Adaptive estimation of continuous-time regression models using high-frequency data

Jia Li, Viktor Todorov, George Tauchen

PII: S0304-4076(17)30063-5
DOI: http://dx.doi.org/10.1016/j.jeconom.2017.01.010
Reference: ECONOM 4361

To appear in: *Journal of Econometrics*

Received date : 6 May 2015
Revised date : 25 July 2016
Accepted date : 2 January 2017

Please cite this article as: Li, J., et al., Adaptive estimation of continuous-time regression models using high-frequency data. *Journal of Econometrics* (2017), http://dx.doi.org/10.1016/j.jeconom.2017.01.010

Adaptive Estimation of Continuous-Time Regression Models using High-Frequency Data*

Jia Li,† Viktor Todorov,‡ and George Tauchen§

January 2, 2017

Abstract

We derive the asymptotic efficiency bound for regular estimates of the slope coefficient in a linear continuous-time regression model for the continuous martingale parts of two Itô semimartingales observed on a fixed time interval with asymptotically shrinking mesh of the observation grid. We further construct an estimator from high-frequency data that achieves this efficiency bound and, indeed, is adaptive to the presence of infinite-dimensional nuisance components. The estimator is formed by taking optimal weighted average of local nonparametric volatility estimates that are constructed over blocks of high-frequency observations. The asymptotic efficiency bound is derived under a Markov assumption for the bivariate process while the high-frequency estimator and its asymptotic properties are derived in a general Itô semimartingale setting. To study the asymptotic behavior of the proposed estimator, we introduce a general spatial localization procedure which extends known results on the estimation of integrated volatility functionals to more general classes of functions of volatility. Empirically relevant numerical examples illustrate that the proposed efficient estimator provides nontrivial improvement over alternatives in the extant literature.

Keywords: adaptive estimation; beta; stochastic volatility; spot variance; semiparametric efficiency; high-frequency data.

*We would like to thank the Editor (Oliver Linton), the Associate Editor and three anonymous referees for many helpful comments and suggestions. Li's and Todorov's research have been partially supported by NSF grants SES-1326819 and SES-1530748, respectively.

†Department of Economics, Duke University, Durham, NC 27708; e-mail: jl410@duke.edu.

‡Department of Finance, Kellogg School of Management, Northwestern University, Evanston, IL 60208; e-mail: v-todorov@northwestern.edu.

§Department of Economics, Duke University, Durham, NC 27708; e-mail: george.tauchen@duke.edu.