67ª RBras e 20º SEAGRO

"A (Bio)estatística e a Biometria na era da revolução digital"

De 24 a 28 de julho de 2023

Londrina/Paraná

LIVRO DE RESUMOS

Patrocínio

Apoio

Realização

Departamento de Estatística

Universidade Estadual de Londrina

FUNDAÇÃO DE AMPARO À PESQUISA DO ESTADO DE SÃO PAULO

Estimation of stochastic volatility models with leverage and heavy tails using Stan software

Ritha Rubi Huaysara Condori [1]
Ricardo Sandes Ehlers [2]

Resumo

In the financial market, it is important to measure and predict the volatility of financial time series returns. This motivates the need to develop statistical models to estimate the volatility of financial returns. Volatility, a measure of risk, can be estimated deterministically using Generalized Autoregressive Conditional Heteroscedasticity (GARCH) models and probabilistically through stochastic volatility (SV) models. In this work, we used SV models with leverage based on scale mixtures of skew-normal distribution (SV-SMSN). This class of SV models can simultaneously capture characteristics of the daily return series such as leverage, heavy tails, and skewness. Estimating SV models is not an easy task due to the intractable form of the likelihood function. In recent years and with the development of Stan software, the use of the Hamiltonian Monte Carlo (HMC) algorithm has increased. The Stan software implements an extension of the HMC algorithm called the No-U-Turn Sampler (NUTS) algorithm. In this work, the family of SV-SMSN models was implemented in the Stan programming language, using the stochastic representation of the scale mixtures of skew-normal (SMSN) distributions. To show the performance of the implementation in Stan, the family of SV-SMSN models was adjusted to the series of daily returns of the São Paulo Stock Exchange Index (IBOVESPA), this series includes the period of the Covid-19 pandemic. According to the Leave-One-Out (LOO-CV) cross-validation technique, the most appropriate SV model to describe the daily returns of the IBOVESPA was the SV model with leverage and skew-Student-t distribution.

Palavras-chave: Leave-One-Out Cross-Validation; Leverage effect; Scale mixtures of skew-normal distribution; Stan; Stochastic volatility models.

[1]Programa Interinstitucional de Pós-Graduação em Estatística UFSCar - USP, São Carlos/SP - rubihuaysara@usp.br
[2]Programa Interinstitucional de Pós-Graduação em Estatística UFSCar - USP, São Carlos/SP - ehlers@icmc.usp.br