A robust component model for long– and short–run dynamics of Realized Covariance matrices

Abstract

Early multivariate volatility models assumed a constant average (or long–run) level of (co)variances, though empirical evidence suggests that it is time–varying. For this purpose component models spread in literature (See Bauwens et al., 2016): the conditional (co)variance is decomposed into a short–run component, aimed at capturing daily fluctuations and transitory effects, and a long–run one, representing the time-varying average level.

However, dynamic component models are based on the Cholesky decomposition, which makes the short–run component potentially sensible to the order of the assets. For this purpose, we propose a new additive component model, in the spirit of Colacito et al. (2011), that does not depend on the Cholesky decomposition to the covariance matrix. Furthermore, the additive specification does not require the calculation at each time of the inverse of the Cholesky factor, thus slowing down the optimization algorithm.

Additionally, in order to overcome the "curse of dimensionality problem", we extend the model presented above with the Hadamard exponential function proposed by Bauwens and Otranto (2022), which allows asset–pair–specific and time–varying parameters.

We conduct an empirical analysis on a series of Realized Covariance matrices belonging to the Dow Jones Industrial Average index. The model we propose performs better than the competitive ones, both in-sample and out-of-sample.

Keywords

Realized Covariance, MIDAS, dynamic component models, Hadamard exponential matrix

References

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