Finance 513 – Financial Engineering I– Course Outline

This syllabus describes the topics I intend to cover during the term. Some topics may be altered or expanded as the semester goes along. For general information about the class, see the handout course_info.pdf on the course Compass pages.

The lecture notes are the official text for the course. (They will be distributed each class and posted to the Compass site.) There is a packet of cases at the bookstore, which you should purchase. I also recommend that you get one of the following recent text books to serve as a reference:


The syllabus below shows the sections of the text books which relate to the material covered in that lecture. Also indicated are the cases we will discuss, and the deadlines for each assignment.

1. **Wednesday, January 21.** What is Financial Engineering ?
   Readings: McDonald Ch. 1.

   **Part 1: Pure Derivatives**

2. **Monday, January 26.** Forwards and Futures Contracts
   Readings: Hull Chs. 1.1, 1.4, 5; McDonald Chs. 5,6,7.
   Assignment: Problem set 1 handed out.

3. **Wednesday, January 28.** Futures vs Forwards
   Case: Russian Rouble: June 1998 (on Compass)

4. **Monday, February 2.** Principles of Swaps
   Readings: Hull Chs. 7, 30; McDonald Ch. 8; Whaley Ch. 4.
   Deadline: Problem set 1 due.
   Assignment: Problem set 2 handed out.

5. **Wednesday, February 4.** More on Swaps: Returns Swaps, Default Swaps
   Case: Smith-Breeden Associates

6. **Monday, February 9.** Options: Robust No-Arbitrage Relations
   Readings: Hull Chs. 8, 9; McDonald Chs. 2, 9; Whaley Ch. 6.
   Deadline: Problem set 2 due.
   Assignment: Problem set 3 handed out.

7. **Wednesday, February 11.** Curvature Restrictions and State-Price Densities
8. **Monday, February 16.** Introduction to Dynamic Arbitrage  
   Readings: Hull Chs. 11, 17.1-17.5; McDonald Chs. 10, 11  
   Deadline: Problem set 3 due.  
   Assignment: Problem set 4 handed out.

9. **Wednesday, February 18.** Binomial Model: Implementation and Extensions

10. **Monday, February 23.** Options in Compensation Contracts  
    Readings: Whaley Ch. 13.  
    Case: Sally Jameson

11. **Wednesday, February 25.** The Black-Scholes-Merton Model  
    Readings: Hull Chs. 12, 13, 14, 15; McDonald Chs. 12, 13.5, 18, 20; Whaley Ch. 7.  
    Deadline: Problem set 4 due.  
    Assignment: Problem set 5 handed out.

12. **Monday, March 2.** Hedging with Options  
    Case: Pine Street Capital

13. **Wednesday, March 4.** Extending the Black-Scholes Formula  
    Readings: Hull Ch. 14; McDonald Chs. 12.2, 14.6, 22.6

14. **Monday, March 9.** Application of Option-to-Exchange  
    Case: Arley Merchandise  
    Deadline: Problem set 5 due.

15. **Wednesday, March 11.** Structural Models of Credit Risk  
    Assignment: Problem set 6 handed out.

16. **Monday, March 16.** Application of Structural Models  
    Case: UBS reverse-convertible bonds (to be handed out).  

17. **Wednesday, March 18.** Single Name Credit Derivatives  
    Readings: Hull Chs. 20, 21; McDonald Ch. 26.4, Whaley Ch 19.  
    Case: Leveraged Loan Market and LCDS.  
    Deadline: Problem set 6 due.

**Part 2: Nontraded Risks**

18. **Monday, March 30.** The Behavior of Volatility  
    Readings: Hull Chs. 16, 19; McDonald Ch. 23.  
    Assignment: Problem set 7 handed out.

19. **Wednesday, April 1.** Derivatives Pricing with Nontraded Risks  
    Readings: Hull Ch. 23.
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<tr>
<td>20. Monday, April 6</td>
<td>Application of Nontraded Risks</td>
<td>NordPool Electricity Derivatives (to be handed out).</td>
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<td>21. Wednesday, April 8</td>
<td>Derivative Pricing in $N$ Dimensions</td>
<td>McDonald Chs. 19, 21; Hull Chs. 17.6, 24.</td>
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<td>22. Monday, April 13</td>
<td>Multi-name Credit Derivatives</td>
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<td>23. Wednesday, April 15</td>
<td>Managing Derivatives Risk</td>
<td>McDonald Ch. 25; Hull Chs. 18, 32.</td>
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<td><strong>LTCM</strong></td>
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<td><strong>Problem set 7 due.</strong></td>
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**Part 3: Nonhedgeable Risks**

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<tr>
<td>24. Monday, April 20</td>
<td>Quasi-derivatives: Insurance</td>
<td><strong>BASIX: Weather Risk in India.</strong></td>
<td><strong>Problem set 8 handed out.</strong></td>
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<td>25. Wednesday, April 22</td>
<td>Securitization of Nonhedgeable Cash-flows</td>
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<td>26. Monday, April 27</td>
<td>Risk Analysis of CDOs</td>
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<td>27. Wednesday, April 29</td>
<td>Valuation versus Description</td>
<td><strong>Structured Index Products and Default Correlation.</strong></td>
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<td>28. Monday, May 4</td>
<td>Financial Engineering and the Subprime Crisis</td>
<td><strong>Subprime Meltdown.</strong></td>
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<td><strong>Problem set 8 due.</strong></td>
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<td>29. Wednesday, May 6</td>
<td>Course review</td>
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<td>30. Week of May 8-17 (TBD)</td>
<td>Final exam</td>
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