Cross-codifference for Bidimensional VAR(1) Models With Infinite Variance

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Abstract

We consider the problem of structure of dependence description for multivariate models with infinite variance. Here, we take under consideration the bidimensional vector autoregressive model of order 1 where the innovation vector comes from two-dimensional sub-Gaussian distribution. In the Gaussian case the dependence can be simply expressed by means of the cross-covariance function. In case of infinite variance the cross-covariance does not exist and the alternative measures of dependence should be applied. In the literature one can find different measures adequate to infinite variance time series. One of the most general is the codifference based on the characteristic function. The codifference generalizes the classical covariance and provides the similar quality-like information. Moreover, in the Gaussian case it reduces to cross-covariance. The codifference is mostly considered as the measure in one-dimensional case indicating the interdependence of a given time series. Here, we introduce the cross-codifference which indicates how quantitatively strong is the relation between spatial components of two-dimensional time series models. Here, we present an analytical result for VAR(1) model with sub-Gaussian innovations. We emphasize that obtained expressions perfectly agree with the empirical counterparts. Last part of the work is devoted to the statistical estimation of VAR(1) parameters based on the empirical cross-codifference. Again, we demonstrate via Monte Carlo simulations that proposed methodology works correctly.

References

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