

Semiparametric multivariate volatility models

Estimation of multivariate volatility models is usually carried out by quasi maximum likelihood (QMLE), for which consistency and asymptotic normality have been proven under quite general conditions. However, there may be a substantial efficiency loss of QMLE if the true innovation distribution is not multinormal. We suggest a nonparametric estimation of the multivariate innovation distribution, based on consistent parameter estimates obtained by QMLE. We show that under standard regularity conditions the semiparametric efficiency bound can be attained. Without reparametrizing the conditional covariance matrix (which depends on the particular model used), adaptive estimation is not possible. However, in some cases the efficiency loss of semiparametric estimation with respect to full information maximum likelihood decreases as the dimension increases. In practice, one would like to restrict the class of possible density functions to avoid the curse of dimensionality. One way of doing so is to impose the constraint that the density belongs to the class of spherical distributions, for which we also derive the semiparametric efficiency bound and an estimator that attains this bound. A simulation experiment demonstrates the efficiency gain of the proposed estimator compared with QMLE.