

## SYLLABUS FOR F600 ASSET PRICING THEORY, SPRING 2014

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### COURSE DESCRIPTION

Welcome to the start of the finance sequence! This course will build the foundation for all of the finance courses to follow. Specifically, I have set four goals for each student to obtain:

- (1) develop a fundamental knowledge of asset pricing theory under perfect capital markets,
- (2) develop key analytic tools and modeling skills,
- (3) develop basic academic writing skills and presentation skills, and
- (4) gain exposure to research in asset pricing theory under imperfect capital markets.

Perfect capital markets is the base case to which nearly all models are compared. Hence, asset pricing theory under perfect capital markets is the foundation of nearly all finance research. Modeling skills are essential to success in all theoretical research and, to a lesser degree, in empirical research. We will develop key analytic tools (continuous time techniques, solving PDEs, many portfolio problems, etc.) and discuss a variety of modeling tricks, traps, and techniques. Academic writing skills are critical to *communicating* your research ideas to other people. The written style of academic papers is unique, complex, and subtle. Hence, a major component of the original research paper will be developing skills at academic writing. A significant amount of current research in asset pricing theory is being done under imperfections of one kind or another. Hence, we will provide some exposure to this type of research.

### MY TEACHING APPROACH

My approach to teaching involves four key features:

- 1. Assignment Preparation.** There is an approximate schedule of assigned readings. You are expected to read all of the assigned readings before class. It is good to stay a little ahead of the schedule, in case we end up going a bit faster than the schedule.
- 2. Class Participation.** You are expected to be ready to lead the class discussion on any part of the assigned reading and to generally participate in the class discussion. Some of the time I will ask for volunteers to lead the class discussion and other times I will cold-call students to insure that everyone participates. This is an “active learning” approach, where students are the primary source of classroom learning and interaction.
- 3. Clicker Participation.** I will frequently ask clicker questions to the entire class. *All* students are asked to respond to these questions using their clickers. Two points will be given for a correct response and one point for an incorrect response. Total clicker points will be scaled to fit the grading scale listed below. Let me know if you change clicker devices so that I can track you and give you credit. No allowance will be made for forgotten clickers, battery failures, or missing class. You are not allowed to submit clicker responses for a classmate. We will use clicker channel 60.

4. **Learn By Doing.** The best way to learn how to do research is to actually do research. The best way to learn how to present your research to others is to actually present your research to others. Therefore, you are expected to do an original research paper and to do a class presentation of your research.

## COURSE OUTLINE

### PART I: NO ARBITRAGE PRICING

<u>Session Topics</u>	<u>Assignment Preparation</u>
<p>(1.) Jan 14</p> <ul style="list-style-type: none"> <li>• <b>Ch. 1 An Introduction to No Arbitrage Pricing and Continuous Time.</b></li> <li>• The No Arbitrage Pricing Methodology.</li> <li>• The Binomial Approach To Continuous Time.</li> </ul>	<p><u>Reading:</u> Holden Sect 1.1–1.2  <u>Excel Models:</u> Binomial Approach To Continuous Time</p>
<p>(2.) Jan 16</p> <ul style="list-style-type: none"> <li>• Diffusion Processes.</li> <li>• Four Special Cases.</li> </ul>	<p><u>Reading:</u> Holden Sect 1.3–1.4, Shimko Pages 1-12</p>
<p>(3.) Jan 21</p> <ul style="list-style-type: none"> <li>• Ito’s Lemma.</li> <li>• <b>Ch. 2 Asset Valuation.</b></li> <li>• Simple Examples.</li> </ul>	<p><u>Reading:</u> Holden Sect 1.5–2.1, Shimko Pages 13-16, 19-21</p>
<p>(4.) Jan 23</p> <ul style="list-style-type: none"> <li>• Solutions To Frequently Occurring ODEs.</li> <li>• Jump Processes.</li> </ul>	<p><u>Reading:</u> Holden Sect 2.2–2.3, Shimko Pages 16-18, 21-23, 33-36</p>
<p>(5.) Jan 28</p> <ul style="list-style-type: none"> <li>• Separation of Variables.</li> <li>• <b>Ch.3 Finite-lived Assets.</b></li> <li>• Simple Examples.</li> <li>• Laplace Transform Technique.</li> </ul>	<p><u>Reading:</u> Holden Sect 2.4–3.2, Shimko Pages 37-38, Appendix</p>
<p>(6.) Jan 30</p> <ul style="list-style-type: none"> <li>• Solutions To Frequently Occurring PDEs</li> <li>• <b>Ch. 4 Options, Forwards, and Futures.</b></li> <li>• Introduction to Options and Forwards.</li> </ul>	<p><u>Reading:</u> Holden Sect 3.3–4.1, Shimko Pages 39-43, Hull Sect 1.1–1.10, 2.1–2.3, 9.1–9.4, 11.1–11.4  <u>Excel Models:</u> Trading Strategies Held To Maturity</p>
<p>(7.) Feb 4</p> <ul style="list-style-type: none"> <li>• Black-Scholes Formula.</li> <li>• Greeks and Trading Strategies.</li> </ul>	<p><u>Reading:</u> Holden Sect 4.2-4.3, Hull 14.1–14.2, 14.6, 14.8–14.9, Hull 18.1–18.9  <u>Excel Models:</u> Black Scholes Option Pricing, Trading Strategies Over Any Horizon, Daily Delta Hedging</p>
<p>(8.) Feb 6</p> <ul style="list-style-type: none"> <li>• Binomial Option Pricing.</li> </ul>	<p><u>Reading:</u> Holden Sect 4.4, Hull Sect 12.1–12.5  <u>Excel Models:</u> Binomial Option Pricing, Binomial Convergence to Normal, Binomial Convergence to Black Scholes</p>

<u>Session Topics</u>	<u>Assignment Preparation</u>
<u>(9.) Feb 11</u> <ul style="list-style-type: none"> <li>• Kickoff Discussion of Original Research Paper</li> <li>• Risk-Neutral Valuation</li> </ul>	<u>Reading:</u> Holden Sect 14.1–14.3, 4.5, Hull Sect 14.7, Appendix of Ch. 14
<u>(10.) Feb 13</u> <ul style="list-style-type: none"> <li>• 15-Minute Discussion of Student-Selected Articles</li> </ul>	
<u>(11.) Feb 18</u> <ul style="list-style-type: none"> <li>• 15-Minute Discussion of Student-Selected Articles</li> </ul>	
<u>(12.) Feb 20</u> <ul style="list-style-type: none"> <li>• Put-Call Parity.</li> <li>• Applications of Put-Call Parity</li> <li>• Put-Call Parity with Foreign Currency.</li> <li>• Interest Rate Parity (IRP).</li> </ul>	<u>Reading:</u> Holden Sect 4.6–4.9, Hull Sect 5.12, 10.4, Shimko Pages 70-72
<u>(13.) Feb 25</u> <ul style="list-style-type: none"> <li>• Futures vs. Forwards.</li> <li>• Implied Standard Deviations (ISD's).</li> <li>• Variations.</li> <li>• American Options</li> </ul>	<u>Reading:</u> Holden Sect 4.10–4.13, Hull Sect 2.11, 5.7, 5.10, 10.5–10.6, 14.12, 16.1–16.2, 17.8, <u>Excel Models:</u> Margin on Futures Contracts, Implied Standard Deviations in Black Scholes Option Pricing
<u>(14.) Feb 27</u> <ul style="list-style-type: none"> <li>• Exotic Options.</li> <li>• Pricing By Simulation.</li> </ul>	<u>Reading:</u> Holden Sect 4.14-4.15, Hull Sect 20.6-20.7, 25.6, 25.8, 25.10–25.12, 27.5–27.7 <u>Excel Models:</u> Exotic Options on Black Scholes Option Pricing, Pricing By Simulation
<u>(15.) March 4</u> <ul style="list-style-type: none"> <li>• Pricing By Finite Differences.</li> <li>• <b>Ch. 5 Bond Pricing Basics.</b></li> <li>• Introduction To Default-free Bonds.</li> <li>• Four Equivalent Ways of Describing Bonds.</li> </ul>	<u>Reading:</u> Holden Sect 4.16–5.2, Hull 20.8 <u>Excel Models:</u> Pricing By Finite Differences
<u>(16.) March 6</u> <ul style="list-style-type: none"> <li>• Duration, Immunization, and Convexity</li> <li>• International Fisher Effect (IFE).</li> </ul>	<u>Reading:</u> Holden Sect 5.3–5.4, <u>Excel Models:</u> Bond Duration, Bond Convexity, US Yield Curve Dynamics
<u>(17.) March 11</u> <ul style="list-style-type: none"> <li>• Swaps.</li> <li>• <b>Ch. 6 Term Structure Dynamics.</b></li> <li>• Single Factor Models.</li> </ul>	<u>Reading:</u> Holden Sect 5.5–6.1, Hull Sect 7.7–7.9, 30.1-30.2 <u>Excel Models:</u> Affine Yield Curve

<u>Session Topics</u>	<u>Assignment Preparation</u>
<u>(18.) March 13</u> <ul style="list-style-type: none"> <li>• Two Factor Models.</li> <li>• Arbitrage-free Models</li> </ul>	<u>Reading:</u> Holden Sect 6.2–6.3, Hull Sect 30.3, 31.1
<u>Spring Break</u>	
<u>(19.) March 25</u> <ul style="list-style-type: none"> <li>• <b>Ch. 7 Corporate Bonds</b></li> <li>• Structural Models</li> <li>• Reduced-Form Models</li> </ul>	<u>Reading:</u> Holden Sect 7.1–7.2 <u>Excel Models:</u> Corporate Bonds

## PART II: INDIVIDUAL OPTIMIZATION IN PARTIAL EQUILIBRIUM

<u>(20.) March 27</u> <ul style="list-style-type: none"> <li>• <b>Ch. 8 Individual Optimization in Partial Equilibrium.</b></li> <li>• Rational Vs. Irrational Agents.</li> <li>• Useful Utility Functions.</li> <li>• The Portfolio Problem.</li> </ul>	<u>Reading:</u> Holden Sect 8.1–8.5, Ingersoll Pages 16-17
<u>(21.) April 1</u> <ul style="list-style-type: none"> <li>• Mean-Variance Analysis.</li> <li>• The St. Petersburg Paradox</li> </ul>	<u>Reading:</u> Holden Sect 8.4–8.5, Ingersoll Pages 52-57 <u>Excel Models:</u> Portfolio Optimization

## PART III: GENERAL EQUILIBRIUM

<u>(22.) April 3</u> <ul style="list-style-type: none"> <li>• <b>Ch. 9 Single Period Asset Pricing.</b></li> <li>• Standard Supply and Demand Problem.</li> <li>• CAPM.</li> <li>• Stochastic Discount Factor Models and the Consumption CAPM</li> </ul>	<u>Reading:</u> Holden Sect 9.1-9.3, Ingersoll Pages 59-60, 64, Cuthbertson and Nitzsche Chapter 13
<u>(23.) April 8</u> <ul style="list-style-type: none"> <li>• APT.</li> <li>• <b>Ch. 10 Multi-Period Asset Pricing in Discrete Time.</b></li> <li>• Dynamic Programming Three Cases.</li> </ul>	<u>Reading:</u> Holden Sect 9.4–10.1, Ingersoll Pages 175-186 (← just skim Examples 1-5)
<u>(24.) April 10</u> <ul style="list-style-type: none"> <li>• Live Exercise in Designing a Theoretical Study</li> <li>• <b>Ch. 11 Multi-Period Asset Pricing in Continuous Time.</b></li> <li>• Constant Investment Opportunity Set and State Independent Utility.</li> </ul>	<u>Reading:</u> Holden Sect 11.2–11.4, Ingersoll Pages 206-210

<u>Session Topics</u>	<u>Assignment Preparation</u>
<u>(25.) April 15</u> <ul style="list-style-type: none"> <li>12-Minute Research Paper Presentations</li> </ul>	
<u>(26.) April 17</u> <ul style="list-style-type: none"> <li>12-Minute Research Paper Presentations</li> </ul>	
<u>(27.) April 22</u> <ul style="list-style-type: none"> <li>Stochastic Investment Opportunity Set and/or State Dependent Utility.</li> <li>Consumption CAPM.</li> <li>Endogenous Riskfree Rate.</li> <li>CIR General Equilibrium Model.</li> </ul>	<u>Reading:</u> Holden Sect 11.2–11.5, Ingersoll Pages 213-215, 218-221, Cox, Ingersoll, and Ross (1985a) (← focus on big picture of this paper – I will explain the details)
<u>(28.) April 24</u> <ul style="list-style-type: none"> <li><b>Ch. 12 International Asset Pricing.</b></li> <li>International Parity Conditions.</li> <li>Solnik's Model.</li> <li>International Investment Problem</li> </ul>	<u>Reading:</u> Holden Sect 12.2–12.3, Ingersoll Pages 289-290, Solnik (1974), Adler and Dumas (1983) <u>Excel Models:</u> International Parity
<u>(29.) April 29</u> <ul style="list-style-type: none"> <li>International Asset Pricing and Intertemporal State Variables.</li> <li>Stylized Facts About International.</li> </ul>	<u>Reading:</u> Holden Sect 12.4–12.5, Adler and Prasad (1992)

#### **PART IV: IMPERFECTIONS**

<u>(30.) May 1</u> <ul style="list-style-type: none"> <li><b>Ch. 13 Transaction Costs and Spatial Separation.</b></li> <li>Transaction Costs.</li> <li>Endogenous Real Exchange Rate.</li> </ul>	<u>Reading:</u> Holden Sect 13.1–13.2, Dumas and Luciano (1989), Dumas (1992)
<u>(31.) May 6</u> <ul style="list-style-type: none"> <li>Round 3 Original Research Paper and Response to the Referee is due at 5:00 p.m.</li> </ul>	

## GRADING

1. Grading is done on a curve based on total points for the course. The following items are graded:

Project	Points	Percent	Kick Off	Due Date
Class Participation in the First Half	100 points	12.5%	----	----
Class Participation in the Second Half	100 points	12.5%	----	----
Clicker Participation in the First Half	100 points	12.5%	----	----
Clicker Participation in the Second Half	100 points	12.5%	----	----
Original Research Paper:				
• Presentation Quality . . . . .	80 points	10%	Feb 11	May 6, 5:00 pm
• Academic Writing Quality . . . . .	120 points	15%		
• Substantive Quality . . . . .	200 points	25%		
Total Points	800 points	100.00%	----	----

2. I expect you to participate in the class discussion. I record class participation for each student immediately after class.

## ARTICLE DISCUSSION

You are asked to lead a 15 minute class discussion while sitting in your chair (i.e., no PowerPoint) of a published or forthcoming article on Asset Pricing Theory. It can be pure theory article or a theory and empirical mix article, but there has to be true theoretical contribution in the article (i.e., there must be a proposition or a theorem in the article). The article must have been published in the years 2008 to the present or currently be forthcoming in the top-tier finance journals (JF, JFE, RFS, and JFQA) or in top-tier accounting or economics journals. To search for articles, try looking at the table of contents or recent issues, clicking on interesting abstracts, and then downloading the full articles that seem especially interesting.

15 minutes is a short amount of time. You need to focus on the big picture. You need to cover the overall motivation, key assumptions, and key results / intuitions. Don't get bogged down in the details and derivations. This is not a presentation, so PowerPoint is not permitted. Instead, you will lead the class discussion from your chair and I will show key article pages on the screen.

Article discussion sign-ups will begin on January 30 after class. Please supply a PDF file of the requested article in its final published form from the journal web site (not in its working paper form). Sign-ups will be first-come, first served. The PDF file of each selected article will be distributed to the entire class. Students are expected to give each selected article at least a 15 minute “quick read” prior to the class discussion. A quick read means completely reading the introduction and then selectively reading key parts, such as the assumptions, figures, propositions, data description, or tables.

## TEXTBOOKS AND NOTES

Options, Futures, and Other Derivatives, Eight Edition by John Hull – The entire text is available by logging onto **OnCourse**, clicking on **F600**, and then clicking on **Courseload**. You have already paid for it! There is no need to purchase it a second time. If it doesn't load, try a different browser.

Notes for F600 Asset Pricing Theory by Craig W. Holden

Optional: The Theory of Financial Decision Making by Jonathan Ingersoll

## ELECTRONIC RESOURCES

I have created a zip file containing an electronic copy of the F600 notes, F600 books, F600 asset pricing articles, Excel models, handouts, and career resources. This zip file can be downloaded by logging into **Oncourse** ([oncourse.iu.edu](http://oncourse.iu.edu)) and then clicking on the **F600** tab, the **Resources** link, and the file **F600 Electronic Resources.zip**.

## ORIGINAL RESEARCH PAPER

You are to develop an original research paper following the three round process listed below.

**Round 1.** Identify an asset pricing theory paper (on the syllabus, on the list of presentation articles, or elsewhere) and brainstorm three-to-five possible theoretical extensions that could be made to the model. The round 1 write-up (limit of one page write-up per extension – can be handwritten if you wish) should specify for each possible extension:

- what the extension is
- what is the motivation – why is this an interesting extension?
- what key *result* you hope to obtain - what is new? what is surprising? (*Results sell papers.*)
- the result's theoretical significance,
- the result's empirical implication significance (if any),
- the result's practical significance (if any), and
- the extension's degree of difficulty.

**Response 1.** Drop by my office and we will discuss the merits of each possible extension.

**Round 2.** Develop a “core model” that captures the key economic idea that you want to address. Often you will need to iterate through a series of models/assumptions/approaches until you find one that is both tractable and which captures your key economic idea. Write up it up in the standard format of an academic paper. The body of the paper (excluding the title page, appendices, tables, or figures) is limited to 10 double-spaced pages with 11 point size (or larger) font and one-inch margins all around. The literature review is limited to 1 page in the introduction. Journal space is very limited, so it is a good habit to learn to write your papers with a very tight, efficient use of space.

Submit your paper twice: (1) as a **PDF file** to [cholden@indiana.edu](mailto:cholden@indiana.edu) and (2) as a **Microsoft Word file** to the Assignments tab of F600 on Oncourse. If you use Latex, just copy and paste the Tex file into Microsoft Word. Do not use special characters in your file name, such as: \ / ? \* “ : < > # % =. The Microsoft Word file will immediately be submitted to the anti-plagiarism tool called **Turnitin**. This tool will check your paper against everything posted on the internet and against all prior papers submitted at IU and will produce a similarity score for your paper.

Your write up should include:

- a title page, including the abstract
- an introduction with motivation and intuition
- a *very brief* literature review - focus on the one or two papers that are the most directly relevant
- to your extension - I want you to focus your effort on *your extension* and not on reading extra articles.
- the model set-up
- step-by-step development of the model - explain each step once in math and a second time in words
- flag key assumptions and results
- optional: comparative statics and other ways to milk the model for all it is worth

- a brief conclusion, including possible future extensions.

**Class Presentation.** Develop a 12 minute, PowerPoint presentation for the class. Your presentation should explain:

- what your are research question(s),
- what is the motivation for this line of research,
- what is your model setup, including key assumptions,
- what are your key results to date, and
- what are your key interpretations / intuitions for your results.

On the presentation date, please come to class a few minutes early and copy your presentation to the Windows Desktop of the classroom computer.

**Response 2.** I will add comments on both the substance and exposition in your paper. I will send you an email that I have read your report and asking you to stop by my office. In my office I will provide additional explanation of my comments.

**Round 3.** Incorporate a response to my comments. Add any additional results and polish the exposition. Write a one-page "**response to the referee**" report explaining with terse bullet points how you have responded to my comments and what additional items have been added. Submit your final version and your response to the referee report as **PDF files** to [cholden@indiana.edu](mailto:cholden@indiana.edu). You do NOT need to submit round 3 materials to the Assignments tab of Oncourse. Your grade for the research paper substance and academic writing will be based on the Round 3 paper and response to the referee report.

### Important Dates:

Feb 27	The Round 1 write-up is due.
March 3, 4, or 5	Drop by my office to discuss the merit of each possible extension.
April 11 (early submissions welcome)	The Round 2 PDF paper submission is due.
April 15 or 17	15 minute presentation of your research to the class.
May 6, 5:00 p.m.	The Round 3 PDF paper and response to the referee report submissions are due.

### PLAGIARISM

- **Plagiarism is obvious.** When a paper is 10 times more sophisticated than what a first or second year doctoral would produce, it is obvious. When a paper's writing style is 10 times more polished compared to what a first or second year would produce, it is obvious. When a paper uses perfect English grammar compared to what a non-native English speaker would produce, it is obvious.
- **Plagiarism is easy to verify.** Just take a unique sentence from the paper, type it into Google in quotes, and you will instantly get the plagiarized document. The entire published literature, all books, and all working papers are online. So everything worth plagiarizing is in Google's index.
- **The penalties for plagiarism are severe.** Anyone I catch will get an "F" in this class and, most likely, you would be dismissed from the doctoral program.
- **If you are in trouble, talk with me.** The most likely context for plagiarism is that someone gets to a deadline and has nothing to turn in. I will understand your situation and will work with you. In the big picture, it is far better to get a lousy grade than to blow-up your career.

### REFERENCES



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## **DOCTORAL PROGRAM LEARNING GOALS**

F600 contributes to achieving the following doctoral program learning goals: (1) comprehensive and intensive disciplinary knowledge, (2) comprehensive and intensive knowledge of research methods, (3) communication of disciplinary research, and (4) evaluations of disciplinary research. The course teaches comprehensive and intensive disciplinary knowledge by teaching the key ideas in asset pricing theory, such as no arbitrage pricing, dynamic term structure models, individual portfolio optimization, single-period equilibrium, multi-period discrete equilibrium, continuous-time equilibrium, equilibrium with intertemporal state variables and state-dependent utility, international asset pricing, portfolio adjustment under transaction costs, real exchange rates under spacial separation, etc. The course teaches comprehensive and intensive knowledge of research methods by teaching the key research methods in asset pricing theory, such as continuous time stochastic processes, the binomial method, risk neutral pricing, solving partial differential equations, pricing by simulation, pricing by finite differences, dynamic programming, measurement currency, high-contact conditions, etc. and by having student do their own original research paper and providing individual feedback on the substance of their paper. The course teaches the communication of disciplinary research by having students present their own research to the class and by providing individual feedback on the academic writing quality of their paper. The course teaches evaluations of disciplinary research by discussing the strengths and weaknesses of each academic paper that we cover and by having each student lead a discussion of a recently published or forthcoming paper.

### **APPENDIX**

#### **Doctoral Program Learning Goals**

##### **Goal 1: Comprehensive and Intensive Disciplinary Knowledge**

Students who earn a doctorate degree in business will be able to demonstrate a comprehensive and intensive knowledge of the theories, concepts, frameworks, empirical findings, and controversies in a chosen business discipline.

##### **Goal 2: Comprehensive and Intensive Knowledge of Research Methods**

Students who earn a doctorate degree in business will be able to demonstrate a comprehensive and intensive knowledge of the research methods and analytical techniques applicable to a chosen business discipline.

##### **Goal 3: Communication of Disciplinary Research**

Students who earn a doctorate degree in business will be able to design, conduct, and communicate – in both written and oral formats – original research that makes a substantial contribution to a selected business discipline.

##### **Goal 4: Evaluations of Disciplinary Research**

Students who earn a doctorate degree in business will be able to evaluate research ideas and completed research projects critically, assessing their conceptual and methodological soundness and importance of contribution to existing knowledge in the field.

### Goal 5: Teaching

Students who earn a doctorate degree in business will be able to teach effectively in a selected discipline at the university level.

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