McDonough School of Business
Finc-574-20 Option Positioning and Trading

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Prerequisites: A full semester of Financial Management, Finc 551 and 557. Besides this basic material, the student must have a good understanding of forwards, basic options, and probability concepts associated with expected values and measures of dispersion (standard deviation/volatility), as well as math-calculus. Finc 556-10, Derivatives and Financial Markets Concepts (DFM) is highly recommended. Students will also benefit by having taken one or more of the corporate finance, investments, real option, and/or fixed income courses.

Description: This course develops derivative-related financial understanding (forwards, swaps, futures, multiple types of options, hybrid securities), and their use in financial positioning, hedging, and trading. A modeling perspective is emphasized.

Objectives: To develop an integrated understanding of derivatives positioning, trading, hedging, and valuation.

To develop derivative-based solutions to investment and corporate financial management problems.

To address problems from the financial engineering perspective.

Required Notes: The first module will be distributed in class. Subsequent modules are available on the MSB intranet as a hyperlink in the title of each section of in the course outline.
https://intranet.msb.edu/faculty/bodurthj/restricted/teaching/574-20_syllabus.htm

Required Text: You should buy any of the listed editions of the following book:


(If you prefer to purchase the book alone, the accompanying CD is not necessary. Required class spreadsheet software is on the class web for download).

As the class-notes are in overhead form, you will need the text. The class note modules all have cross-references to the appropriate sections of the Hull book(s). It is also recommended that you keep up with the financial press. The FT-US and WSJ are good daily sources. The Wall Street Journal provides discount student subscriptions on a quarterly or a semester basis (click to access) -- as does the FT for students. Weekly sources include The Economist, Barron's, Business Week, Fortune, and Forbes.

Calculation: The course will require a significant amount of calculation and/or computer spreadsheet work. Please always bring your financial calculator to class.

Grading: A series of 100 point quizzes and projects will be given every one or two weeks throughout the
module and during the assigned final exam period. The course final project is also due at or before our final exam session. The grade weight of the final project is equal to two in-module quizzes and projects \((2 \times 100\) points). In the final exam period, a quiz on your final project content will be given and will be equal to \(1/2\) of a regular quiz or project \((1/4\) of the final project.)

As this course concerns derivatives, you earn two grading options by completing all quizzes and projects. You will have the option to exclude one quiz or project from your final grade calculation. Should you have an excused absence for a quiz or project, then you must complete the quiz or project as additional homework to apply the drop option to the associated quiz. Additionally, you will have the option to redo one quiz question on each quiz to earn back half of the points lost on the question. The options are inclusive, i.e. you have both options.

The grade equation is the following:

\[
=\text{IF}\{F>0,([\text{SUM}(Q)-\text{MIN}(Q)]+F/2)/[N-1/2],([\text{SUM}(Q)-\text{MIN}(Q)]/2)/[N-1/2]\}
\]

In Excel, the formula is the following:

\[
=\text{IF}(Z16>0,((\text{SUM}(P16:Y16)-\text{MIN}(P16:Y16))+Z16/2)/(\text{COUNT}(P16:Y16)-1/2),(\text{SUM}(P16:Y16)-\text{MIN}(P16:Y16)/2)/\text{COUNT}(P16:Y16)-1/2))
\]

\(Q = \text{Quiz Grades (Excel Range P16:Y16 for student in worksheet row 16, etc.)}\)
\(F = \text{Final Session Grade} = 1/2 \text{ regular quiz (Excel Cell Z16 for student in row 16, etc.)}\)
\(N = \text{Number of Quizzes}\)

**Grade Weights**

<table>
<thead>
<tr>
<th>Quizzes, Projects and Required Homework</th>
<th>90%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class Attendance</td>
<td>10%</td>
</tr>
</tbody>
</table>

There will be a series of *required* homework and smaller projects with each module. Homework and project materials will be available on the class web site.

If you do miss a class or have negative participation, then I will evaluate your excuse, and potentially adjust the related project or quiz grade by 10%. Obviously, there will be a sign-up sheet handed out for each class, and I ask you to sit in the same seat throughout the semester.

**Grading Curve**

Class Grades will be curved in line with the suggested finance elective median of 3.5.

**Quiz and project dates** -

Our first quiz is during the second class period. All other quizzes, projects, and the final exam session will be scheduled subsequently.

There will be *no quiz make-ups*. If, for some reason - like snow, a quiz must be *canceled for the entire class*, then the next quiz will count as a double quiz.

**Outline**

1. **The Binomial Option Model**

   **Objectives**
   - Identify and define option time values
   - Link expected values, arbitrage and risk-neutral valuation
   - Show that option hedging is option pricing
   - Link discrete-time binomial and continuous-time Black-Scholes models
   - Highlight European and American option distinction

   **Structure**
   - Calculate discounted risk-neutral expected values
   - Develop binomial hedging option model - Binomlwk.xls
   - Link risk-neutral and risk-adjusted discounted expected values
   - Illustrate binomial model convergence to Black-Scholes - Binomial_convergence.xls
3. Delta-Hedged Option Positions, Trading, and "The Greeks"

Objectives
To understand the concept of Delta and the dynamics of Delta Hedging
To become familiar with the importance of other measures of option sensitivity and associated issues of managing option books

Options 7th: Chapter 17
Options 6th: Chapter 15
Options 5th: Chapter 14
Options 4th: Chapter 13

4. Modifying Standard Black-Scholes and Binomial Models

Objectives
Adjust Black-Scholes and the binomial model for rate term structure effects, and volatility term structure effects

Structure
Discrete forward rate term structure
Risk-neutral (drift) valuation - RSKNTRL.XLS
Two volatility specifications
Merton's option pricing model
Options 7th: 13.1, Chapter 18; optional Chapter 21
Options 6th: 13.1, Chapter 16; optional Chapter 19
Options 5th: 12.10-12.11, Chapter 15; optional Chapter 17
Options 4th: 11.10-11.11, Chapter 17; optional Chapter 15

5. Interest Rate Options and Risk Management (optional)

Objectives
Develop continuous- and discrete-time interest rate derivative models by the HJM method
Identify key links between forward prices and rates, and futures prices and rates

Structure
Rate evolution
Black-Scholes model for discount bonds
Bond forwards and futures prices
Forward rate agreements
Eurodollar forward and futures prices
Forward rate options (caps and floors)
Eurodollar options (calls and puts)
Numerical applications (discount bonds, fra, bond-rate options, exotics and index amortizing swaps - HJMSPML.XLS)

Options 7th: Chapters 28 and 31, optional Chapters 22, 23, 29 and 30
Options 6th: Chapters 26 and 29, optional Chapters 20, 21, 27 and 28
Options 5th: Chapters 22 and 24, optional Chapter 23, 26 and 27
Options 4th: Chapters 20 and 22, optional Chapter 21 and 23

6. Exotic Options and Simulation

Objectives
Understand pricing and uses of Exotics
Address standard model short-comings and alternative types of options

Structure
Barrier (Knock-...) Options
Average -Rate (Asian) Options
Compound Options (Options on Options)
Simulation methods and improving accuracy
Other distributions and methods - SIMLGNFP.XLS

Options 7th: 19.6-7, Chapter 24
Options 6th: 17.6-7, Chapter 22
Options 5th:  Chapter 19
Options 4th: Chapter 18

7. Multiple Risks and Correlation

Objectives
Understand multi-dimensional environments
Apply multivariate valuation techniques

Structure
The correlation concept
Portfolio basket covariance
Quanto application
Multivariate simulation

Options 7th: 21.6, 24.11-24.12, 26.6
8. Final Project Materials

Project topics are open at this point. Three suggestions are the following:

1) Actively manage an underlying exposure and derivative hedges over the module period
2) Analyze the structure of a project, security or other financial position that has derivative components
3) Program an alternative variant of a derivative pricing and hedging model

WSJ and Web-based Information on futures and options markets

PostScript

Additional Suggested References -

Jarrow, R.A. and S. Turnbull, Derivative Securities, Cincinnati, Ohio, South-Western, 1996.

Derivatives Used in Practice -


More technical -