

**Peter F. Drucker and Masatoshi Ito**  
**Graduate School of Management**  
**CLAREMONT GRADUATE UNIVERSITY**  
**Claremont, CA, 91711**

**MGT 339: FINANCIAL DERIVATIVES**  
**SPRING 2008**  
**Tuesdays 4:00 - 6:50pm, Burkle Room 16**

**Prof. Cornelis A. Los, PhD**

Office hours: Tuesdays 2:00-4:00pm and by appointment

Office: Burkle 212

Tel: (909) 607-9062

E-mail: [cornelis.los@cgu.edu](mailto:cornelis.los@cgu.edu)

URL: <http://www.cgu.edu/pages/5170.asp>

Faculty Support: Kathy Holden, (909) 607- 9061, [Kathy.holden@cgu.edu](mailto:Kathy.holden@cgu.edu)

**Abstract**

This course reviews many of the existing derivatives products and how each can be used to transform and transfer the financial risks of a corporation. Nowadays, corporations routinely hedge and insure using derivatives, finance their activities with structured products, and use derivatives models to value their strategic investments. Any financially literate business students must understand the basics of derivatives. But in this course the emphasis will be on the role played by financial engineering in the successful execution of corporate strategy. The focus of this course will be to provide the student with a unified, systematic, and common-sense way of thinking about how various derivative financial instruments can be used to manage or mitigate the market risks arising from the corporations pricing, sourcing, financing and on-going operational decisions. The course begins with a comprehensive overview of the theory and applications of forwards, futures, options and swaps. It ends with an analysis of synthetic and hybrid financial products with embedded derivative contracts.

**Prerequisites**

This is a course designed for MBA and MSFE students who are interested in advanced finance. Completion of MGT335 Corporate Finance is required. For MSFE students, this course is intended to complement the Mathematical Finance course. However, knowledge of advanced mathematical techniques is not a requirement for this course, although basic knowledge of Statistics, Calculus I and Linear Algebra is assumed. This course requires a positive attitude towards complex challenges and a fair amount of practice and sheer hard work.

**Required Readings**

The basis textbook for this course is a trusted and widely acknowledged textbook (a large part of which I helped to thoroughly review before it was published) by Robert McDonald, the Erwin P. Nemmers Distinguished Professor of Finance at Northwestern University's Kellogg School of Management:

[MD] McDonald, Robert L. (2003), *Derivatives Markets*, Addison-Wesley, Boston (ISBN: 0-201-72960-1, hard cover).

In addition I will make frequent references to my own compact and very basic textbook, for a different, more scientific, perspective and to familiarize you with the issues such as modeling risk, which more recently have come to the foreground. Since I'm also working on a 2<sup>nd</sup> edition of this book for 2008, your comments and suggestions for improvement will be welcomed and acknowledged in the Preface to the 2<sup>nd</sup> edition:

<b>CLASSES WEDNESDAY AFTERNOONS 4:00-6:50PM</b>	<b>TOPICS</b>	<b>READINGS</b>
Jan 22 Week 1	Introduction to Financial Markets, Derivatives and Financial Engineering; Building Blocks: Forwards and Options	DM Chapters 1 – 2 CAL Chapters 1 - 2 Tufano (1996)
Jan 29 Week 2	Risk Management; Two Sides of the Same Trade: Speculation vs. Hedging; Insurance and Other Risk Management Strategies; Why Do Firms Manage Risk? No CFO Can do Without!	DM Chapters 3 – 4 Smithson&Simkins article Merton (2005)
Feb 5 Week 3	Financial and Commodity Forwards and Futures; Do Forwards Predict? Cash-and-Carry; Let's (Co-) Tango! Synthetics and Spreads	DM Chapters 5 – 6 CAL Chapter 12
Feb 12 Week 4	Fundamental Security Valuation; Bond Price Volatility; Interest Rate Forwards and Futures; Commodity Forward Price Curves; Interest Rate, Currency, Energy and Commodity Forward Swaps; Swaptions; Multi-Currency Investment Strategies <b>Case: Enron Gas Services (1995)</b>	DM Chapters 7 – 8 CAL Chapters 3, 11, 13, 14 Los (1998)
Feb 19 Week 5	Put-Call Parity (Trading Balance Equation): Analysis and Synthesis; Option Boundaries; Portfolio Insurance; Binomial Option Pricing; Risk-Neutral Pricing; American Options: The Freedom to Choose! Complete Capital Market Pricing	DM Chapters 9 – 10 CAL 8.1 – 8.4, 9
Feb 26 Week 6	European (Black-Scholes) Option Pricing Formula; Implied Volatility Measures the Empirical Nonstationarity of Financial Markets!	DM Chapters 11 – 12 CAL Chapter 10
Mar 4 Week 7	Market Making; Taylor Expansion; Mathematics of Greeks; Dynamic Hedging	DM Chapter 13
Mar 11 Week 8	<b>MIDTERM EXAM</b>	
Mar 18	<b>Spring Break</b>	
Mar 25 Week 9	Exotic Options; European, American and Asian Options; Path Dependence; Compound and Exchange (Switching) Options; All-or-Nothing Options; Quantos and Other Currency-Linked Options; Multi-Factor Options <b>Cases: MW Petroleum (A) (1994) and (B) (1996)</b>	DM 14, 22
Apr 1 Week 10	Financial Market Risk Measurement and Analysis; Geometric and Fractal Models of Price Diffusion; Long Memory Pricing; Warrants	DM Chapter 18, 20.1 - 20.5 Los (2003) Chapter 1 Jamdee & Los (2007) Los and Bing (2008)
Apr 8 Week 11	Ito's lemma; Valuation Under Certainty and Under Uncertainty; Black-Scholes Equation; Risk-Neutral Pricing in Differential Form	DM Chapters 20.6 - 21
Apr 15 Week 12	Financial Engineering and Security Design; Structured Notes; Floating Rate Notes; Equity, Currency and Commodity-Linked Notes; Goldmine of Opportunity; Debt and Equity as Options; Compensation Options; Collars and Acquisitions; Equity Arbitrage <b>Case: Ticonderoga: Inverse Floating Rate Bond (2006)</b>	DM Chapters 15 - 16
Apr 22 Week 13	Modeling of the Term Structure of Interest Rates; Predictability of Interest Rates; Credit Risk and Credit Derivatives <b>Case: Risk Management at Apache (2001)</b>	DM Chapter 23, 24.2 Chacko&Hecht (2005)
Apr 29 Week 14	Strategic Investments as Real Options; Valuing Oil and Gas Wells; Valuing Licenses and Patents; Boeing's Correct Decision	DM Chapter 17 3
May 6 Week 15	<b>FINAL EXAM</b>	

[CAL] Los, Cornelis, A. (2001), *Computational Finance: A Scientific Perspective*, World Scientific Publishing Co., Singapore (ISBN: 981-02-4497-7, paperback).

Computational finance is another name for financial engineering, the technical cross-disciplinary field, which relies on mathematical finance, numerical methods and computer simulations to make trading, hedging and investment decisions, as well as facilitating the risk management of those decisions. Using various methods, practitioners of computational finance aim to precisely determine the actual financial risk that certain financial instruments create.

I will discuss a few corporate application cases in class, which you are required to prepare before class, so that you will become familiar with various application difficulties:

### **Class Participation**

Students are expected to prepare for class by reading the assigned materials prior to the class session in which they are covered. Home works will be assigned for practice after the class discussion, but they will not be graded. Their assignment is intended to assist the students with their preparation for the exams. You are expected to work on the assigned problems on your own. A printed student solutions manual is available, providing answers to all even-numbered questions in the textbook:

Cassano, Mark, and Rudiger Fahlenbrach (2003) *Solutions Manual to Accompany Derivatives Markets*, Addison-Wesley, Boston (ISBN: 0-201-89278-2).

For the assigned odd-numbered questions, I will prepare solutions and make them available on this course's Sakai web site, a few weeks after they have been assigned. The questions with which the students expressly experience particular difficulties, will be discussed in class upon request by the students.

### **Software**

Three spreadsheets with user-defined option pricing functions in Excel are included on a CD-ROM packaged with McDonald's textbook. These Excel functions are written in VBA, with the code accessible and modifiable via the Visual Basic editor built into Excel. Most of the calculations in this textbook can be replicated using these spreadsheets and the spreadsheets are essential to produce many of the solutions of the home work assignments.

### **Regular Testing**

I plan to use the e-Instruction's Class Performance System (CPS) to start each class with a competitive 5-10 minute multiple choice quiz, which is automatically scored, when you enter your answers with electronic responders to be purchased from the Huntley bookstore.

### **Grading**

Your grades will be based on the regular (CPS in-class?) tests (20%), Case Participation (10%), a Midterm Exam (40%) and a Final Exam (40%). The Midterm Exam covers the material of Week 1 – 7 and The Final Exam the material of Week 9 – 14 (See schedule below).

### **Additional References**

Bernstein, Peter L. (1998) *Against the Gods: the Remarkable Story of Risk*, John Wiley & Sons, New York (ISBN: 978-0471295631, paperback).

Das, Satiyajit (2006) *Traders, Guns & Money: Knowns and Unknowns in the Dazzling World of Derivatives*, Financial Times Press, London, UK (ISBN: 978-0273704744, paperback)  
**(Note:** Warren Buffet once memorably described derivatives as "financial weapons of mass

destruction.” This is Das’ wry and wickedly comic exposé of the culture, games, and pure deceptions played out every day in trading rooms around the world, usually with “other people’s money” (= the name of Danny DeVito’s = “Larry the Liquidator’s” corporate take-over movie). But make no mistake: as the following four-volume set demonstrates, Das is a leading international authority in the area of financial derivatives and treasury management. He was the treasurer for the TNT Group on Australia for six years. Prior to this he worked in the Commonwealth Bank of Australia, Citicorp Investment Bank and Merrill Lynch Capital Markets).

Das, Satiyajit (2006) *The Swaps & Financial Derivatives Library: Products, Pricing, Applications and Risk Management*, 3rd Edition Revised, John Wiley & Sons, Singapore (ISBN: 978-0470821763, hardback).

**(Note:** this expensive four-volume set, listed at \$450, but now available for the “low” price of \$243, covers Derivative Products & Pricing, Risk Management, Structured Products Volume 1: Exotic Options, Interest rates & Currency, and Structured Products Volume 2: Equity, Commodity, Credit & New Markets).

Derman, Emanuel (2004) *My Life as a Quant: Reflections on Physics and Finance*, John Wiley & Sons, Hoboken, NJ. (ISBN: 0-471-39420-3, hardback).

Haug, Espen Gaardner (2006) *The Complete Guide to Option Pricing Formulas*, 2<sup>nd</sup> ed., McGraw-Hill, New York (ISBN: 978-0071389976 hardback).

Lo, Andrew W. and A. Craig MacKinlay (2001) *A Non-Random Walk Down Wall Street*, Princeton University Press, Princeton, NJ (ISBN: 978-0691092560, hardback).

Los, Cornelis A. (2003) *Financial Market Risk: Measurement and Analysis*, Routledge/Taylor&Francis Group (ISBN: 9780415278669, hardcover, July 2003; and ISBN: 9780415771139, paperback; ISBN: 9780203987636, electronic, August 2006).

**(Note:** I’m working on the 2<sup>nd</sup> edition for World Scientific Publishing Co. in Singapore. Any student finding a substantial number of typos, mistakes or has serious suggestions for improvement, will be acknowledged in the Preface to this 2<sup>nd</sup> ed., to be published in the Fall of 2008).

Malkiel, Burton, G., A. (2007) *A Random Walk Down Wall Street: The Time-Tested Strategy for Successful Investing*, 9<sup>th</sup> ed., W. W. Norton, New York (ISBN: 978-0393330338, paperback).

Martin, John S. (2001) *Applied Math for Derivatives: A Non-Quant Guide to the Valuation and Modeling of Financial Derivatives*, John Wiley & Sons, Singapore (ISBN: 0-471-47902-0, hardback).

**(Note:** includes a disk with spreadsheet models and answers to self-test questions)

Neftci, Salih N. (2004) *Principles of Financial Engineering*, Elsevier Academic Press, Amsterdam (ISBN: 0-12-515394-5, hardback)

Schachter, Barry, and Richard R. Lindsey (Eds.) *How I Became a Quant: Insights from 25 of Wall Street’s Elite*, John Wiley & Sons, Hoboken, NJ. (ISBN: 0470050624, Hardback).

**(Note:** highly recommended for aspiring Financial Engineers!)

Taleb, Nassim N. (1997) *Dynamic Hedging: Managing Vanilla and Exotic Options*, John Wiley & Sons, New York (ISBN: 0-471-15280-3, hardback).

**(Note:** by a “Master mathematical trader,” before he became a skeptic).

Taleb, Nassim N. (2007) *The Black Swan: The Impact of the Highly Improbable*, Random House, New York (ISBN: 978-1-14000-6351-2, hardback).

**(Note:** by the skeptic and currently Professor in the Sciences of Uncertainty at the University of Massachusetts at Amherst).

Voit, J. (2005) *The Statistical Mechanics of Financial Markets*, Springer, Berlin, 3<sup>rd</sup> ed. (ISBN: 3-540-26285-7, hardback)

Wilmott, Paul, Sam Howison and Jeff Dewynne (1998) *The Mathematics of Financial Derivatives: A Student Introduction*, Cambridge University Press, Cambridge, UK (ISBN: 0-521-49789-2, paperback)

### Websites

[www.aw.com/mcdonald](http://www.aw.com/mcdonald)

This is the web site for McDonald's textbook, where also the spreadsheets and any updates are posted.

<http://www.sifma.org/>

This is the web site of the Securities Industry and Financial Markets Association (SIFMA). Its mission is "To champion policies and practices that benefit investors and issuers, expand and perfect global capital markets, and foster the development of new products and services. Fundamental to achieving this mission is earning, inspiring and upholding the public's trust in the industry and the markets." It has many interesting links and you can see the dynamic current US Treasury yield curve and compare it with its values of one week and a few weeks ago.

<http://www.garp.com>

This is the web site of the not-for-profit Global Association of Risk Professionals, a professional association with 50,000 members in 135 countries promoting "a culture of risk awareness," annually awarding the "Risk Manager of the Year Award" (often at the United Nations in New York) and the home of the GARP Risk Academy, a practice-oriented, financial risk management education and training institution, and the GARP Career Center. GARP administers a series of self-study exams so that you can become officially certified as a "Financial Risk Manager" (FRM). In the last ten years in the global world of banking the FRM has become as desirable a designation as the Certified Financial Analyst (CFA) or Certified Public Accountant (CPA). Via GARP you can also earn a specialized International Certificate in Banking Risk and Regulation or earn an Energy Risk Diploma. The web site has an extensive digital library, with the latest books on risk management. You can put yourself on the mailing list of *GARP News Alert*, to follow what's daily happening in the world of applied ((market, credit, and operational) risk management. GARP organizes an annual, very well-attended, conference, often in New York, with lots of seminars on the latest risk management developments, like on "Copulas for the Quantitatively Challenged," "Credit Risk: Principles of Credit Portfolio Management," " Practical Application of the Black-Litterman Asset Allocation Model." The annual meeting also functions as a job market.

<http://www.iafe.org>

The International Association of Financial Engineers is also a not-for-profit, professional society, dedicated to fostering the profession of quantitative finance by providing platforms to discuss cutting-edge and pivotal issues in the field. Founded in 1992, the IAFE is composed of individual academics and practitioners from banks, broker dealers, hedge funds, pension funds, asset managers, technology firms, regulators, accounting, consulting and law firms, and universities across the globe. It also has a job board and a very good quarterly *IAFE Newsletter*. *The Journal of Derivatives* (edited at New York University) is now its very high quality quarterly flagship publication and since 1999 the successor of the earlier *Journal of Financial Engineering* (1992-99).

<http://www.riskpublications.com/risk/index.htm>

*RISK Magazine* is a glossy magazine to educate CFOs and treasurers about the latest developments in not too technical terms and at the mathematical level of MD. If you can afford it, it's a good way to keep up to date about Financial Engineering.

<http://www.iop.org/Journals/qf>

The web site of *Quantitative Finance*, a journal publishing some of the latest and most advanced developments in financial markets research and financial engineering

<http://www.ge.infm.it/econophysics>

Located at the University of Genoa, this site provides extensive lists of research papers, conferences and school, courses, job advertisements and links to research institutes and companies.

<http://www.unifr.ch/econophysics>

This site contains news meeting announcements, book reviews, lists of recent preprints, opinions and discussions. There is also a page with data sources and access to financial data and to financial institutions.

<http://www.quantnotes.com>

This is a high-quality web site providing selected publications. It features introductory articles where you will learn about various financial instruments, and how mathematics you may be familiar with is applied daily by banks to fairly price these instruments. In addition there are also book reviews, links to software and data sites, jobs and event listings, etc.

<http://www.gloriamundi.org>

This site contains a wealth of material on value at risk and related topics. Many important papers on value at risk are available for download. There is a good list of books covering this topic. This site also includes papers containing criticism of value at risk as well as work on coherent risk measures, expected shortfall, etc. In terms of types of risk, most material naturally covers market risk. Credit risk is less prominent, perhaps due to the regulators' reluctance to recognize internal models. A few models address operational risk.

<http://www.elsevier.nl/homepage/sae/econbase/empfin/menu.sht>

The *Journal of Empirical Finance* shows the current status of financial risk measurement

<http://link.springer.de/link/service/journals/00780/index.htm>

The web site of *Finance and Stochastics* is devoted to the theoretical cognoscenti among Financial Engineers, who are interested in finding out by what stochastic processes the financial markets may be modeled.

<http://www.tandf.co.uk/journals/routledge/1350486X.html>

The web site of *Applied Mathematical Finance* is also devoted to the more applied mathematics oriented Financial Engineers