

## **Economics Seminar, Indian Statistical Institute, New Delhi.**

SPEAKER: Rituparna Sen, University of California, Davis

TITLE: Functional Data Analysis for Volatility

TIME: 11:30-1:00 P.M.

DAY & DATE: Friday, 8th January 2010

PLACE: Seminar Room 2

### **Abstract:**

We introduce a functional volatility process that provides a novel tool for modeling volatility trajectories in financial markets. Volatility of returns is assumed to result from a smooth functional volatility process in combination with a multiplicative white noise. In our model, random trajectories of volatility are a hidden component of financial markets for which only implicit and indirect information is available through observed returns. Functional principal component analysis that relies on the Karhunen-Love decomposition based on data that reflect repeated patterns allows to empirically characterize the underlying functional volatility process. We describe the implementation of the corresponding functional methods, provide asymptotic justifications, and illustrate the approach with an analysis of volatility patterns inherent in intra-day trading of various stocks. We also propose and evaluate the prediction of volatility by applying functional regression techniques based on functional principal component scores of the functional volatility process. This approach can be used to detect days on which the stock price process has jumps and to measure the size of jumps. Thus we can separate the jump component from the integrated volatility in the quadratic variation process. This separation leads to better prediction of integrated volatility. This result is particularly useful for high-frequency data, because existing measures like realized variation and bipower variation require sampling at long horizons to get rid of microstructure noise. We develop the theory and present examples with real data on indices and exchange rates.

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