

**Time Series Models for Realized Covariance Matrices Based on the Matrix-F Distribution**

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Abstract: We propose a new Conditional BEKK matrix-F (CBF) model for the time-varying realized covariance (RCOV) matrices. This CBF model is capable of capturing the heavy-tailed RCOV, which is an important stylized fact but could be handled inadequately by the Wishart-based models. Moreover, we give a systematical study on the probabilistic properties and statistical inferences of the CBF model, including exploring its stationarity, establishing the asymptotics of its maximum likelihood estimator, and introducing some new inner-product-based tests for its model checking. In order to handle a large dimensional RCOV matrix, we construct two reduced CBF models --- the variance-target CBF model (for moderate but fixed dimensional RCOV matrix) and the factor CBF model (for high dimensional RCOV matrix). For both reduced models, the asymptotic theory of the estimated parameters is derived. The importance of our entire methodology is illustrated by simulation results and real data analysis.