

STANFORD UNIVERSITY
DEPARTMENT OF STATISTICS
DEPARTMENTAL SEMINAR

4:15 p.m., Tuesday, January 20, 2004
Sequoia Hall Room 200
(Cookies at 3:45 in 1st Floor Lounge)

Tze Lai

**Dynamic Models with Time-Varying Volatilities and Regression Parameters and
Their Applications to Financial Time Series**

Abstract:

Volatility modeling is a cornerstone of empirical finance, as portfolio theory, asset pricing and hedging all involve volatilities, and its fundamental importance has been recognized in this year's Nobel Prize award in Economics. After a brief review of conventional approaches to modeling asset returns and their volatilities, we describe a new class of dynamic models that are stochastic regression models in which the regression parameters and error variances may undergo abrupt changes at unknown time points, while staying constant between adjacent change-points. Assuming conjugate priors, we derive closed-form recursive Bayes estimates of the regression parameters and error variances. Approximations to the Bayes estimates are developed that have much lower computational complexity and yet are comparable to the Bayes estimates in statistical efficiency. We also address the problem of unknown hyperparameters and propose two practical methods for simultaneous estimation of the hyperparameters, regression parameters and error variances. Applications of the methodology to simulated and real financial data show that it offers a promising alternative approach to modeling and forecasting asset returns and their volatilities.