COLLOQUIUM
UNIVERSITY OF PITTSBURGH
THURSDAY, MARCH 20, 2008
704 THACKERAY HALL
3:00 P.M.

PROFESSOR ADAM METZLER

DEPT. OF STATISTICS & ACTUARIAL SCIENCE
UNIVERSITY OF WATERLOO

MULTIVARIATE FIRST-PASSAGE MODELS FOR CREDIT RISK

BRIEF BACKGROUND ON CREDIT RISK

In many financial contracts, such as mortgages and corporate bonds, one of the parties involved has contractual obligations which extend over several years. The term "credit risk" refers to the potential for substantial losses to be incurred should that party be unable to fulfill these obligations. As evidenced by the ongoing sub-prime mortgage crisis in the United States, the consequences of such failures, or "defaults,"' can be severe and widespread, extending far beyond those involved in the original transactions. This crisis has also demonstrated that industry-standard models for managing credit risk are simply not appropriate. These include models used by large financial institutions to value complex contracts, as well as those used by regulatory bodies to communicate the risk profiles of such contracts to less sophisticated investors.

ABSTRACT: In this talk we discuss multivariate first-passage models for credit risk. These are models in which the default event is triggered upon the first passage of a stochastic process, often representing the financial health or "credit quality" of an obligor, to some lower threshold. We begin with the popular multivariate version of the Black-Cox model, in which default times are simply first-passage times of correlated Brownian motion to fixed levels. In the two-dimensional case we derive an exact method for simulating these first-passage times, based on known results for conformal local martingales and the strong Markov property of Brownian motion.

We also introduce an alternative to the Black-Cox framework which incorporates stochastic drift and volatility in obligors' credit qualities. Dependence between default events is modeled via the introduction of latent "factor" processes, common to all obligors, which govern drift and volatility in credit qualities. This results in a setting where credit qualities are "mixtures" of diffusion processes, and where defaults occur upon first passage of time-changed Brownian motion to stochastic barriers. We are able to express the proportion of defaults in an asymptotically large portfolio as a path functional of these underlying latent factors, and discuss a weakly convergent Monte Carlo method for simulation of portfolio loss trajectories. We conclude with a brief discussion concerning calibration of the model's parameters to multi-name credit derivatives known as synthetic collateralized debt obligations.

I will present some recent results on the construction of blow up solutions to several equations in fluid dynamics.

Refreshments served at 2:30 p.m.
in the Math Dept. COMMON ROOM, Thackeray 705

*The speaker is a candidate for a position in the Department.