CONTINUOUS TIME FINANCE
G63.2792, Spring 2004
Wednedays 7:10-9pm
WWH 1302
updated Feb. 17, 2004

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Special Dates: First lecture Jan. 21. No class Feb. 11 (I'm out of town). No lecture March 17 (spring break). Last lecture April 28. Final exam: May 5.

Prerequisites: Derivative Securities and Stochastic Calculus, or equivalent.

Content: This is a "second course" in arbitrage-based pricing of derivative securities, continuing where the "first course" Derivative Securities left off. The first 1/3 of the semester will be devoted to the Black-Scholes model and its generalizations (equivalent martingale measures; the martingale representation theorem; the market price of risk; applications including change of numeraire and the analysis of quantos). The next 1/3 will be devoted to interest rate models (the Heath-Jarrow-Morton approach and its relation to short-rate models; applications including mortgage-backed securities). The last 1/3 will address more advanced topics, including the volatility smile/skew and approaches to accounting for it (underlyings with jumps, local volatility models, and stochastic volatility models).

Course requirements: There will be several homework sets, one every couple of weeks, probably 6 in all. Collaboration on homework is encouraged (homeworks are not exams) but registered students must write up and turn in their solutions individually. There will be one in-class final exam.

Lecture notes: Lecture notes and homework sets will be handed out, and also posted on my web-site as they become available.

Books: We will not follow any single textbook. However I strongly recommend

- M. Baxter and A. Rennie, *Financial calculus: an introduction to derivative pricing*, Cambridge University Press, 1996.

It correlates strongly with the material we'll cover in the first 2/3 of the semester. I'll also draw material from the following books, which will be on reserve in the CIMS library:

- M. Avellaneda and P. Laurence, *Quantitative modeling of derivative securities: from theory to practice*, Chapman and Hall, 2000
- D. Lamberton and B. Lapeyre, *Introduction to stochastic calculus applied to finance*, Chapman and Hall, 1996
- R. Korn and E. Korn, *Option pricing an portfolio optimization*, American Mathematical Society, 2001
- S. Neftci, *An introduction to the mathematics of financial derivatives*, second edition, Academic Press, 2000.
- D. Brigo and F. Mercurio, *Interest rate models: theory and practice*, Springer, 2001.
- R. Rebonato, *Interest-rate models: understanding, analysing, and using models for exotic interest-rate options*, second edition, John Wiley and Sons, 1998.

You'll notice there's nothing on the volatility smile/skew in this list. That's because I haven't yet decided what sources to use for the final 1/3 semester. The reserve list will be augmented as appropriate.