

**COLLOQUIUM**  
**UNIVERSITY OF PITTSBURGH**  
**FRIDAY, JANUARY 11, 2008**  
**704 THACKERAY HALL**  
**4:00 P.M.**

**PROFESSOR NING CAI**

**DEPT. OF INDUSTRIAL ENG. & OPERATIONS RESEARCH**  
**COLUMBIA UNIVERSITY**

**JUMP DIFFUSION PROCESSES IN FINANCIAL MODELING**

**ABSTRACT:** The talk includes two parts. The first part is about a hyper-exponential jump diffusion model for option pricing. The main objective is to extend the analytical tractability of the Black-Scholes model to alternative models with jumps, no matter whether the jump sizes have exponential-type tails or power-type tails. More precisely, we study a jump diffusion model for asset prices whose jump sizes are hyper-exponentially distributed. The hyper-exponential distribution can approximate most heavy-tail distributions as closely as possible, including both power- and exponential-type distributions. We demonstrate the hyper-exponential jump diffusion model can lead to analytical solutions for popular path-dependent options such as lookback, barrier, quantile, and perpetual American options. Numerical examples indicate that the formulae are easy to implement and accurate. These analytical solutions are made possible mainly because we solve several high-order integro-differential equations explicitly related to first passage time problems and optimal stopping problems.

In the second part, we propose a two-factor equilibrium model for electricity spot and futures prices. Not only does our model capture features such as spikes and seasonality, but it also has some other properties. First, it can incorporate oligopoly. Second, the spot prices have infinite expectations, but the futures prices have finite expectations.

**Refreshments served at 3:30 p.m.**  
**in the Math Dept. COMMON ROOM, Thackeray 705**

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