Factor State-Space Models for High-Dimensional Realized Covariance Matrices of Asset Returns

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Abstract

We propose a flexible matrix-variate state-space model for the prediction of high-dimensional covariance matrices of asset returns based on observable common factors such as the three Fama-French factors. In this model the latent joint covariance matrix of the assets and the common factors is observed through the corresponding realized covariance matrix with a measurement density which is assumed to be a central Wishart. By imposing a factor structure the covariance matrix of the assets is decomposed into a low-rank component driven by the covariance matrix of the factors and a diagonal residual covariance matrix. In this decomposition we allow for dynamic variation in the factor and residual covariance as well as in the factor loadings. This decomposition translates into a convenient factorization of the Wishart measurement density which greatly simplifies statistical inference in high-dimensional applications. The proposed model can be analyzed using Bayesian MCMC procedures and exploiting computational parallelization techniques enables a fast, scalable and numerically precise statistical inference. An empirical application to realized covariance matrices for 60 NYSE traded stocks shows that the model performs very well in- and out of sample.

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