THE UNIVERSITY OF CHICAGO

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DISSERTATION PRESENTATION AND DEFENSE

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Estimating the Integrated Parameter of the Locally Parametric Model in High-Frequency Data

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Eckhart 110, 5734 S. University Avenue

ABSTRACT

This talk will cover two different problems. Firstly, we consider the problem of estimating high-frequency covariance (quadratic covariation) of two arbitrary assets observed asynchronously. Simple assumptions, such as independence, are usually imposed on the relationship between the prices process and the observation times. In this paper, we introduce a general endogenous two-dimensional nonparametric model. Because an observation is generated whenever an auxiliary process called *observation time process* hits one of the two boundary processes, it is called the *hitting boundary process with time process* (HBT) model. We establish a central limit theorem for the Hayashi-Yoshida estimator under HBT in the case where the price process and the observation price process follow a continuous Itô process. We obtain an asymptotic bias. We provide an estimator of the latter as well as a bias-corrected estimator of the high-frequency covariance. In addition, we give a consistent estimator of the associated standard error.

Second, we show that the techniques used to solve the high-frequency covariance problem can actually be applied to other problems in the high-frequency literature. To do that, we propose mixed parametric and nonparametric statistical techniques. We give a general time-varying parameter model, where the multidimensional parameter follows a continuous local martingale. As such, we call it the *locally parametric model* (LPM). The quantity of interest is defined as the *integrated value over time* of the parameter process $\Theta := T^{-1} \int_0^T \theta_t^* dt$. We provide estimators of Θ based on the parametric estimators of the original (non time-varying) parametric model and conditions under which we can show consistency and the corresponding central limit theorem. Since the estimator is obtained by chopping the data into small blocks, then estimating the parameter on each block while pretending it is constant locally and finally taking a block length weighted mean of the estimates on each block, we call it the *local parametric estimator* (LPE). The class of estimators is very broad, and can contain estimators that are (not too) biased, such as the *bias-corrected MLE*. We show that the LPM class contains some models that come from popular problems in the high-frequency financial econometrics literature (estimating volatility, high-frequency covariance, leverage effect, volatility of volatility, integrated betas), as well as a new asset-price diffusion model that allows for endogenous observations and time-varying noise which can be autocorrelated and correlated with the efficient price. Finally, as another example of how to apply the theory provided in this paper, we show that we can verify easily the theoretical conditions under which the limit theory of the LPE applies for one specific problem, the estimation of the 2-dimensional parameter of volatility together with endogeneity parameter in the model with uncertainty zones using the LPE of a known parametric estimator in the high-frequency data literature.

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