

Covariance estimation using high-frequency data: Microstructure noise and sensitivities of estimation methods

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Abstract

Finding the relevant variance-covariance matrix for financial assets and commodities is the building block of strategic allocation and risk management. Recent access to intra-daily high-frequency data for financial assets and commodities has made it possible to apply new and promising methods for analyzing covariance and correlation. Within the realized covariance (RCov) and correlation estimation framework the traditional estimation method by Andersen et al. (2001) and Barndorff-Nielsen and Shephard (2004) have been commonly used (e.g. Lien et al., 2011). This approach requires equally spaced data intervals as input in the estimation procedure. One potential problem in estimation of co-movements with this procedure is microstructure noise and non-synchronous trading. A range of alternative realized covariance and correlations estimators that deals with microstructure noise and non-synchronous trading (e.g. Griffin and Oamen, 2011, Zhang, 2011) will be used in combination with the approach by Andersen et al. and Barndorff-Nielsen and Shephard on high-frequency tick-by-tick oil and natural gas futures data from the Intercontinental Exchange (ICE), to illustrate sensitivities of estimation methods on the resulting realized covariance and correlation estimates. Further, we examine performance of a simple-to-implement HAR model across the above methods for calculating RCov on day-ahead Value-at-Risk (VaR) predictions.

Key words: realized covariance and correlation, VaR, high-frequency data, ICE futures oil and gas data

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