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Bayesian Inference in Stochastic Volatility in Mean Models using Hamiltonian Monte Carlo Method

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Resumo

In finance, it is often desirable to assess the risk of a portfolio of financial assets using price variation. An important tool in this analysis is the stochastic volatility model (SV), which is capable of capturing the main empirical properties of such series. However, its use requires intensive pre-processing to ensure reliable results. An attractive alternative to avoid this problem is the stochastic volatility in mean (SVM) model. The objective of this work was to analyze financial series using the SVM model with scale mixture normal (SMN) distribution. This class of models is more robust as it accommodates observational errors with heavier tails than the normal distribution, which is a notable characteristic of financial series. The parameters were estimated using the Bayesian approach via Markov chain Monte Carlo (MCMC) techniques, specifically the No-U-Turn Sampler (NUTS) method implemented in the RStan library available in the R language. The recently developed information criteria, Watanabe-Akaike information criterion (WAIC) and leave-one-out cross-validation (LOO-CV), were calculated to compare the models' fit, as well as the deviance information criterion (DIC). A simulation study was conducted to compare the performance of these criteria. Finally, we applied the models to real data.

Palavras-chave: Financial series; Hamiltonian Monte Carlo; Scale mixture normal distribution; Stochastic volatility in mean.

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