

REALIZED NETWORKS

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Abstract

In this work we introduce a LASSO based regularization procedure for large dimensional realized covariance estimators of log-prices. The procedure consists of shrinking the off diagonal entries of the inverse realized covariance matrix towards zero. This technique produces covariance estimators that are positive definite and with a sparse inverse. We name the regularized estimator realized network, since estimating a sparse inverse covariance matrix is equivalent to detecting the partial correlation network structure of the log-prices. We focus in particular on applying this technique to the Multivariate Realized Kernel and the Two-Scales Realized Covariance estimators based on refresh time sampling. These are consistent covariance estimators that allow for market microstructure effects and asynchronous trading. The paper studies the large sample properties of the regularized estimators and establishes conditions for consistent estimation of the integrated covariance and for consistent selection of the partial correlation network. As a by-product of the theory, we also establish novel concentration inequalities for the Multivariate Realized Kernel estimator. The methodology is illustrated with an application to a panel of US bluechips throughout 2009. Results show that the realized network estimator outperforms its unregularized counterpart in an out-of-sample global minimum variance portfolio prediction exercise.

Keywords: Networks, Realized Covariance, LASSO

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