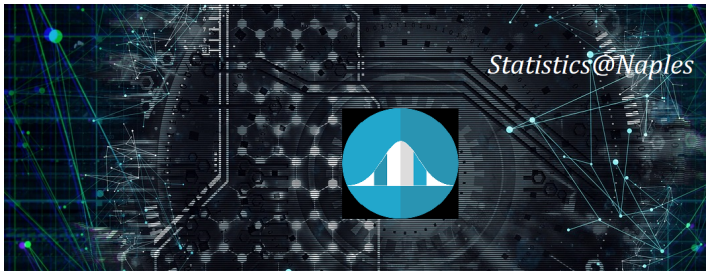

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Maximum likelihood estimation of multivariate regime switching Student-t copula models

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We propose a novel estimation method for multivariate regime switching models based on a Student-t copula function. These models account for the interdependencies between multiple variables by considering the correlation strength controlled by specific parameters. Moreover, they address fat-tailed distributions through the number of degrees of freedom. These parameters, in turn, are governed by a latent Markov process.

We consider a two-steps procedure carried out through the Expectation-Maximization algorithm to estimate model parameters by maximum likelihood. The primary computational challenge lies in estimating both the matrix of dependence parameters and determining the number of degrees of freedom for the Student t-copula. To address this, we introduce a new approach that leverages Lagrange multipliers, simplifying the estimation process.

Through a comprehensive simulation study, we demonstrate that our estimators possess desirable properties in finite samples. Additionally, the estimation procedure shows good computational efficiency.

We apply our model to analyze the log-returns of five different cryptocurrencies. The results enable us to identify distinct bull and bear market periods based on the intensity of correlations observed between the crypto assets. This finding highlights the model's efficacy in capturing and characterizing market dynamics within the cryptocurrency domain.

Keywords: statistical models for financial analysis, cryptocurrencies, time series, Expectation-Maximization algorithm, latent variable models

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