Finance 7855- Seminar in Options, Futures and Other Derivative Securities- Spring, 2002

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Class: Wed 4:40-7:30
CEBA 2147

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Fin 7855 is a study of arbitrage and equilibrium models of derivative pricing and related applications. The course focuses primarily on models derived via the continuous time Ito Processes. However, binomial, finite difference, Monte Carlo and other numerical approaches will be addressed. Introductory lectures include a subset of applied topics in Mathematical Statistics, Stochastic Processes and Ito Calculus.

Questions and student involvement is encouraged. Following the background lectures, we move rapidly through the textbook with abbreviated lectures and problem solving exercises. Students are required to present problem solutions in class. Prerequisite: Working knowledge of Calculus and Probability.

Additional courses in Finance and Economics are desirable.

During the latter part of the course students present and critique journal articles. These can be taken from the list in part XII, "Articles." You may also choose some articles in applied fields which use option methodology. All articles prefaced by an * in the articles section should be regarded as "must" reading.

All students must develop and present a “survey” paper of a selected area of derivative pricing or a derivatives application. The paper should clearly outline the survey area and discuss the contribution of each seminar article to this area. I expect that most areas will require at least 15 papers in the survey.

Texts: Options, Futures, and other Derivative Securities, Fourth Edition, by John Hull (H). Articles are denoted by A, Notes by N, and reference texts by the number only. The following texts are on reserve in the CEBA Reading Room: Theory of Financial Decision Making, by Jonathan Ingersoll (I), Mathematics of Financial Derivatives, by Salih Neftci (SN) and Continuous Time Finance, Merton (M). Ingersoll, Chapter x is, for example, Ix. You are responsible for all material indicated in the text (H) and in the notes (N). Other supplements and handout will be provided.

Grades: Grades will be determined by:

Classroom Participation 10%
Notebook 10%
Article Presentation 15%
Survey Paper 25%
Final Exam (take home) 40%

Topic Reference

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1. Introduction To Stochastic Processes
   A. Preliminaries and Definitions
   B. Moment Generating Functions
   C. Distributions (Normal, Lognormal)
   D. Stochastic Processes
      a) Independent Increments
      b) Weiner-Levy Processes
      c) Random Walk and Martingales
      d) Diffusion Processes

   N,IO,1O,13
   N,H10,H11:1-2
   H11.2,IO,1,15
   N,H10,IO,2,4
   N,H10,II2,12
   N,H10,II2,9,10,14
   N,H10,IO,9,13
   N,H10,II6,2,8,9,16

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<td><strong>E. Stochastic Calculus</strong></td>
<td>N,H10,H10.1,16</td>
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<td><strong>II. Forward and Futures Contracts and Securities</strong></td>
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<tr>
<td>A. Preliminaries</td>
<td>N,H1</td>
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<tr>
<td>B. Hedging</td>
<td>N,H2</td>
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<td>C. Forward and Futures Pricing</td>
<td>N,H3</td>
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<td>D. Interest Rate Futures</td>
<td>N,H4</td>
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<td>E. Swaps</td>
<td>N,H5</td>
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<td><strong>III. Options</strong></td>
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<td>A. Markets</td>
<td>H6</td>
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<td>B. Put-Call Parity</td>
<td>N,H7,8</td>
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<td>C. General Arbitrage Relations</td>
<td>N,H7,5,6,8</td>
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<td><strong>IV. Continuous Time Option Pricing Models</strong></td>
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<td>A. Black-Scholes</td>
<td>N,H11,5,6,8,16</td>
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<td>B. Risk Neutrality</td>
<td>N,H11,114,5,6,8</td>
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<td><strong>V. Applications</strong></td>
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<td>A. Stock Options</td>
<td>N,H12</td>
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<td>B. Options on Indices, Futures, Currency</td>
<td>N,H12,117</td>
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<td><strong>VI. Comparative Statics</strong></td>
<td>N, H13</td>
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<td>A. Hedging Positions</td>
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<td>B. The Greek Letters</td>
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<td><strong>VII. Estimating Volatilities and Correlations</strong></td>
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<tr>
<td>A. EWMA, ARCH, and GARCH</td>
<td>N, H15</td>
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<td>B. Correlations</td>
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<td><strong>VIII. Numerical Procedures</strong></td>
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<td>A. Finite Difference Methods</td>
<td>N,H16,6</td>
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<td>B. Monte Carlo Methods</td>
<td>N,H16,6</td>
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<td>C. Analytic Approximation</td>
<td>N,H16,6</td>
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<td><strong>IX. Alternative Models</strong></td>
<td>N, H17, M9</td>
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<tr>
<td>A. Jump Diffusions</td>
<td>N</td>
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<td>B. The Volatility Smile</td>
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<td><strong>X. Extensions of the Theoretical Framework</strong></td>
<td>N, H19</td>
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<td>A. Market Price of Risk</td>
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<td>B. Martingales and Measures</td>
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<td><strong>XI. Interest Rate Derivative Securities</strong></td>
<td>N,H20</td>
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<td>A. Pricing Interest Sensitive Assets</td>
<td>N,H21</td>
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<td>B. The Term Structure</td>
<td>N, H22</td>
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<td>C. Heath Jarrow-Morton Model</td>
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<td><strong>XII. Articles -- Required (read in order given)</strong></td>
<td>30, 9,33,17,40, 10,11, 22,28</td>
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<td>21a, 23,2,1b, 25</td>
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XIII. Final Exam (Take Home)

Reference Books


Articles


Possible Topics – Survey Paper

Pricing

Options
1. Derivatives on Indices
   a. Foreign
   b. Domestic
2. Long Term Derivatives on Equities
3. Derivatives on Mortgages
4. Interest Rate Derivatives
5. Derivatives on Currencies
6. Derivatives on Commodities
   a. Metals
   b. Precious Metals
   c. Oil
   d. Agricultural
7. Energy Derivatives
8. Models with two state variables
9. Models with three or more state variables
10. European vs American - Relative Valuation
11. Models with Stochastic Volatility
12. Models with mixed Jump Diffusion
13. Monte Carlo Pricing Models
14. Finite Difference Methods
15. Binomial and Trinomial Models
16. Equilibrium vs Arbitrage Models
17. Using ARCH and GARCH to Model Volatility in Pricing Models
18. Exotic Options
19. Using Options to obtain Implied Parameters or Market rates
20. Options with Credit Risk
21. Pricing options on non-traded assets

Swaps
1. Interest Rate Swaps
2. Currency Swaps
3. Commodity Swaps
4. Exotic Swap Arrangements

Forwards and Futures
1. Pricing Differences – Spots vs Futures
2. Pricing Models with Stochastic Interest Rates
3. Probability Distribution of Forward and Futures Prices
4. Options on Futures

Financial Risk Management
1. Hedging: Theory or Applications of any of the above instruments
2. Financial Portfolio Risk Management
3. Alternative means of raising capital – Transactions Costs Differences
4. Corporate Finance Applications
5. Applications in Insurance
6. Applications in Real Estate
7. Hedging Currency Risk in Equity Portfolios
8. Types of Hedges- Applications using stacked, strip, rolling hedges, etc.
9. Value at Risk (VaR)

**Testing Option Pricing Models**
- 1. Efficiency of the Options Markets
- 2. Trading Strategies
- 3. Comprehensive description of data bases
- 4. Econometric Testing Methods for Options and/or Futures

**Miscellaneous Topics**
- 1. Regulatory Issues
- 2. Trading, Circuit Breakers and Institutional Features
- 3. Costs and Benefits of Futures & Options Markets
- 4. Options and Government Announcements
- 5. Studies of Transactions Volume-Clustering, etc.
- 6. Famous Hedging Debacles – Who Won?
- 7. Put-Call Parity Applications
- 8. The Volatility Smile
- 9. Options on Real Assets

**The Survey Paper** - I expect the topic should be defined in such a way that you will have between 15 and 50 references. In general, there should be a one paragraph discussion (sometimes more) of each paper included in the references. Be sure to carefully define the area of study and the unique contribution of each paper to that area. Ideally, you will be able to point out in your summary some of the possible areas for further study.

**Some Journals to Consider:**
- Journal of Finance
- Review of Financial Studies
- Journal of Financial and Quantitative Analysis
- Journal of Financial Economics
- Mathematical Finance
- Journal of Risk
- Journal of Derivative Markets
- Journal of Futures Markets
- Review of Derivatives Research
- Journal of Mathematical Finance
- Journal of Portfolio Management
- Financial Analysts Journal
- Journal of Applied Corporate Finance
- Financial Management
- Journal of Banking and Finance
- Journal of Corporate Finance
- Journal of Financial Research
- Financial Review
Problem Assignments

Problem Set 1

Problem Set 2

Problem Set 3

From the Textbook:

Chapter 1 - 1.12, 1.16, 1.21

Chapter 2 - 2.14, 2.18, 2.30, 2.31

Chapter 3 - 3.1, 3.5, 3.6, 3.14, 3.24, 3.26

Chapter 4 - 4.3, 4.4, 4.7, 4.14, 4.25, 4.30

Chapter 5 - 5.1, 5.5, 5.11

Chapter 6 - 6.4, 6.9, 6.12

Chapter 7 - 7.12, 7.14, 7.17, 7.25

Chapter 9 - 9.1, 9.5, 9.10

Chapter 10 - 10.3, 10.5, 10.7, 10.8, 10.10

Chapter 11 - 11.9, 11.12, 11.19, 11.21, 11.23

Chapter 12 - 12.5, 12.6, 12.9, 12.15, 12.16, 12.21, 12.35


Chapter 14 - 14.1

Chapter 15 - 15.3, 15.8, 15.10

Chapter 16 - 16.4, 16.6, 16.7, 16.9, 16.20, 16.21

Chapter 19 - 19.5, 19.6, 19.7, 19.8, 19.10

Special Notes For Finance 7855

I will make available to you the following sources.


2. Folders of articles to be read. Starred (*) articles “must” be read. You should copy these right away.

3. A Solutions Manual. For your own benefit, you should refer to it only *after* you have derived your own results.

Your assignment, while we are covering part I, is as follows:

1. Read Chapter 10, Sections 10.1, and 10.2, 10.3 and Chapter 11. Also read Chapters 1,2,3 and 4 of Hull's text.

2. Work the following problems:
   - Chapter 10 - 10.3, 10.5, 10.7, 10.8, 10.10
   - Chapter 11 – 11.9, 11.12, 11.19, 11.21, 11.23
   - Chapter 1 - 1.12, 1.16, 1.21
   - Chapter 2 - 2.14, 2.18, 2.30, 2.31
   - Chapter 3 - 3.5, 3.6, 3.14, 3.24, 3.26
   - Chapter 4 - 4.3, 4.4, 4.7, 4.14, 4.25, 4.30

All of the assigned problems are to be included in your notebook that is due at the end of the semester.