IE 420 – Financial Engineering

All times are Champaign times (US Central Time)

Instructor   Liming Feng  
Email: fenglm@illinois.edu  
Office hour: TBD

Course sites  
https://compass2g.illinois.edu  
https://www.gradescope.com

Prerequisites  
Introductory probability/statistics (e.g., IE 300)

Credit hours  
Undergraduate 3 hours; Graduate 4 hours

Teaching assistant  
Peter McGlaughlin  
Email: mcglghl2@illinois.edu  
Office hour: TBD

Zoom Links (see links on https://compass2g.illinois.edu)  
- Lectures  
- Office hours and appointments with TA/instructor

Course description
Introduction to the theory and practice of financial engineering: basics of derivative securities and risk management; Markowitz portfolio theory and capital asset pricing model; interest rate and bonds; forward and futures contracts, hedging using futures contracts; option contracts and arbitrage relationships; binomial model, no arbitrage pricing, risk neutral pricing, and American options pricing; Brownian motion, Black-Scholes-Merton model, Black-Scholes formula, delta hedging, Greek letters, implied volatility, and volatility smile.

Course materials
- Lecture notes: available on http://compass2g.illinois.edu
- References (* Availability electronically from the library)  
  o Aron Gottesman, 2016, Derivatives Essentials, Wiley. *
  o John Hull. Options, Futures, and Other Derivatives.

Policies
- Homework 50%, In-class live-video test I 25% (*Thursday 3/11/2021*), In-class live-video test II 25% (*Tuesday 5/4/2021*)
- **Homework** should be submitted on https://www.gradescope.com. Submit homework early to avoid possible last-minute technical difficulties.
- **Late homework:** Half of the points will be taken off a late homework. No homework submission accepted 24 hours after it’s due. The lowest two homework scores are dropped.
- **Make-up tests** are possible only under emergencies (official proof required prior to the tests). Make sure you don’t have interviews, meetings etc. during the time of the tests.
- **Regrading** requests for correcting possible grading errors must be submitted within one week after the work is returned. No corrections possible afterwards
- All homework assignments must be finished individually.
- Cheating in this course is not tolerated. Those who violate will be reported. You should never share your work with others. For UIUC student code of conduct, see https://studentcode.illinois.edu/docs/20.001.FullCodeInside.vf.pdf
Announcements about the course are made in class or by email. It is your responsibility to attend class on time and check email regularly for announcements.

**Tentative course content**
- Basics (derivative securities, hedging, risk management, arbitrage)
- Interest rate and bonds (compounding, bond yield, duration and convexity)
- Markowitz portfolio theory (efficient frontier, capital asset pricing model, beta)
- Forward contracts (forward price, no arbitrage pricing, forward contracts valuation)
- Futures (settlement and margining, cross hedging)
- Options (arbitrage relationships, European put-call parity, American options, basic trading strategies)
- Binomial model (no arbitrage pricing, risk neutral pricing, delta hedging, pricing American options)
- Black-Scholes-Merton model (introductory stochastic calculus, Black-Scholes-Merton equation, risk neutral valuation, Black-Scholes formula, Greek letters, implied volatility and smiles)
- Optional topics of interest

**Tentative Schedule**

<table>
<thead>
<tr>
<th>Sun</th>
<th>Mon</th>
<th>Tue Lecture (11-12:20)</th>
<th>Wed</th>
<th>Thu Lecture (11-12:20)</th>
<th>Fri</th>
<th>Sat</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>L1 1/26</td>
<td>L2 1/28</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>HW01</td>
<td>L3 2/2</td>
<td>L4 2/4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>HW02</td>
<td>L5 2/9</td>
<td>L6 2/11</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>HW03</td>
<td>L7 2/16</td>
<td>L8 2/18</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>HW04</td>
<td>L9 2/23</td>
<td>L10/25</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>HW05</td>
<td>L11 3/2</td>
<td>L12 3/4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>HW06</td>
<td>L13 3/9 Review/Q&amp;A</td>
<td>L14 3/16</td>
<td></td>
<td>L15 3/18</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3/11 In-Class Test I</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Summer</td>
<td>Time Starts</td>
<td>L14 3/16</td>
<td></td>
<td>L15 3/18</td>
<td></td>
</tr>
<tr>
<td>HW07</td>
<td>L16</td>
<td>3/23</td>
<td>L17 3/25</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HW08</td>
<td>L18</td>
<td>3/30</td>
<td>L19 4/1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HW09</td>
<td>L20</td>
<td>4/6</td>
<td>L21 4/8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>L23</td>
<td>4/20</td>
<td>HW10 L22 4/15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>L24</td>
<td>4/22</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HW11</td>
<td>L25</td>
<td>4/27</td>
<td>L26 4/29</td>
<td>Review/Q&amp;A</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>HW10</td>
<td></td>
</tr>
<tr>
<td>HW12</td>
<td>5/4</td>
<td></td>
<td></td>
<td></td>
<td>L26 4/29</td>
<td>In-Class Test II</td>
</tr>
</tbody>
</table>

Summer Time Starts