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Moving Average-Based Estimators of Integrated Variance

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Abstract

We examine moving average (MA) filters for estimating the integrated variance (IV) of a financial asset price in a framework where high-frequency price data are contaminated with market microstructure noise. We show that the sum of squared MA residuals must be scaled to enable a suitable estimator of IV. The scaled estimator is shown to be consistent, first-order efficient, and asymptotically Gaussian distributed about the integrated variance under restrictive assumptions. Under more plausible assumptions, such as time-varying volatility, the MA model is misspecified. This motivates an extensive simulation study of the merits of the MA-based estimator under misspecification. Specifically, we consider nonconstant volatility combined with rounding errors and various forms of dependence between the noise and efficient returns. We benchmark the scaled MA-based estimator to subsample and realized

kernel estimators and find that the MA-based estimator performs well despite the misspecification.

Keywords:

Bias correction | High-frequency data | Integrated variance | Moving average | Realized variance | Realized volatility

JEL Classification:

C10 | C22 | C80

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Notes

[1]Within TTS, Griffin and Oomen (2008) further distinguish two categories: In the first (transaction time sampling), $t_{i,m}$ is the time of a transaction; while in the second (for which they reserve the term, tick time sampling) $t_{i,m}$ is the time of a quote revision.

[2]Andersen et al. (2001) experiment with unfiltered and also linearly interpolated five-minute returns, finding similar dynamics in all cases. Nevertheless, sampling NYSE data at five-minute intervals, they find a median moving-average coefficient of −0.214 (+ 0.214 in the notation of this article), at which level, if the microstructure is an IID noise, the unscaled MA(1)-based estimator overstates IV by 62%.

[3]The main exception was which was quite similar to at the smaller variances. Graphs giving this information are available from the authors on request.

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