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A hybrid MSV-MGARCH generalisation of the t-MGARCH model

(abstract)

In volatility modelling of financial time series, hybrid MSV-MGARCH models were introduced in order to exploit advantages of both model classes: flexibility of the MSV class and relative simplicity of the MGARCH class. The parsimonious hybrid MSF-SBEKK model proved useful in multivariate analysis of returns on financial and commodity markets. Any MSF-MGARCH specification amounts to using a conditionally normal MGARCH process and multiplying its conditional covariance matrix H_t by such positive random variable g_t that $\ln(g_t)$ follows a Gaussian AR(1) process with autoregression parameter φ. If $\varphi = 0$ then such MSF-MGARCH specification reduces to the MGARCH process with the conditional distribution being a continuous mixture of multivariate normal distributions with covariance matrices $g_t H_t$ and g_t log-normally distributed.

In this paper we propose a natural hybrid extension of very popular conditionally Student t MGARCH models. Our new hybrid models are obtained by multiplying matrix H_t by random variable g_t coming from such latent process with autoregression parameter φ that, for $\varphi = 0$, g_t has an inverted gamma distribution and leads to the t-MGARCH specification (where the conditional distribution can be represented as a continuous mixture of multivariate normal distributions with covariance matrices $g_t H_t$ and an inverted gamma distribution of g_t). If $\varphi \neq 0$, the latent variables g_t are dependent, so – in comparison to the t-MGARCH specification – in the new models of the observed time series we get an additional source of dependence and one more parameter. Using Bayesian approach, equipped with MCMC simulation techniques, we show how to estimate the new hybrid MSV-SBEKK model. We present an empirical example that serves to illustrate the hybrid extension of the t-SBEKK model and its validity, as well as to compare it to the previous MSF-SBEKK specification.