THE UNIVERSITY OF CHICAGO

Department of Statistics

DISSERTATION PRESENTATION AND DEFENSE

RICHARD Y. CHEN

Department of Statistics
The University of Chicago

High-Frequency Functional Inference of Dynamic Data in Time and Frequency Domains

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ABSTRACT

New nonparametric frameworks are proposed in this dissertation, with strong theoretical guarantees, for nonlinear functionals of volatility matrix in an asymptotic regime relevant to the rapidly growing TAQ database of WRDS. One framework leads to a method that enables simultaneous handling of noise and jumps by time-domain smoothing and truncation. Second-order expansion reveals explicit nonlinearity biases and a pathway to optimal convergence after bias correction. The other framework utilizes harmonic analysis and is spectral in nature. This spectral framework is advantageous in that it harnesses the power of Fourier transform to handle missing data and asynchronous observations without any artificial time alignment nor data imputation. When observations are synchronous, this approach attains both the optimal convergence rate and the efficiency bound in the sense of Le Cam and Hajek. New methodologies based on this dissertation extend previous applications of volatility matrix functionals, including principal component analysis, generalized method of moments, continuous-time linear regression et cetera, to large-scale high-frequency datasets of which microstructure noise and asynchrony are prevalent features.

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