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Bias-corrected realized variance under dependent microstructure noise

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Abstract

The aim of this study is to develop a bias-correction method for realized variance (*RV*) estimation, where the equilibrium price process is contaminated with market microstructure noise, such as bid–ask bounces and price-change discreteness. Although *RV* constitutes the simplest estimator of daily integrated variance, it remains strongly biased, and many estimators proposed in previous studies require prior knowledge about the dependence structure of microstructure noise to ensure unbiasedness and consistency. The dependence structure is unknown however, and needs to be estimated. A bias-correction method based on statistical inference from the general noise dependence structure is thus proposed. The results of Monte Carlo simulation indicate that the new approach is robust with respect to changes in the dependence of microstructure noise.

Keywords: Realized variance; Dependent microstructure noise; Two time scales

1. Introduction

The estimation of the daily integrated variance (*IV*) of returns on financial assets is important for derivatives pricing and risk management purposes. While realized variance (*RV*) constitutes a simple but useful estimator of daily *IV*, it also remains a strongly biased estimator, where the equilibrium price process is contaminated with market microstructure noise. This microstructure noise can be induced by various market frictions such as bid–ask bounces and the discreteness of price changes, inter alia. There are three approaches to cope with noise contamination, including (i) use of returns on the appropriate interval length based on optimal sampling frequency proposed by Bandi and Russell [2], (ii) subsampling and bias correction proposed by Zhang et al. [8] and (iii) kernel estimation following Barndorff-Nielsen et al. [4]. McAleer and Medeiros [6] provide an extensive review of the recent literature on *RV* estimation. It is the time-dependent noise structure that ensures the unbiasedness and consistency of *IV* estimators. The estimation methods proposed in previous studies ultimately require prior knowledge about this noise dependency, which needs to be estimated. The present study addresses these estimation issues, and uses the consistent autocovariance estimator of microstructure noise and the tests statistics developed by Ubukata and Oya [7] to identify the noise dependence

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