic Review 80, 38–42.

2. ⋆ Campbell, John Y., and John H. Cochrane, 1999, By Force of Habit: A Consumption-Based Explanation of Aggregate Stock Market Behavior, Journal of Political Economy, 107, 205 - 251.

3. Constantinides, George, 1990, "Habit Formation: A Resolution of the Equity Premium Puzzle," Journal of Political Economy 98, 519 – 543.

3.3 Long Run Risks

1. ⋆ Bansal, Ravi, and Amir Yaron, 2004, "Risk for the Long Run: A Potential Resolution of Asset Pricing Puzzles," Journal of Finance, 59(4), 1481-1509,

2. ⋆ Frank Schorfheide, Dongho Song, and Amir Yaron, 2017, "Identifying Long Run Risks: A Bayesian Mix Freuency Approach," forthcoming Econometrica.

3. Bansal, Ravi, Dana Kiku, and Amir Yaron, 2010, "Long Run Risks: Estimation with Time Aggregation," Journal of Monetary Economics.

4. Bansal Ravi, Khatachtarian Varoujan, and Amir Yaron, "Interpretable Asset Markets?", European Economic Review. 49, April 2005: 531-560.

5. Epstein, L., and S. Zin, 1989, "Substitution, Risk Aversion, and the Temporal Behavior of Consumption and Asset Returns: An Empirical Analysis," Journal of Political Economy 99, 263-286.

3.4 Disasters

1. ⋆ Robert Barro "Rare Disasters, Asset Prices, and Welfare Costs," American Economic Review, March 2009.

2. Rietz, Thomas A., 1988, "The equity risk premium: A solution," Journal of Monetary Economics 22, 117–131.

3. Xavier Gabaix, "Gabaix, Xavier "Variable Rare Disasters: An Exactly Solved Framework for Ten Puzzles in Macro-Finance," Quarterly Journal of Economics, vol. 127(2), 2012, 645-700.

4. Wachter Jessica "Can time-varying risk of rare disasters explain aggregate stock market volatility?, forthcoming Journal of Finance

5. Bansal Ravi, Dana Kiku, Amir Yaron, 2010, Long-Run Risks, the Macroeconomy, and Asset Prices," American Economic Review

3.5 Heterogeneity and Incomplete Markets

1. ⋆ Constantinides, George M., and Darrell Duffie, 1996, "Asset pricing with heterogeneous consumers," Journal of Political Economy 104, 219–240.

2. Mankiw, N. Gregory, 1986, "The equity premium and the concentration of aggregate shocks," Journal of Financial Economics 17, 211–219.

3. Vissing-Jørgensen, Annette. "Limited Asset Market Participation and the Elasticity of Intertemporal Substitution." Journal of Political Economy, August 2002, 110(4), pp. 825–53.

4. Attanasio, Orazio, and Vissing-Jorgensen, "Stock-market participation, intertemporal substitution, and risk-aversion," 2003, American Economic Review 93 (2), 383-391

5. Attanasio, Orazio P.; Banks, James and Tanner, Sarah. "Assets Holding and Consumption Volatility." Journal of Political Economy, August 2002, 110(4), pp. 771–92.'

6. Heaton, John C., and Deborah J. Lucas, 2000, 'Portfolio choice and asset prices: The importance of entrepreneurial risk," Journal of Finance 55, 1163–1198.

7. Grossman, S.J., Shiller, R.J., 1982. "Consumption correlatedness and risk measurement in economies with non-traded assets and heterogeneous information." J. Finan. Econ. 10, 195–210.

8. Storesletten, Kjetil, Christopher Telmer, and Amir Yaron, "Cyclical dynamics in idiosyncratic labor market risk," Journal of Political Economy 112, 2004; 695-717

9. Jacobs, Kris, 1999, "Incomplete markets and security prices: Do asset pricing puzzles result from aggregation problems?" Journal of Finance 54, 123–163.

10. Schmidt, Lawrence D. W., MIT Sloan Working Paper 5500-16. Cambridge, MA: MIT Sloan School of Management, March 2016.

4 Financial Econometric Methods

1. Cochrane John , Asset Pricing, Chapter 10, 11, 14.1-14.2.

2. Hamilton, James, Time Series Analysis

3. Kim, Chang-Jin and Charles Nelson, State-Space Models with Regime Switching, *Book*

4. Hansen, L.P., 1982, "Large Sample Properties of Generalized Method of Moments Estimators," Econometrica 50, 1029–1054.

5. Pakes, A., and Pollard. D. 1989. "Simulation and the asymptotics of optimization estimators." Econometrica 57(5):1027–57

6. Lee, B., and B. Ingram, 1991, "Simulation Estimation of Time-Series Models," Journal of Econometrics 47, 197–205.

7. Ogaki, M., 1993, "Generalized Method of Moments: Econometric Applications," in Handbook of Statistics, Vol. 11.

8. Gallant, R., and G. Tauchen, 1996, "Which Moments to Match," Econometric Theory 12, 657–681.

9. Tauchen G. and R. Hussey, 1991, "Quadrature-Based Methods for Obtaining Approximate Solutions to Nonlinear Asset Pricing Models," Econometrica, Volume 59, No. 2, pp. 371–396.

10. Duffie, Darrell, and Kenneth J Singleton, 1993, "Simulated moments estimation of Markov models of asset prices," Econometrica 61, 929-52.

11. Gourieroux, C, A Monfort, and E Renault, 1993, "Indirect inference," Journal of Applied Econometrics, 8.

12. Dridi, Ramdan, Alain Guay, and Eric Renault, 2007, "Indirect inference and calibration of dynamic stochastic general equilibrium models," Journal of Econometrics 136, 397 - 430.

13. Hansen, Lars P.; Heaton, John and Yaron, Amir. "Finite-Sample Properties of Some Alternative GMM Estimators." Journal of Business and Economic Statistics, July 1996, 14(3), pp. 262–80.

5 Cross-section of Returns: ICAPM, Beta Representation, and SDF Methods

5.1 Cross section of returns: Facts

1. ⋆ CLM – Chapters 5,6

2. ⋆ Cochrane Chapters 14-16.

3. ⋆ Fama, Eugene F., and Kenneth R. French, 1992, The Cross-Section of Expected Stock Returns, Journal of Finance, 47, 427–465.

4. ⋆ Fama, Eugene F., and Kenneth R. French, 1993, Common Risk Factors in the Returns on Stocks and Bonds," Journal of Financial Economics, 33, 3-56.

5. Fama, Eugene F., and Kenneth R. French, 1995, Size and Book-to-Market Factors in Earnings and Returns, Journal of Finance, 50, 131–155.

6. Fama, Eugene F., and Kenneth R. French, 1996, Multifactor Explanations of Asset Pricing Anomalies, Journal of Finance, 51, 55–84.

7. Berk, Jonathan, 1995, A Critique of Size-Related Anomalies, Review of Financial Studies, 8, 275–286.

5.2 Methods: SDF & Cross sectional Regressions

1. ⋆ Cochrane –Chapter 9.1, 8.3-8.4, 12.2-12.3

2. ⋆ Fama Eugene F., and J MacBeth, 1973, "Risk, Return and Equilibrium test", Journal of Political Economy, 91, 607-636.

3. ⋆ Gibbons, Michael R., Stephen A. Ross, and Jay Shanken, 1989, A Test of the Efficiency of a Given Portfolio, Econometrica, 57, 1121–1152.

4. Hansen, L.P., and R. Jagannathan, 1997, "Assessing Specification Errors in Stochastic Discount Factor Models," Journal of Finance 52, 557-590.

5. ⋆ Jagannathan, Ravi, and Zhenyu Wang, 1996, The Conditional CAPM and the Cross-Section of Expected Returns, Journal of Finance, 51, 3–54.

6. ⋆ Lettau, Martin, and Sydney Ludvigson, 2001, Resurrecting the (C)CAPM: A Cross-Sectional Test When Risk Premia Are Time-Varying, Journal of Political Economy, 109 (6), 1238–1287.

7. Jonathan Lewellen, and Stefan Nagel, and Jay Shanken, 2010, A Skeptical Appraisal of Asset Pricing Tests, Journal of Financial Economics.

8. Jagannathan, Ravi and Zhenyu Wang, 2002, Empirical evaluation of asset pricing models: A comparison of the SDF and Beta methods, Journal of Finance 57, 2337 – 2367.

9. Lewellen, J., and S. Nagel, 2006, "The Conditional CAPM Does Not Explain Asset-Pricing Anomalies," Journal of Financial Economics, 82, 289-314.

10. Roussanov, N.," Composition of wealth, conditioning information, and the cross-section of stock returns," Journal of Financial Economics 111 (2), 352-380

Examining Cashflows

11. Bansal R. Dittmar R. and C. Lundblad 2005, "Consumption, Dividends, and the Cross-Section of Equity Returns," Journal of Finance.

12. Hansen Lars Peter, John Heaton, and Nan Li. Consumption Strikes Back?, 2011, Journal of Political Economy.

13. Menzly Lior, Tano Santos, Pietro Veronesi, 2004, The Time Series of the Cross Section of Asset Prices, Journal of Political Economy.

14. Davydiuk Tetiana, Scott Richard, Ivan Shaliastovich, and Amir Yaron, 2017, "How Risky is the U.S. Corporate Sector?", working paper, Wharton.

Recommended

1. ⋆ Berk, Jonathan, 1995, A Critique of Size-Related Anomalies, Review of Financial Studies, 8, 275–286.

2. Campbell, John and Vuolteenaho, Tuomo, 2004, Bad Beta, Good Beta. American Economic Review 94:1249-1275.

3. Daniel, Kent, and Sheridan Titman, 1997, Evidence on the Characteristics of Cross Sectional Variation in Stock Returns, Journal of Finance, 52, 1–33.

4. Fama, Eugene F., and Kenneth R. French, 1999, Value Versus Growth: The International Evidence, Journal of Finance, 53 (6), 1975–1999.

5. Lakonishok, Josef, Andrei Shleifer, and Robert W. Vishny, 1994, Contrarian Investment, Extrapolation, and Risk, Journal of Finance, XLIX (5), 1541–1578.

6. LaPorta, Rafael, Josef Lakonishok, Andrei Shleifer, and Robert Vishny, 1997, Good News for Value Stocks: Further Evidence on Market Efficiency, Journal of Finance, 52 (2), 859–874.

7. Jonathan Lewellen, and Stefan Nagel, 2006, "The Conditional CAPM Does Not Explain Asset Pricing Anomalies," Journal of Financial Economics

8. Moskowitz Tobias, Chris Malloy, Annette Vising-Jorgensen, 2010, "Long run consumption risk of stockholders," Journal of Finance,

9. Liew, Jimmy, and Maria Vassalou, 2000, Can Book-to-Market, Size, and Momentum Be Risk Factors That Predict Economic Growth? Journal of Financial Economics, 57, 221–245.

5.3 Cross Section: Arbitrage, Multifactor Models

1. CLM —Chapter 6

2. Cochrane Chapter 9.4, 12-16

3. ⋆ Chen, Nai-Fu, Richard Roll, and Stephen Ross, 1986, Economic Forces and the Stock Market, Journal of Business, 59, 3, 383–403.

4. Bansal, Ravi and Viswanathan, S. (1993), No-arbitrage and and arbitrage pricing: A new approach", Journal of Finance 48, 1231 – 1262.

5. Ferson, Wayne E., and Campbell R. Harvey, 1999, Conditioning Variables And Cross-Section of Stock Returns, Journal of Finance, 54, 1325–1360.

6. Ferson Wayne, and Campbell R. Harvey, 1991, The Variation of Economic Risk Premiums, Journal of Political Economy, 99, 285–315.

7. Pastor L. and R.F. Stambaugh, 2003, Liquidity risk and expected stock returns, Journal of Political Economy, 111, 642-85.

8. Frazzini Andrea and Lasse Pederson, 2014, "Betting Against Beta," Journal of Financial Economics, Volume 111, Issue 1, 1-25.

9. Ralph Koijen, Toby Moskowitz, Lasse Pedersen, and Evert Vrugt, 2016," Carry" forthcoming Journal of Financial Economics.

10. Asness Cliff, Frazzini Andrea, and Lasse Pedersen, 2015, "Quality Minus Junk", SSRN

11. Fama Eugene and Kenneth French, 2015, A Five Factor Asset Pricing Model," Journal of Financial Economics, Volume 116, Issue 1, 1-22.

12. Hou, Kewei, Chen Xue, and Lu Zhang, 2015, "Digesting anomalies: An investment approach," Review of Financial Studies 28 (3), 650-70

13. Robert Stambaugh and Yu Yuan, 2017, "Mispricing Factors," Review of Financial Studies, forthcoming.

5.4 New methods for big data: nonparametrics, machine learning, etc.

1. Freyberger, Joachim, Andreas Neuhierl, and Michael Weber. 2020. " Dissecting Characteristics Nonparametrically." The Review of Financial Studies 33 (5): 2326-2377. issn: 0893-9454. https://doi.org/10.1093/rfs/hhz123. https://doi.org/10. 1093/rfs/hhz123.

2. Giannone, Domenico, Michele Lenza, and Giorgio E Primiceri. 2017. " Economic Predictions with Big Data: The Illusion Of Sparsity." CEPR Discussion Papers, https://ideas.repec.org/p/cpr/ceprdp/12256.html.

3. Gu, Shihao, Bryan Kelly, and Dacheng Xiu, 2020, Empirical asset pricing via machine learning, The Review of Financial Studies 33, 2223–2273

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6 Other Asset Classes

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7 Price phenomena across asset classes and other recent topics

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7.5 Intermediary Asset Pricing

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7.6 Announcements

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8 Firms, Asset Pricing, and Macro-Finance

Heterogeneous Firm Models and Asset Pricing:

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Asset Pricing in a General Equilibrium with Production

1. Cochrane, J., 1991, "Production-Based Asset Pricing and the Link between Stock Returns and Economic Fluctuations," Journal of Finance 46, 207-234
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4. Lochstoer Lars, 2011, Long-Run Risk through Consumption Smoothing, Review of Financial Studies
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6. Kung, Howard and Lukas Schmid (2015), Innovation, Growth, and Asset Prices. The Journal of Finance

9 Other Applications in Finance

1. Time permitting
2. TBD — topics targeted are use of instrumental variables, identifications schemes, uses of Probit & Logit, regression discontinuity.

UNIVERSITY OF PENNSYLVANIA
The Wharton School

FNCE 9220:
CONTINUOUS-TIME FINANCIAL ECONOMICS

Prof. Domenico Cuoco Fall 2023

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Phone: 898-8290
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Course Description:

The course is an introduction to the theory of continuous-time financial economics, offering a review not only of the core results relating to dynamic asset pricing and consumption/portfolio choice in continuous time, but also of the main tools on which the theory is built, with particular emphasis on continuous-time stochastic processes. Upon completion of the course, students should have sufficient familiarity with these tools to be able to formulate and analyze continuous-time financial models.

The articles listed in the course outline include many of the classical papers in the field. You are strongly encouraged to read as many of them as possible.

Prerequisites:

The prerequisite for this course is FNCE 9110 (or familiarity with C.-f. Huang and R. Litzenberger, *Foundations for Financial Economics*, North-Holland, 1988 or Skiadas, *Asset Pricing theory*, 2009). Some graduate-level knowledge of analysis and statistics is helpful but not required.

Text and References:

The recommended textbook is:

D. Duffie, *Dynamic Asset Pricing Theory*, Princeton University Press, 2001.

The following books might also be helpful:

K. Back, *Asset Pricing and Portfolio Choice Theory*, Oxford University Press, 2010.

I. Karatzas and S.E. Shreve, *Methods of Mathematical Finance*, Springer, 2016.

The suggested mathematical references are:

H.L. Royden, *Real Analysis*, Macmillan, 1988.

N. Dunford and J.T. Schwartz, *Linear Operators. Part I: General Theory*, Wiley, 1988.

The suggested statistical references are:

J.M. Steele, *Stochastic Calculus and Financial Applications*, Springer, 2010.

I. Karatzas and S.E. Shreve, *Brownian Motion and Stochastic Calculus*, Springer, 1998.

P. Protter, *Stochastic Integration and Differential Equations*, Springer, 2003.

Course Outline and Suggested Readings:

1. Background Material from Mathematics and Statistics

Lecture notes.

2. The Fundamental Theorem of Asset Pricing

Lecture notes.

Textbook, Chapter 6.

J.M. Harrison and D. Kreps (1979), "Martingales and Arbitrage in Multiperiod Securities Markets", *Journal of Economic Theory* **20**, 381–408.

∗ S. Clark (1993), "The Valuation Problem in Arbitrage Price Theory", *Journal of Mathematical Economics* **22**, 463–478.

∗ K. Back and S. Pliska (1991), "On the Fundamental Theorem of Asset Pricing with an Infinite State Space", *Journal of Mathematical Economics* **20**, 1–18.

P.H. Dybvig and C.-f. Huang (1988), "Nonnegative Wealth, Absence of Arbitrage, and Feasible Consumption Plans", *Review of Financial Studies* **1**, 377–401.

3. Complete Markets: Pricing Contingent Claims

Lecture notes.

Textbook, Chapters 5 and 8.

F. Black and M. Scholes (1973), "The Pricing of Options and Corporate Liabilities", *Journal of Political Economy* **81**, 637–654.

∗ R. Merton (1973), "Theory of Rational Option Pricing", *Bell Journal of Economics and Management Science* **4**, 141–183.

∗ I. Karatzas (1988), "On the Pricing of American Options", *Applied Mathematics and Optimization* **17**, 37–60.

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∗An asterisk denotes material that can be skipped on a first reading.

4. Complete Markets: Optimal Consumption and Portfolio Choice

Textbook, Chapter 9.

R. Merton (1971), "Optimum Consumption and Portfolio Rules in a Continuous Time Model", *Journal of Economic Theory* **3**, 373–413.

J. Cox and C.-f. Huang (1989), "Optimal Consumption and Portfolio Choices when Asset Prices Follow a Diffusion Process", *Journal of Economic Theory* **49**, 33–83.

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∗ I. Karatzas, J.P. Lehoczky and S.E. Shreve (1987), "Optimal Portfolio and Consumption Decisions for a 'Small Investor' on a Finite Horizon", *SIAM Journal on Control and Optimization* **25**, 1557–1586.

5. Dynamic Equilibrium with Complete Markets

Textbook, Chapter 10, Sections A–H and J.

∗ R. Merton (1973), "An Intertemporal Capital Asset Pricing Model, *Econometrica* **41**, 867–888.

∗ D. Breeden (1979), "An Intertemporal Asset Pricing Model with Stochastic Consumption and Investment Opportunities", *Journal of Financial Economics* **7**, 265–296.

I. Karatzas, J.P. Lehoczky and S.E. Shreve (1990), "Existence and Uniqueness of Multi-Agent Equilibrium in a Stochastic, Dynamic Consumption/Investment Model", *Mathematics of Operations Research* **15**, 80–128.

6. The Term Structure of Interest Rates

Textbook, Chapter 7 and Chapter 10, Section I.

J. Cox, J. Ingersoll and S. Ross (1985), "An Intertemporal General Equilibrium Model of Asset Prices", *Econometrica* **53**, 363–384.

J. Cox, J. Ingersoll, and S. Ross (1985), "A Theory of the Term Structure of Interest Rates", *Econometrica* **53**, 385–408.

D. Heath, R. Jarrow and A. Morton (1992), "Bond Pricing and the Term Structure of Interest Rates: A New Methodology for Contingent Claims Valuation", *Econometrica* **60**, 77–105.

7. Incomplete Markets

H. He and N.D. Pearson (1991), "Consumption and Portfolio Choices with Incomplete Markets and Short-Sale Constraints: The Infinite-Dimensional Case", *Journal of Economic Theory* **54** 259–305.

∗ I. Karatzas, J.P. Lehoczky, S.E. Shreve and G.-L. Xu (1991), "Martingale and Duality Methods for Utility Maximization in an Incomplete Market", *SIAM Journal on Control and Optimization* **29**, 702–730.

8. Portfolio Constraints

J. Cvitanić and I. Karatzas (1992), "Convex Duality in Constrained Portfolio Optimization", *Annals of Applied Probability* **2**, 767-818.

* H. He and H. Pagés (1993), "Labor Income, Borrowing Constraints, and Equilibrium Asset Prices", *Economic Theory* **3**, 663–696.

D. Cuoco (1997), "Optimal Consumption and Equilibrium Prices with Portfolio Constraints and Stochastic Income", *Journal of Economic Theory* **72**, 33–73.

* J. Cvitanić and I. Karatzas (1993), "Hedging Contingent Claims with Constrained Portfolios", *Annals of Applied Probability* **3**, 652–681.

M. Broadie, J. Cvitanić and H.M. Soner (1998), "Optimal Replication of Contingent Claims under Portfolio Constraints", *Review of Financial Studies* **11**, 59–79.

∗ I. Bardhan (1995), "Synthetic Replication of American Contingent Claims when Portfolios are Constrained", *Stochastic Processes and their Applications* **57**, 149–165.

S. Basak and D. Cuoco (1998), "An Equilibrium Model with Restricted Stock Market Participation", *Review of Financial Studies* **11**, 309–341.

* J. Detemple and A. Serrat (2003), "Dynamic Equilibrium with Liquidity Constraints", *Review of Financial Studies* **16**, 597–629.

Finance 923
Spring 2024
Course Outline and Readings

Richard Kihlstrom

Version: January 7, 2024

1. Information Basics

   (a) The value of information

      i. Expected Utility Models
      Papers
      D. Blackwell, "The Comparison of Experiments", *Proceedings of the Second Berkeley Symposium on Mathematical Statistics and Probability*, University of California Press, (1951), 93-102.
      *D. Blackwell, "Equivalent Comparisons of Experiments", *Annals of Mathematical Statistics*, (June, 1953), 265-72.
      R. Kihlstrom, "A Bayesian Exposition of Blackwell's Theorem on the Comparison of Experiments", in M. Boyer and R. Kihlstrom, editors, *Bayesian Models in Economic Theory*, (1984), 13-31.
      Gollier, C. 2001. Chapter 24, *The Economics of Risk and Time*, MIT Press
      *R. Kihlstrom, "Risk Aversion and the Value of Information: A Selective Survey" Chapter111, *Encyclopedia of Finance*, C.F. Lee and Alice Lee, editors, Springer Nature, (2022)
      *Cabrales, A., O. Gossner and R. Serrano, "Entropy and the Value of Information for Investors," *American Economic Review,* (2013) 360-77.

      ii. Kreps-Porteus and Epstein-Zin, Weil Preferences
      Papers
      *Selden,L., "A New Representation of Preferences over 'Certain x Uncertain' Consumption Pairs: The 'Ordinal Certainty Equivalent' Hypothesis," *Econometrica, 46 (1978) 1045-60*
      *Kreps, David and Evan Porteus, "Temporal Resolution of Uncertainty and Dynamic Choice Theory," *Econometrica*, 46, (1978)185-200
      *Epstein, L., and S. Zin, "Substitution, Risk Aversion and the Temporal Behavior of Consumption and Asset Returns: A Theoretical Framework," *Econometrica*,57 (1989), 937-69
      *Weil, P., "The Equity Premium Puzzle and the Risk Free Rate Puzzle," *Journal of Monetary Economics,* 24 (1989), 401-21.

      iii. The Social Value of Information
      Papers

*J. Hirschleifer, "The Private and Social Value of Information", *American Economic Review*, 61, (1971), 561 74.
P. Milgrom and N. Stokey, "Information, Trade and Common Knowledge," *Journal of Economic Theory*, 26, (1982), 17 27.

(b) Generalities

Paper

M. Jensen and W. Meckling, "Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure", *Journal of Financial Economics*, 3, (Oct., 1976), 305 60

2. Rational Expectations

Papers

*R. Lucas, "Expectations and the Neutrality of Money," *Journal of Economic Theory*, 4, (1972), 103-24.

*D. Kreps, "A Note on Fulfilled Expectations Equilibria", *Journal of Economic Theory*, 14, (1977), 32 44.

S. Grossman, "The Existence of Futures Markets, Noisy Rational Expectation and Informational Externalities", *The Review of Economic Studies*, 44, (1977), 431-49.

*S. Grossman, "On the Efficiency of Competitive Stock Markets where Traders Have Diverse Information", *Journal of Finance*, 31, (1976), 573-85.

S. Grossman and J. Stiglitz, "On the Impossibility of Informationally Efficient Markets", *American Economic Review* 70, (1980), 393-408.

John Y. Campbell and Albert S. Kyle, "Smart Money, Noise Trading and Stock Price Behaviour," *The Review of Economic Studies*, 60, (Jan., 1993) 1-34

J. Wang, "A Model of Intertemporal Asset Prices Under Asymmetric Information," *Review of Economic Studies*, 60, (1993) 249-282.

*Martin Hellwig, "On the Aggregation of Information in Competitive Markets." *Journal of Economic Theory, 22* (1980) 477-98

*A. Kyle, "Continuous Auctions and Insider Trading", *Econometrica*, 53 (Nov., 1985), 1315 35.

*A. Kyle, "Informed Speculation with Imperfect Competition", *Review of Economic Studies*, 56 (1989) 317-55.

3. Adverse Selection and Signaling Equilibria

Papers

*M. Rothschild and J. Stiglitz, "Equilibrium in Competitive Insurance Markets: An Essay on the Economics of Imperfect Information", *Quarterly Journal of Economics*, 90, (1976) 629 50.

*J. Stiglitz, "Monopoly, Non-linear Pricing, and Imperfect Information: The Insurance Market," *Review of Economic Studies*, 44, (Oct., 1977) 407-430.

S. Ross, "The Determination of Financial Structure: the Incentive Signaling Approach", *Bell Journal of Economics and Management Science*, 8, (Spring, 1977) 23 40.

*H. Leland and D. Pyle, "Information Asymmetries, Financial Structure and Financial Intermediation", *Journal of Finance*, 32, (May, 1977), 737 48.

S. Myers and N. Majluf, "Corporate Financing and Investment Decisions when Firms Have Information that Investors Do Not Have", *Journal of Financial Economics*, 13, (June, 1984), 187 221.

*Chakrabarty, A., and B. Yilmaz, "Adverse Selection and Convertible Bonds," (2009) *Review of Economic Studies.*

K. Rock, "Why New Issues Are Underpriced", *Journal of Financial Economics*, 14 (Mar., 1986) 187 212.

*P. DeMarzo and D. Duffie, "A Liquidity Based Model of Security Design," *Econometrica*, 67 (1999) 65-99.

*P. DeMarzo, " The Pooling and Tranching of Securities," *Review of Financial Studies*, 18 (2005) 1-35.

J. Stiglitz and A. Weiss, "Credit Rationing in Markets with Imperfect Information," *American Economic Review*, 71 (1981) 393-410.

Douglas W. Diamond, "Reputation Acquisition in Debt Markets" *The Journal of Political Economy*, 97, (Aug., 1989), 828-862.

4. Moral Hazard, Managerial Incentives and "Bonding" Equilibria

   Papers

   *S. Grossman and O. Hart, "Corporate Financial Structure and Managerial Incentives", in J. McCall, editor, *The Economics of Information and Uncertainty*, University of Chicago Press: Chicago, (1982), 107 37.

   Jeffrey Zwiebel, "Dynamic Capital Structure under Managerial Entrenchment," *The American Economic Review*, 86, (Dec., 1996), 1197-1215.

   M. Jensen, "Agency Costs of Free Cash Flow, Corporate Finance and Takeovers," *American Economic Review*, 76 (1986) 323-9.

5. Dynamic Models with Asymmetric Information

   Papers

   William P. Rogerson, "Repeated Moral Hazard," *Econometrica*, 53, (Jan., 1985), 69-76.

   Spear, S., and S. Srivastava, "On Repeated Moral Hazard with Discounting," *Review of Economic Studies*, 54, (1987), 599–617.

   Holmstrom, B. and P. Milgrom, "Aggregation and Linearity in the Provision of Intertemporal Incentives," *Econometrica,* 55, (Jan., 1987), 303-28

   Albuquerque, R. and Hopenhayn, H. A. "Optimal Lending Contracts and Firm Dynamics," *Review of Economic Studies*, 72, (2004), 285-315.

   Clementi, G. L. and Hopenhayn, H. A. "A Theory of Financing Contracts and Firm Dynamics," *Quarterly Journal of Economics*, 121, (2006), 229-265.

   P. DeMarzo and M. Fishman, "Optimal Long-Term Financial Contracting," *Review of Financial Studies*, 20, (2007), 2079-2128.

   P. DeMarzo and M. Fishman, "Agency and Optimal Investment Dynamics," *Review of Financial Studies*, 20, (2007), 152-188.

DeMarzo, P. and Y. Sannikov "Optimal Security Design and Dynamic Capital Structure in a Continuous-Time Agency Model," *Journal of Finance*, 61, (2006) 2681-2724.

Sannikov,Y., "A Continuous-Time Version of The Principal-Agent Problem," *Review of Economic Studies*, 75, (2008), 957-984.

6. Auctions

   Papers

   W. Vickrey, "Counterspeculation, Auctions and Competitive, Sealed Tenders", *Journal of Finance*, 16, (1961), 8 37.

   R. Wilson, "A Bidding Model of Perfect Competition", *Review of Economic Studies*, 44, (1977), 511 8.

   S. Matthews, "Information Acquisition in Discriminatory Auctions", in Boyer and R. Kihlstrom, editors, *Bayesian Models in Economic Theory*, (1984).

   S. Matthews, "A Technical Primer on AuctionTheory I: Independent Private Values", Unpublished Lecture Notes, (1995).

   P. Milgrom and R. Weber, "A Theory of Auctions and Competitive Bidding", *Econometrica*, 50, (Sept., 1982), 1089 122.

   J. Riley and W. Samuelson, "Optimal Auctions", *American Economic Review*, 71, (June, 1981), 381 92.

   *R. Myerson, "Optimal Auction Design", *Mathematics of Operations Research*, 6, 58 73.

   M. Harris and A. Raviv, "A Theory of Monopoly Pricing Schemes with Demand Uncertainty", *American Economic Review*, 71, (June, 1981), 347 6.

   V. Krishna, *Auction Theory*, Academic Press, San Diego, 2002.

   G. Jehle and P. Reny, *Advanced Microeconomic Theory*, Second Edition, Chapter 9, "Auctions and Mechanism Design," Addison Wesley Longman, New York, 2001.

   W. Pesendorfer and J. Swinkels, "The Loser's Curse and Information Aggregation in Common Value Auctions," *Econometrica*, 65 (1997) 1247-82.

   M. Jackson and I. Kremer, "On the Informational Efficiency of Discriminatory Price Auctions," *Journal of Economic Theory*,

   *P. DeMarzo, I. Kremer and A. Skrzypacz, "Bidding with Securities: Auctions and Security Design," *American Economic Review*, forthcoming.

   P. Povel and R. Singh, "Stapled Finance," *Journal of Finance*, (June, 2010), 927-53.

7. Recent Papers in Information in Financial Markets

   Papers

   Duffie, Darrell, Nicolae Garleanu, and Lasse Pedersen, "Over-the-Counter Markets." *Econometrica*, 73, (2005), 1815-1847.

   Duffie, Darrell, Nicolae Garleanu, and Lasse Pedersen, "Valuation in Over-the-Counter Markets." *Review of Financial Studies*, 20, (2007), 1865-1900.

Duffie, Darrell, Semyon Malamud, and Gustavo Manso, "Information Percolation with Equilibrium Search Dynamics," *Econometrica*, 77, (2009), 1513-1574.

*Duffie, Darrell, Semyon Malamud, and Gustavo Manso, "Information Percolation in Segmented Markets," *Journal of Economic Theory*, 157, (2015), 1130-58.

B. Homstrom and J. Tirole, "Private and Public Supply of Liquidity," *Journal of Political Economy*, 106, (1998) 1-40.

O. Hart and L. Zingales, "Liquidity and Inefficient Investment," Journal of the European Economic Association 13 (5): (2015) 737-769.

FINANCE 9240
INTERTEMPORAL MACROECONOMICS AND FINANCE
Fall 2023

Professor Tim Landvoigt
Email: timland@wharton.upenn.edu
Hours: Tuesday 5:00-6:00 SHDH 2324

Richard Kaser: kaser@wharton.upenn.edu
Review Session: Thursday 2:00-3:30pm SHDH 2422

Course Description

This is a first-year doctoral course on Macroeconomic Theory. We will study the key intertemporal decisions of households and firms, their basic implications for long run economic growth, business cycle fluctuations and asset prices, and the role of monetary policy. We also develop basic numerical techniques to solve dynamic optimization problems and apply them to study a broad range of economic models.

Prerequisites: The prerequisites are a graduate level course in microeconomics (could be taken concurrently) and a strong understanding of algebra and calculus. A basic knowledge of a mathematical programming language is recommended.

Grading

Students are expected to come to class and participate regularly. Grades will be based on six homework assignments (60%) and one final exam (40%). Actively working on the assignments is essential for your understanding of the course material. You *may work in groups*, but you must turn in your own answers. The best set of answers will be anonymized and posted online.

Materials

The main reference for this class are **my slides** which are detailed. Slides, assignments and, occasionally, additional readings will be posted on Canvas. The lecture notes are designed to be self-contained and, together with the problem sets, should be your primary source of study.

There is no required textbook. Most macro graduate sequences include the equivalent to two semesters of course work and virtually all textbooks cover many more topics than what can be discussed in a single course. Nevertheless, the course material is closest to two main books:

- **LS:** Lars Ljunqvist and Thomas J. Sargent. *Recursive Macroeconomic Theory*, MIT.
- **W:** Michael Wickens, *Macroeconomic Theory: A Dynamic General Equilibrium Approach*, 2nd edition, Princeton
- **G:** Jordi Gali, *Monetary Policy Inflation and the Business Cycle*, 2nd edition, Princeton

Wickens (W) offers a fairly straightforward introduction to most topics. Ljunqvist and Sargent (LS) is technically more demanding and also discusses many fairly advanced topics, but is generally considered the standard text for 1st year macro. Gali is a very good source for monetary models.

Additional and complementary discussions of specific topics are provided in

- **DR:** David Romer, *Advanced Macroeconomics*, McGraw Hill.

Finally, a detailed treatment of many of the necessary mathematical methods and numerical tools can be found in

- **SLP:** Nancy Stokey and Robert Lucas, with Edward Prescott, *Recursive Methods in Economic Dynamics*, Harvard.
- **J:** Judd, Kenneth, *Numerical Methods in Economics,* MIT Press.

List of Topics Covered

0. Introduction (advance pre-term reading)
1. Household Consumption and Saving
2. Tools: Dynamic Programing and Numerical Methods
3. Endowment Economies and Asset Prices with Complete Markets
4. Incomplete Markets
5. Production, General Equilibrium and Long Run Growth
6. Business Cycles
7. Monetary Economies
8. Financial Market Frictions
9. Overlapping Generations

University of Pennsylvania
The Wharton School

FNCE 925:
Advanced Topics in Asset Pricing
Syllabus is tentative and subject to change

Prof. Jules H. van Binsbergen
Office: SH-DH 2460
Email: julesv@wharton.upenn.edu

Fall 2019
Classes: Wednesday 3:00pm–6:00pm

Course Description

This course exposes students to recent developments in the asset pricing literature. The starting point for the course is the standard neo-classical rational expectations framework. We will then critically investigate where this framework has succeeded and where it has not. Recently documented deviations from the framework in the literature are discussed and placed in context. The course will also focus on hypothesis development, recent research methods, and research writing. The ultimate objective is for students to develop their own hypotheses and research ideas. The final deliverable for the course is a research proposal or (even better) a paper. In addition to lecturing by the instructor, the second half of the course (quarter 2) will feature presentations of research proposals as well as discussions of recent papers by the students.

Prerequisites

The prerequisites for this course are graduate level econometrics, microeconomics (Economics 681 or Economics 701) and calculus. Finance 911 (Foundations for Financial Economics) is recommended.

Course Material

- The website for this course can be accessed through Canvas:

  https://canvas.upenn.edu.

  On this website you can find lecture notes, papers, and announcements.

- Following each topic, there is a list of recommended articles which can also be found on the website.

Reading

Recommended Texts for Reading:

- J. Campbell, *Financial Decisions and Markets: A Course in Asset Pricing*, Princeton University Press.
- J. Campbell, A. Lo, A. MacKinlay, 1996, *The Econometrics of Financial Markets*, Princeton University Press. (See especially chapters 5-11)
- J. Cochrane, 2005, *Asset Pricing* Revised Edition, Princeton University Press. (See especially chapters 1-9, 17-21)
- D. Duffie, 2001, *Dynamic Asset Pricing Theory* 3rd edition, Princeton University Press. (See especially chapters 1-4)
- J. Ingersoll, 1987, *Theory of Financial Decision Making*, Rowman and Littlefield.

Course Outline and Additional Readings

Note: Dates are approximate and further readings will be added as we go along.

I **Rational Expectations in Asset Pricing**
August 28

- Outline
  - The development of the rational expectations framework
  - Testing the rational expectations framework
  - Why is the rational expectations framework a good benchmark?
  - Writing theory papers
  - Writing empirical papers
  - How to develop a null hypothesis
  - The "as if" paradigm
- Additional Readings:
  (a) Rational Expectations and the Theory of Price Movements, by J. Muth
  (b) Speculative Asset Prices, by R. Shiller
  (c) A Survey of Behavioral Finance, by N. Barberis and R. Thaler

(d) The Methodology of Positive Economics, by M. Friedman, Essays in Positive Economics, Chicago: University of Chicago Press, pp. 3-43.

II **Rational Expectations Models in Asset Pricing**
September 4

- Outline
  - Empirical moments of interest (puzzles)
  - Popular rational expectation models and their underlying mechanism
  - Evaluating assumptions and model performance
  - What do we expect from a model?
  - Are strongly rejected models useful? What for?
- Additional Readings:
  (a) Original papers of the models (rare disasters, habits, lrr) have been assigned repeatedly in earlier classes. Please reread if you are fuzzy on them.
  (b) Global Stock Markets in the Twentieth Century, by P. Jorion and W. Goetzmann
  (c) Why is Long-Horizon Equity Less Risky? A Duration-Based Explanation of the Value Premium, by M. Lettau and J. Wachter
  (d) The Long-Run Risks Model and Aggregate Asset Prices: An Empirical Assessment, by J. Beeler and J. Campbell

III **Recent Tests of Rational Expectations Models for Financial Assets**
September 11

- Outline
  - Testing models using multiple asset classes
  - Testing models using multiple regions
  - Is there one stochastic discount factor?
  - What do we learn from the cross-section vs the time series?
- Additional Readings:
  (a) The Term Structure of Returns by J. van Binsbergen and R. Koijen
  (b) Value and Momentum Everywhere by C. Asness, T. Moskowitz, L. Pedersen
  (c) Very Long Run Discount Rates by S. Giglio, M. Maggiori and J. Stroebel

IV **Rational Expectations Models for Intermediated Assets: Theory**
September 18

- Outline
  - Money management in equilibrium
  - Asset management as a resource allocation problem
  - Frictions in money management
  - Competition and financial markets
- Additional Readings:
  (a) Mutual Fund Flows and Performance in Rational Markets by J. Berk and R. Green
  (b) Mutual Funds in Equilibrium by J. Berk and J. van Binsbergen

V **Rational Expectations Models for Intermediated Assets: Empirics**
September 25

- Outline
  - Value and alpha measures
  - Implied risk preferences of investors
  - Optimal size of intermediated asset management
- Additional Readings:
  (a) On Persistence in Mutual Fund Performance by M. Carhart
  (b) Measuring Skill in the Mutual Fund Industry by J. Berk and J. van Binsbergen

VI **Real Implications of Asset Market Inefficiencies**
October 2

- Outline
  - Are financial markets a sideshow?
  - Are financial markets a zero-sum game?
  - What is the optimal size of the financial sector?
  - Do financial markets interact with real investment?
- Additional Readings:
  (a) The Stock Market and Investment: Are Financial Markets a Sideshow, by R. Morck, A. Shleifer and Robert W Vishny

(b) Real Anomalies by J. van Binsbergen and C. Opp

VII **Intermediary Asset Pricing**
October 9

- Outline
  - Whose stochastic discount factor?
  - Slow-moving capital
  - Capital constraints
- Additional Readings:
  (a) Intermediary Asset Pricing, by Z. He and A. Krishnamurthy
  (b) Financial intermediaries and the cross-section of asset returns, by T. Adrian, E. Etula and T. Muir

Empirical Methods in Corporate Finance
FNCE 9260

Spring 2023

Instructors:

- Sylvain Catherine: scath@wharton.upenn.edu
- Daniel Garrett: danielgg@wharton.upenn.edu
- Marius Guenzel: mguenzel@wharton.upenn.edu
- Sasha Indarte: aindarte@wharton.upenn.edu
- Michael Roberts: mrrobert@wharton.upenn.edu
- Luke Taylor: luket@wharton.upenn.edu

Coordinator: Luke Taylor

Lectures: Tuesdays, 1:45-4:45pm, SHDH 2401

Office hours: By appointment

Teaching assistant: Sergey Sarkisyan: sesar@wharton.upenn.edu

Course website on Canvas: https://canvas.upenn.edu/courses/1692933

Summary and goals

The primary goal of this course is to teach students how to conduct empirical research on corporate finance and related fields (e.g., household finance, financial intermediation). The emphasis will be on econometric tools. The course will also expose students to papers on the research frontier. Topics will include OLS regression, difference in differences, instrumental variables, regression discontinuity design, regression kink design, sufficient statistics, binary choice models, duration models, inference, solving models using GPUs, and an introduction to structural estimation. The course will cover recent papers using these tools, which will expose students to the wide range of topics within corporate finance and related fields.

Prerequisites

We will assume students have taken at least one semester of a PhD-level econometrics class. We will also assume students know how to numerically solve dynamic optimization problems by value-function iteration.

Deliverables and evaluation

Problems sets will be due every one to two weeks. Problems sets will have a strong coding component. You will be expected to code in Stata, Matlab, and potentially other languages. Grades will be based on the problems sets and classroom participation.

Textbook

Course readings, detailed below, come from many sources. You should buy *Mostly Harmless Econometrics,* by Angrist and Pischke (Amazon link).

Communication

Instructors will use Canvas announcements to send extra details on assignments, readings, and course logistics. Feel free to email the TA or individual professors as needed.

Schedule, topics, and readings

An asterisk (*) denotes a required, high-priority reading. PDFs of most high-priority readings can be found on Canvas >> Files >> Readings.

- Session 1 (Jan. 17): Regression Part 1: identification, causality, omitted variables, measurement error, RCTs

  Instructor: Sasha Indarte

  * Chapters 2 and 3: *Mostly Harmless*

  * Karlan, Dean, and Jonathan Zinman. 2009. Observing Unobservables: Identifying Information Asymmetries With a Consumer Credit Field Experiment. *Econometrica* 77, 1993-2008.

  Sections 7.1-7.6: Manski, Charles F. 2009. Identification for prediction and decision. Harvard University Press. Note: you can download chapters for free via Franklin.

- Session 2 (Jan. 24): Regression Part 2: panel data, lagged dependent variables, fixed effects, difference in differences, and triple differences

  Instructor: Dan Garrett

  * Zwick, Eric. "The 12 Step Program for Grad School." http://www.ericzwick.com/public_goods/twelve_steps.pdf

  * Chapters 5: *Mostly Harmless*

  * Sections 4 and 7: Roberts, Michael R., and Toni M. Whited. 2013. Endogeneity in empirical corporate finance. *Handbook of the Economics of Finance* 2, 493-572.

  Manski, Charles. 2010. Unlearning and Discovery. *The American Economist 55(1), 9-18.*

Bertrand, Marianne, and Sendhil Mullainathan. 2003. Enjoying the quiet life? Corporate governance and managerial preferences. *Journal of Political Economy 111*(5), 1043-1075.

Zwick, Eric, and James Mahon. 2017. Tax policy and heterogeneous investment behavior. *American Economic Review* 107(1), 217-48.

Garrett, Daniel G., Eric Ohrn, and Juan Carlos Suárez Serrato. 2020. Tax policy and local labor market behavior. *American Economic Review: Insights 2*(1), 83-100.

- Session 3 (Jan. 31): Regression Part 3: heterogeneous treatment effects, matching, synthetic control, quantile regression, and semiparametrics

  Instructor: Dan Garrett

  * Chapters 5.2 and 7.1: *Mostly Harmless*

  * Gibbons, Charles E., Juan Carlos Suárez Serrato, and Michael B. Urbancic. 2019. Broken or fixed effects? *Journal of Econometric Methods 8*(1). *20170002*

  * De Chaisemartin, Clément, and Xavier d'Haultfoeuille. 2020. Two-way fixed effects estimators with heterogeneous treatment effects. *American Economic Review 110*(9), 2964-96.

  * Abadie, Alberto. 2021. Using synthetic controls: Feasibility, data requirements, and methodological aspects. *Journal of Economic Literature 59*(2), 391-425.

  Roth, Jonathan, Pedro H. C. Sant'Anna, Alyssa Bilinski, and John Poe. 2022. What's Trending in Difference-in-Differences? A Synthesis of the Recent Econometrics Literature. *arXiv preprint arXiv:2201.01194*.

  Borusyak, Kirill, Xavier Jaravel, and Jann Spiess. 2022. Revisiting event study designs: Robust and efficient estimation. *arXiv preprint arXiv:2108.12419*.

  Sections 6 and 8.4: Roberts, Michael R., and Toni M. Whited. 2013. Endogeneity in empirical corporate finance. *Handbook of the Economics of Finance* 2, 493-572.

- Session 4 (Feb. 7): Instrumental variables

  Instructor: Sasha Indarte

  * Chapter 4: *Mostly Harmless*

  * Indarte, Sasha. 2022. Financial Crises and the Transmission of Monetary Policy to Consumer Credit Market. *Working Paper.*

Bartik papers:

Borusyak, Kirill, Peter Hull, and Xavier Jaravel. 2022. Quasi-Experimental Shift-Share Research Designs. *The Review of Economic Studies* 89(1) 181–213.

Goldsmith-Pinkham, Paul, Isaac Sorkin, and Henry Swift. 2020. Bartik instruments: What, when, why, and how. *American Economic Review* 110, 2586-2624.

Simulated IV papers**:**

Borusyak, Kirill, and Peter Hull. 2021. Non-Random Exposure to Exogenous Shocks. *Working Paper.*

Mahoney, Neale. 2015. Bankruptcy as implicit health insurance. *American Economic Review* 105(2), 710-746.

Examiner IV papers:

Dobbie, Will, and Jae Song. 2015. Debt Relief and Debtor Outcomes: Measuring the Effects of Consumer Bankruptcy Protection. *American Economic Review* 105(3), 1272-1311

Arnold, David, Will Dobbie, and Crystal S. Yang. 2018. Racial Bias in Bail Decisions. *Quarterly Journal of Economics* 133(4), 1885–1932.

Dobbie, Will, Andres Liberman, Daniel Paravisini, and Vikram Pathania. 2021. Measuring Bias in Consumer Lending. *The Review of Economic Studies* 88(6), 2799–2832.

- Session 5 (Feb. 14): Regression discontinuity design

Instructor: Michael Roberts

Read the papers below **in the following order**:

* Chava, Sudheer, and Michael R. Roberts. 2008. How does financing impact investment? The role of debt covenants. *The Journal of Finance* 63, 2085-2121.

* Gulen, Huseyin, Candace E. Jens, and T. Beau Page. 2019. An application of causal forest in corporate finance: How does financing affect investment? *Working Paper.*

* Chava, Sudheer, and Michael R. Roberts. 2020. Debt Covenants and Investment: Response to Gulen, Jens, and Page (2020). *Working Paper.*

- Session 6 (Feb. 21): Regression kink design and sufficient statistics

  Instructor: Sasha Indarte

  * Card, David, David S. Lee, Zhuan Pei, and Andrea Weber. 2015. Inference on Causal Effects in a Generalized Regression Kink Design. *Econometrica* 83(6), 2453-2483.

  * Indarte, Sasha. 2021. Moral Hazard versus Liquidity in Household Bankruptcy. *Journal of Finance*, Forthcoming.

  Chetty, Raj. 2006. A general formula for the optimal level of social insurance. *Journal of Public Economics* 90(10-11), 1879-1901.

  Chetty, Raj. 2008. Moral Hazard versus Liquidity and Optimal Unemployment Insurance. *Journal of Political Economics* 116(2), 173-234.

  Jaeger, Simon, and Peter Ganong. 2018. A Permutation Test for the Regression Kink Design. *Journal of the American Statistical Association* 113, 494-504.

- Session 7 (Feb. 28): Binary-choice and duration models

  Instructor: Marius Guenzel

  * Guenzel, Marius, Hamilton, C., and Malmendier, Ulrike. 2023. CEO Social Preferences and Layoffs. Working paper.

  * Malmendier, Ulrike, Geoffrey Tate, and Jon Yan. 2011. Overconfidence and early-life experiences: The effect of managerial traits on corporate financial policies. *The Journal of Finance 66*(5), 1687-1733.

  * Gormley, Todd A., and David A. Matsa. 2016. Playing it safe? Managerial preferences, risk, and agency conflicts. *Journal of Financial Economics 122*(3), 431-455.

  * Chapters 3.2.3 ("Bad Control" only): *Mostly Harmless*

- Session 8 (Mar. 14): Additional issues in reduced-form estimation

  Instructor: Marius Guenzel

  Guenzel, Marius. 2022. In Too Deep: The Effect of Sunk Costs on Corporate Investment. Working paper.

Borgschulte, Mark, Mark Guenzel, Canyao Liu, and Ulrike Malmendier. 2022. CEO Stress, Aging, and Death. *Working paper.*

Jenter, Dirk, and Fadi Kanaan. 2015. CEO Turnover and Relative Performance Evaluation. *The Journal of Finance 70*, 2155-2184.

- Session 9 (Mar. 21): Introduction to structural estimation

  Instructor: Luke Taylor

  * Keane, Michael. 2015. Practical issues in structural estimation. 90-minute Youtube video: https://www.youtube.com/watch?v=0hazaPBAYWE

  * Kahn, Jay R., and Toni M. Whited. 2018. Identification is not causality, and vice versa. *Review of Corporate Finance Studies* 7, 1-21.

  Dou, Winston W., Lucian A. Taylor, Wei Wang, and Wenyu Wang, 2021. Dissecting bankruptcy frictions. *Journal of Financial Economics* 142, 975-1000.

  Whited, Toni M. 2018. A primer on how to do dynamic programming. Lecture note, available on our Canvas page (Canvas >> Files >> Readings)

  DellaVigna, Stefano. 2018. Structural behavioral economics. *Handbook of Behavioral Economics: Applications and Foundations 1*, 613-723.

- Session 10 (Mar. 28): Solving models using GPUs

  Instructor: Sylvain Catherine

  * Catherine, Sylvain. 2022. Countercyclical Labor Income Risk and Portfolio Choices over the Life Cycle. *The Review of Financial Studies*, 35(9) 4016–4054

- Session 11 (Apr. 4): Simulation estimators

  Instructor: Luke Taylor

  * Sections 3 and 4 (pages 82-146): Strebulaev, Ilya A., and Toni M. Whited. 2012. Dynamic models and structural estimation in corporate finance, *Foundations and Trends in Finance* 6, 1-163.

  Gourieroux, Christian S., Alain Monfort, and Eric Renault. 1993. Indirect inference. *Journal of Applied Econometrics* 8, S85-S118

  Pakes, Ariel, and David Pollard. 1989. Simulation and the asymptotics of optimization estimators. *Econometrica* 57, 1027-1057.

- Session 12 (Apr. 11): Inference

    - Instructor: Luke Taylor

        * Chapters 8: *Mostly Harmless*

- Session 13 (Apr. 18): Structural estimation applications

    Instructor: Sylvain Catherine

    * Catherine, Sylvain. 2022. Keeping options open: What motivates entrepreneurs? *Journal of Financial Economics* 144, 1-21.

    Catherine, Sylvain, Thomas Chaney, Zongbo Huang, David Sraer, and David Thesmar. 2022. Quantifying Reduced-Form Evidence on Collateral Constraints. *The Journal of Finance* 77, 2143-2181

    Catherine, Sylvain, Mehran Ebrahimian, David Sraer, and David Thesmar. 2022. Robustness Checks in Structural Analysis. *Working Paper.*

- Session 14 (Apr. 25): Additional topics TBD and course wrap-up

    - Instructor: Luke Taylor

        * Berk, Jonathan B., Campbell R. Harvey, and David Hirshleifer. 2017. How to write an effective referee report and improve the scientific review process. *Journal of Economic Perspectives 31, 231-244*

INTERNATIONAL FINANCE
Finance 9330, Spring 2023
Preliminary and Subject to Revision

Karen K. Lewis
Tuesday 8:30 – 11:45 am EST (Philadelphia)
Tuesday 2:30 – 4:45 pm CET (Fontainebleau)
Tuesday 9:30 -11:45 pm SGT (Singapore)
Karenklewis2223@gmail.com
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(Note: INSEAD email not operational until Jan 2023)

Note to Students: Welcome to International Finance! This year you are part of a collaboration between Wharton and INSEAD campuses. The course will be primarily on-line, but occasionally I may be in either Philadelphia or Fontainebleau and appear in person. In that event, the course will be hybrid from other locations. I will give at least three days notice of in person classes. You are welcome to contact me directly with any follow-up questions out of class and we can set up Zoom one-on-one meetings.

Goals of the course
To provide an understanding of selected topics of current academic research in the areas of international finance and its intersection with international macroeconomics; to teach interested students the tools for conducting research in this field. Each topic will be developed beginning with early classic papers and then updated through the current status of the profession. The typical target audience comprises students in their second year or later.

Readings
Most papers assigned for this course are available on the web. For published papers, http://www.library.upenn.edu link to *E-journals* and then link to *Economics* or *Finance*, for most working papers www.google.com. However, most of the papers will be posted on Canvas, especially older and more difficult-to-find papers.

Requirements
(1) Final Exam comprising 60% of grade; (2) Critical analysis of a research paper given by oral presentation comprising 40% of grade. For students falling between a letter grade, a third category may be relevant: (3) Course participation.

The Final exam is tentatively scheduled for April 25. The final exam will be on-line.

In order to further understand concepts, two or three homework sets will be assigned during the semester. I will check the assignments but they will not count toward your final grade.

Note to INSEAD students: I recognize that your term is shorter and will make amends for these requirements at a later date.

Student presentations
Students will be required to choose a paper that they wish to critique from a list that will be made available in September and posted on Canvas. Papers are chosen on a first-come first-serve basis. I will provide detailed information about how this presentation should be prepared by the end of October.

Auditors
Any students sitting in on the course who are not registered for a grade will be expected to read the relevant papers and participate in the discussions.

Lectures
Papers marked with a * will be covered in class by me. Professor Roussanov will be a guest lecturer for one class. The readings for that class are marked with a **. The other papers provide background reading that I may touch on during lectures.

TOPICS AND READINGS

1. Basic International Model

*Lucas, Robert E, Jr., 1982, Interest Rates and Currency Prices in a Two-Country World. Journal of Monetary Economics. Vol. 10 (3). p 335-59. November

2. General Equilibrium Models of International Business Cycles

2.1. Basic model with complete markets

*Backus, David K; Kehoe, Patrick J; Kydland, Finn E., 1992, *International Real Business Cycle,* The Journal of Political Economy, Vol 100, No. 4, pp 745-775.

*Backus, David K; Kehoe, Patrick J; Kydland, Finn E., *International Business Cycles: Theory and Evidence,* National Bureau of Economic Research Working Paper: 4493. p 23. October 1993, also in Cooley, Frontiers of Business Cycle Research.

Backus, David, Kehoe, Patrick and Kydland Finn, 1994, *Dynamics of the trade balance and the terms of trade: The J-Curve,* American Economic Review 84:84-10.

Baxter, Marianne, 1995, *International Trade and Business Cycles*, National Bureau of Economic Research Working Paper: 5025. p 44. February

Dumas B. C. R. Harvey and P. Ruiz, 2003. *Are Correlations in International Stock Returns Justified by Subsequent Changes in National Outputs?*, The Journal of International Money and Finance, *22 (2003)*, 777-811.

2.2. Incomplete markets, default and moral hazard

Atkeson Andrew, 1991, *International lending with moral hazard and risk of repudiation*, Econometrica, vol, 59., 1069-1089.

*Baxter, Marianne, 1995, *International Trade and Business Cycles*, see above

Baxter, Marianne; Crucini, Mario J., 1995, *Business Cycles and the Asset Structure of Foreign Trade*, International Economic Review. Vol. 36 (4). p 821-54. November

Kollmann, Robert, 1996, *Incomplete Asset Markets and the Cross-Country Consumption Correlation Puzzle*, Journal of Economic Dynamics & Control. Vol. 20 (5). p 945-61.

*Alvarez, Fernando and Jermann, Urban, 2001, *Quantitative Asset Pricing Implications of Endogenous Solvency Constraints*, The Review of Financial Studies, 1117-51

*Kehoe, Patrick and Perri, Fabrizio, 2002, *International Business Cycles with Endogenous Incomplete Markets*, Econometrica, vol 70(3), 907-928.

3. Exchange Rates

3.1 Exchange Rate Basics

Dornbusch, Rudiger, 1976, *Expectations and Exchange Rate Dynamics*, Journal of Political Economy. Vol. 84 (6). p 1161-76. Dec.

*Lucas, Robert E, Jr., 1982, Interest Rates and Currency Prices in a Two-Country World. Journal of Monetary Economics. Vol. 10 (3). p 335-59. November

Mussa, Michael, 1982, *A model of exchange rate dynamics*, Journal of Political Economy, 74104

Meese, Richard; and Rogoff, Kenneth. 1983, *The out of sample failure of empirical exchange rate models*, in: J.A. Frenkel, ed., Exchange rates and international macroeconomics (University of Chicago Press, Chicago), chapter 3

Svensson, Lars, 1985, *Currency prices, terms of trade and interest rates: a general equilibrium asset-pricing cash in advance approach*, Journal of International Economics, vol 18, 1742

*Mark, N., 1995, *Exchange rates and fundamentals: evidence on long-horizon predictability*, American Economic Review, March, 201-218

Engel, Charles, 1999, *Accounting for U.S. Real Exchange Rate Changes*, Journal of Political Economy, 107:3, 507-538.

*Chari, V V, Kehoe, Patrick J, McGrattan, Ellen R., 2002, *Can Sticky Price Models Generate Volatile and Persistent Real Exchange Rates*, The Review of Economic Studies, Vol 69:3, pp. 533-563.

*Chen, Y; Rogoff, Kenneth, 2003, *Commodity Currencies*, Journal of International Economics, Vol. 60:1, pp. 133-160.

*Engel, Charles;West, Kenneth D, 2005, *Exchange Rates and Fundamentals*, Journal of Political Economy, vol. 113, no. 3, June pp. 485-517

Rossi, Barbara, 2013, *Exchange Rate Predictability*, Journal of Economic Literature, Vol. 51:4, pp. 1063-1119.

3.2 The Foreign Exchange Risk and Returns

a) Foreign Premium Anamoly

Hansen, Lars, Hodrick R., 1983, *Risk averse speculation in the forward foreign exchange market: An econometric Analysis of Linear Models*, in: J.A. Frenkel, ed., Exchange rates and international macroeconomics (University of Chicago Press, Chicago).

Fama, Eugene, 1984, *Forward and Spot Exchange Rates*, Journal of Monetary Economics, 14, 319-338.

Bekaert, Geert; Hodrick, Robert J., 1992, *Characterizing Predictable Components in Excess Returns on Equity and Foreign Exchange Markets*, Journal of Finance. Vol. 47 (2). p 467-509. June

*Backus, David K; Gregory, Allan W; Telmer, Chris I., 1993, Accounting for Forward Rates in Markets for Foreign Currency,. Journal of Finance. Vol. 48 (5). p 1887-1908. December

Alvarez, Fernando, Andy Atkeson and Pat Kehoe, 2002, *Volatile Exchange Rates and the Forward Premium Anomaly: A Segmented Asset Market View*,

*Lewis, Karen K; 1995, *Puzzles in International Finance*, Handbook of international economics.

Volume 3. Grossman, Gene M. Rogoff, Kenneth, eds., Handbooks in Economics, vol. 3. Amsterdam; New York and Oxford: Elsevier, North-Holland. p 1913-1949 .

b) **The Carry Trade**

*Lustig Hanno, and Adrien Verdelhan, *The Cross-Section of Foreign Currency Risk Premia and US Consumption Growth,* American Economic Review, 2007.

Brunnermeier, Markus K., Stefan Nagel and Lasse Pedersen, *Carry Trades and Currency Crashes*, with, NBER Macroeconomics Annual 2008, Vol. 23

Lewis, Karen K.; 2011, *Global Asset Pricing*, Annual Reviews of Financial Economics, 3:7.1-32

*Burnside Craig, Martin Eichenbaum , Isaac Kleshchelski and Sergio Rebelo, 2011, *Do Peso Problems Explain the Returns to the Carry Trade?* The Review of Financial Studies, Vol 24:3, pp. 853-891.

Lustig Hanno, Adrien Verdelhan and Nick Roussanov, 2011, *Common Risk Factors in Currency Markets*, Review of Financial Studies, Vol 24: 11, pp. 3731-3777

Lustig Hanno, Adrien Verdelhan and Nick Roussanov, 2014, *Countercyclical Currency Risk Premia*, Journal of Financial Economics, Vol 111: 3, pp. 527-53

Itskhoki, Oleg and Mukhin, Dmitry, 2021, *Exchange Rate Disconnect in General Equilibrium,* Journal of Political Economy, Vol 129: 8, pp. 2183-2232.

c) **Foreign Exchange Risk Models**

*Verdelhan, Adrien, 2010, *A Habit-Based Explanation of the Exchange Rate Risk Premium,* Journal of Finance, Journal of Finance, 65:1, 123-145.

* Colacito, Riccardo; Croce, Mariano M.; 2011, "Risks for the Long Run and the Real Exchange Rate," Journal of Political Economy, 119(1), pp. 153-181

**Ready, Robert; Roussanov, Nikolai; Ward, Colin, 2017, *Commodity Trade and the Carry Trade: A Tale of Two Countries*, The Journal of Finance, Vol 72:6, pp. 2629-2684.

**Ready, Robert; Roussanov, Nikolai; Ward, Colin, 2017, *After the Tide: Commodity currencies and Global Trade*, Vol 85, pp. 69-86.

3.3 Exchange Rates and Risk-sharing

Samuelson, Paul A. 1948, "International Trade and Equalization of Factor Prices," Economic Journal, June, 163-184.

*Cole, Harold L.; Obstfeld, Maurice, 1991, *Commodity Trade and International Risk Sharing: How Much Do Financial Markets Matter?* Journal of Monetary Economics, 28, 3-24.

Dumas, B. and R. Uppal, 2001, "Global Diversification, Growth and Welfare with Imperfectly Integrated Markets for Goods," *The Review of Financial Studies*, 14 (Spring 2001), 1, 277-305.

*Dave Backus, Silverio Foresi Telmer Chris, 2001, *Affine Term Structure Models and the Forward Premium Anomaly*, Journal of Finance 56, 279-304.

*Brandt, Michael W., John H. Cochrane, and Pedro Santa-Clara, *International Risk Sharing is Better Than You Think, or Exchange Rates are Too Smooth*, *Journal of Monetary Economics* 53, 2006, 671-698.

Pavlova, Anna; Rigobon, Roberto, 2008, "Asset Prices and Exchange Rates," The Review of Financial Economics, 20:4, 1139-1180.

*Bakshi, Gurdip; Cerrato, Mario; Crosby, John, 2018, "Implications of Incomplete Markets for International Economies," Review of Financial Studies, 31:10, pp. 4017-4062.

*Lustig, Hanno; Verdelhan, Adrien, 2019, "Does Incomplete Spanning in International Financial Markets Help to Explain Exchange Rates?" American Economic Review, 109(6), pp.2208-44.

*Sandulescu, Mirela; Trojani, Fabio; Vedolin, Andrea, 2020, "Model-Free International Stochastic Discount Factors," Journal of Finance forthcoming (also Swiss Finance Institute Research Paper Series, N°18-18.)

4. International Diversification and Segmentation

4.1. Home bias

*French and Poterba, 1991, *International diversification and international equity markets*, American Economic Review, 81: 222-226

Cooper, Ian; Kaplanis, Evi, 1994, *Home Bias in Equity Portfolios, Inflation Hedging, and International Capital Market Equilibrium*, Review of Financial Studies. Vol. 7 (1). p 4560.

Bekaert, G. and C. R. Harvey, 1995, "*Time-Varying World Market Integration*," Journal of Finance, 50, 403-444.

Tesar, I. And I. M. Werner, 1995, "*Home Bias and High Turnover*," Journal of International Money and Finance.

Coval, J. and T. J. Moskowitz, 1999, "*Home Bias at Home: Local Equity Preference in Domestic Portfolios*," The Journal of Finance, 54, 2045-2074.

Ahearne, A., W. Griever, and F. Warnock. 2004. Information costs and home bias: An analysis of U.S. holdings of foreign equities. *Journal of International Economics* 62:313–36.

*Coeurdacier, Nicolas; Rey, Helene, 2013, *Home Bias in Open Economy Financial Macroeconomics* Journal of Economic Literature, Vol 51:1, pp. 63-115.

4.2. International Portfolio Choice

* Adler, M. and B. Dumas, 1983, "*International Portfolio Choice and Corporation Finance: a Synthesis*," The Journal of Finance, 38, 925-984.

Black, Fisher, 1990, *Equilibrium Exchange Rate Hedging, Journal of Finance, Volume: 45, Issue: 3.*

Dumas, Bernard; Solnik, Bruno, 1995, "*The World Price of Foreign Exchange Risk*," Journal of Finance, 50:2, 445-79.

Baxter, Marianne; Jermann, Urban J; King, Robert G., 1997, *Nontraded Goods, Nontraded Factors, and International Non-diversification*, Journal of International Economics. Vol. 44 (2). p 211-29. April

Pukthuanthong, Kuntara; Roll, Richard, 2009, "*Global Market Integration: An Alternative Measure and Its Application*," Journal of Financial Economics 94,2, 214-232.

Bekaert, Geert; Harvey, Campbell R; Lundblad, Christian T; Siegel, Stephan, 2011, "*What Segments Equity Markets?*" Review of Financial Studies, 24.12, 3841-3890.

4.3. Welfare Gains from International Diversification

*Obstfeld, M., 1994, "*Risk Taking, Global Diversification and Growth*," American Economic Review, 84, 1310-1329.

Tesar, Linda L., 1995, "*Evaluating the gains from international risksharing*," CarnegieRochester Conference Series on Public Policy, 42, 95-143.

Lewis, K., 1996, "What Can Explain the Apparent Lack of International Consumption RiskSharing?" *Journal of Political Economy*, 104, 267-297.

*Lewis, K., 1999, "Trying to Explain Home Bias in Equities and Consumption," *Journal of Economic Literature*, XXXVII, 571-608.

Basak, S., 2000, "*An Intertemporal Model of International Capital Market Segmentation*," Journal of Financial and Quantitative Analysis, 31, 161-188.

Lewis, Karen K, 2000, *Why Do Stocks and Consumption Imply Such Different Gains from International Risk Sharing?* Journal of International Economics, vol. 52, no. 1, October pp. 1-35

* Lewis, Karen K.; Liu, Edith X., 2015, "*Evaluating International Consumption Risk Sharing Gains: An Asset Return View*," Journal of Monetary Economics, 71, 84 - 98.

5. Capital flows

5.1. Capital Flow Basics

*Brennan, M. J. and H. H. Cao, 1997, "International Portfolio Investment Flows," *Journal of Finance*, 52(5), 1851-80.

Rey, H, Gourinchas P.O., 2007, *International Financial Adjustment*, Journal of Political Economy,115:4, pp. 665- 703, August.

VanWincoop, E. and Tille C., 2010, *International Capital Flows*, Journal of International Economics, 80:2, pp. 157-175, March

*Curcuru, S., C. Thomas, F.Warnock, and J.Wongswan. 2011. *U.S. international equity investment and past and prospective returns*. American Economic Review 101:3440–55

Forbes, K., and F. Warnock. 2012. *Capital flow waves: Surges, stops, flight, and retrenchment*. Journal of Financial Economics 88:235–51.

5.2. Segmented Asset Markets Models

*Alvarez, Fernando, Atkeson, Andrew, 1997, *Money and Exchange Rates in the Grossman - Weiss-Rotemberg Model*, Journal of Monetary Economics. Vol. 40 (3). p 619-40, December

Alvarez Fernando, Andrew Atkeson, and Patrick J. Kehoe, 2002, *Money, interest rates, and exchange rates with endogenously segmented markets*. Journal of Political Economy 110 (1, February): 73—112.

Hau, Harald; Rey, Helene, 2006, *Exchange Rates, Equity Prices, and Capital Flows*, The Review of Financial Studies, Vol 19:1, pp. 273-317.

5.3 Informational Frictions

Gehrig, T.P., 1993, "An Information-based Explanation of the Domestic Bias in International Equity Investment," *The Scandinavian Journal of Economics*, 97-109.

Albuquerque, R., G. Bauer, and M. Schneider. 2007. *International equity flows and returns: A quantitative equilibrium approach*. Review of Economic Studies 74:1–30.

*Albuquerque, R., G. Bauer, and M. Schneider. 2009. Global private information in international equity markets. Journal of Financial Economics 94:18–46.

*Van Nieuwerburgh, Stijn; Veldkamp, Laura; 2009, *Information Immobility and the Home Bias Puzzle*, Journal of Finance, 64:3, 1187-1215.

5.4 Differences of Opinion Models

Scheinkman, J., and W. Xiong. 2003. *Overconfidence and speculative bubbles*. Journal of Political Economy 111:1183–1219.

Xiong, W., and H. Yan. 2010. *Heterogeneous expectations and bond markets*. Review of Financial Studies 23:1433–66.

*Dumas, Bernard; Lewis, Karen K.; Osambela, Emilio, 2017, "Differences of Opinion and International Equity Markets," The Review of Financial Studies, 30:3, 750-800.

5.5 Capital Flows at the Investor Level

Hau, Harald, and Helene Rey. "*Home Bias at the Fund Level*." American Economic Review P&P, 98: 2, 2008, pp. 333-338.

*Maggiori, Matteo; Neiman, Brent; Schreger, Jesse, 2020, *International Currencies and Capital Allocation*, Journal of Political Economy, Vol 128:6, pp. 2019-2066.

6. Sovereign Risk

6.1 Sovereign Default

Bulow, Jeremy; Rogoff, Kenneth, 1989, *Sovereign Debt: Is to Forgive to Forget?* American Economic Review, Volume 79:1 pp 43-50.

*Eaton, Jonathan, Fernandez, Raquel, 1995, *Sovereign Debt*, Handbook of international economics. Volume 3. Grossman, Gene M. Rogoff, Kenneth, eds., Elsevier, North-Holland. p 2031-77. 1995. Also NBER working paper 5131.

*Cole, Harold; Kehoe, Tim. 2000, *Self-Fulfilling Debt Crises* Review of Economic Studies, 67(1), 91–116.

Aguiar, Mark; Chatterjee, Sathajit; Cole, Harold; Stangebye, Zachary, 2020, *Self-Fulfilling Debt Crises, Revisited* Federal Reserve Bank of Philadelphia Working paper #20-03.

6.2 Emerging Market Debt

*Arellano, Cristina, 2008, *Default Risk and Income Fluctuations in Emerging Economies*, American Economic Review, June.

Eichengreen, Barry; Hausmann, Ricardo; Panizza, Ugo, 2003 *The Pain of Original Sin*. Revision of paper presented to a conference at the Inter-American Development Bank (November 2002). This version appears in Barry Eichengreen and Ricardo Hausmann (eds.), *Other People's Money: Debt Denomination and Financial Instability in Emerging Market Economics* (University of Chicago Press, 2004).

Arellano, Cristina; Ramanarayanan, Ananth, 2012, "Default and the Maturity Structure in Sovereign Bonds," *Journal of Political Economy*, 120: 2, pp. 187-232.

*Du, Wenxin; Schreger, Jesse, 2016, *"Local Currency Sovereign Risk*," Journal of Finance, 71: 3, pp. 1027-1069.

*Ottonello, Pablo; Perez, Diego J. 2019, "*The Currency Composition of Sovereign Debt*," American Economic Journal: Macroeconomics, 11(3), pp. 174-208.

7. International Disaster Risk

Backus, David; Chernov, Mikhail; Martin, Ian, 2011, "*Disasters Implied by Equity Index Options*," Journal of Finance, 66: 6, 1969-2012.

*Nakamura, Emi; Steinsson, Jon; Barro, Robert; Ursua, Jose, 2013, "*Crises and Recoveries in an Empirical Model of Consumption Disaster*s," American Economic Journal: Macroeconomics, 5.3, 35-74.

Farhi, Emmanuel; Gabaix, Xavier, 2016, *"Rare Disasters and Exchange Rates*," The Quarterly Journal of Economics 131, 1-52.

Gourio, François; Siemer, Michael; Verdelhan, Adrien, 2013, "*International Risk Cycles*," Journal of International Economics, 89:2, 471--484.

*Lewis, Karen K.; Liu, Edith X., 2017, "*Disaster Risk and Asset Returns: An International Perspective*," Journal of International Economics, 108,S1, S42-S48.

Appendix: Additional Topics (Reference only)

A1 "Peso Problems," Rare Events, and Learning

*Karen Lewis, *Puzzles in International Finance*, Handbook of international economics. Volume 3. Grossman, Gene M. Rogoff, Kenneth, eds., Handbooks in Economics, vol. 3. Amsterdam; New York and Oxford: Elsevier, North-Holland. p 1913-1949 . 1995.

Karen Lewis, "Peso Problem," 2007, The New Palgrave Dictionary of Money & Finance

Engel, Charles; Hamilton, James D,1990, *Long Swings in the Dollar: Are They in the Data and Do Markets Know It?*American Economic Review, vol. 80, no. 4, September, pp. 689713

Evans, Martin D D; Lewis, Karen K, 1995, *Do Long-Term Swings in the Dollar Affect Estimates of the Risk Premia?* Review of Financial Studies, vol. 8, no. 3, Fall, pp. 709-42

Bates, David S, 1996, *Dollar Jump Fears, 1984-1992: Distributional Abnormalities Implicit in Currency Futures Options,* Journal of International Money and Finance, vol. 15, no. 1, February, pp. 65-93

A2. International managerial decisions: Exports, Corporate Governance, and Financing

A2.1 Exports, profitability, and business cycles

Melitz, Marc J, 2003, *The Impact of Trade on Intra-industry Reallocations and Aggregate Industry Productivity*, Econometrica, vol. 71, no. 6, November, pp. 1695-1725

* Ghironi, Fabio; Melitz, Marc J, 2005, *International Trade and Macroeconomic Dynamics with Heterogeneous Firms*, Quarterly Journal of Economics, vol. 120, no. 3, August, pp. 865915

Atkeson, Andrew; Burstein, Ariel, 2006, *Innovation, Firm Dynamics, and International Trade*, UCLA working paper

A2.2 Firm financing a) **Financing/dual listings/ADR programs**

*Karolyi, G. Andrew, 2006, Review of Finance, " The World of Cross-Listings and CrossListings of the World: Challenging Conventional Wisdom"

Karolyi, G. A. and R. M. Stulz, 2001, "Are Financial Assets Priced Locally or Globally?" in G. Constantinides, M. Harris and R. Stulz, eds, *Handbook of the Economics of Finance* (North Holland).

Chaplinsky, S. and L. Ramchand, 2000, "The Impact of Global Equity Offerings," *Journal of Finance*, 55, 2767-2789.

b) **Investor protection/governance**

*La Porta, R., F. Lopez-de-Silanes, A. Shleifer and R. Vishny, 1998, "Corporate Ownership Around the World," *Journal of Finance*, 471-517.

Rajan, R. and L. Zingales, 1998, "Financial Dependence and Growth," *American Economic Review*, 88, 559-586.

c) **International Cost of Capital Basics**

Harvey, C., 1991, "The World Price of Covariance Risk," The Journal of Finance, 111-158.

*Dumas, B. and B. Solnik, 1995, "The World Price of Foreign Exchange Risk," The Journal of Finance, 50, 445-479.

Ferson, W. and C. Harvey, 1993, "The Risk and Predictability of International Equity Returns," Review of Financial Studies, 527-566.

d) **International Cost of Capital: Industry or Country Factors?**

Heston, Steven L; Rouwenhorst, K Geert, 1994, Does Industrial Structure Explain the Benefits of International Diversification? Journal of Financial Economics, vol. 36, no. 1, 1994, pp. 3-27

Bekaert, G., R. Hodrick, and X. Zhang. 2009. *International stock return comovements*. Journal of Finance 64:2591–2626.

Monetary Policy, Liquidity, and Risk Premia
Fall 2023

Itamar Drechsler
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Overview

We study how monetary policy affects the financial system and through this the "real" economy. We look at how the short interest rate and other central bank tools impact the supply of liquidity by the financial system and the risk premium on assets. We discuss the banking system in detail: what drives the business of banking, how is this affected by the short interest rate, and how do banks manage interest rate risk. We discuss the different types of lending, including mortgage, commercial and, personal, and look at how and why this lending is divided between the bond market, banks, and non-bank intermediaries. We study historical evidence on inflation, monetary policy, and business cycles and analyze how well this evidence is explained by alternative models.

The course covers both theory and empirics. It makes use of approaches and methods from empirical corporate finance and asset pricing. The emphasis is on empirical analysis. We examine the use of cross-sectional analysis of micro data for conducting well-identified tests of macroeconomic theories. I also emphasize institutional details of the financial system. A central goal of the class is to highlight and stimulate discussion of open questions and promising directions for future research in this area.

Reading List

This is a broad reading list of papers on topics related to the course. I include this mainly as a general reference, though of course I will discuss results from these papers in the class. I will add to it during class.

1. Financial Intermediation Theory

- Holmström, Bengt, and Jean Tirole. "Private and public supply of liquidity." Journal of political Economy 106.1 (1998): 1-40.
- Diamond, Douglas W., and Philip H. Dybvig. "Bank runs, deposit insurance, and liquidity." Journal of political economy 91.3 (1983): 401-419.
- Diamond, Douglas W. "Financial intermediation and delegated monitoring." The review of economic studies 51.3 (1984): 393-414.

- Gorton, Gary, and George Pennacchi. "Financial intermediaries and liquidity creation." The Journal of Finance 45.1 (1990): 49-71.
- Calomiris, Charles W., and Charles M. Kahn. "The role of demandable debt in structuring optimal banking arrangements." The American Economic Review (1991): 497-513.
- Diamond, Douglas W., and Raghuram G. Rajan. "A theory of bank capital." The Journal of Finance 55.6 (2000): 2431-2465.
- Allen F, Gale D. "Financial contagion." Journal of Political Economy. 2000 Feb;108(1):1-33.
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