Summaries

Bayesian Estimation of a Stable Distribution Using the Hamiltonian Monte Carlo Method with Application to Stock Indices

Hideomi Totsuka, Hidetoshi Mitsui

This paper features a Bayesian approach using the Hamiltonian Monte Carlo method to estimate the probability density function for the stable distribution of daily returns of stock indices. The stock indices used in the empirical analysis include the Nikkei, the TOPIX, the DJIA, and the S&P 500. Based on the daily returns, the results of the empirical study show that there are substantial differences in the values of the stability parameter of the probability density function for the stable distributions of the four indices. Moreover, the distributions of daily returns for the Nikkei and the TOPIX are found to be skewed, while the distributions for the DJIA and the S&P 500 are not. It is confirmed that the difference in the distributions of the daily returns of the four indices is due to the difference in the probability density function for the stable distribution.

Bayesian Estimation of Stochastic Volatility Model Using Hamiltonian Monte Carlo Method and its Application to Nikkei 225 Data

Hidetoshi Mitsui, Hideomi Totsuka

In time series data of return on risky assets such as stocks, stock indices, and foreign exchange markets, the variation of the second-order moment called volatility is of importance. The stochastic volatility (SV) model has been widely used in the analysis of such data on risky asset return. However, it is difficult to estimate the parameters of the SV model using maximum likelihood because of the inclusion of latent variables, and an alternative maximum likelihood estimation method is thus required. To solve this problem, many previous studies have employed Bayesian estimation using the Markov chain Monte Carlo (MCMC) method. In the SV model, it is necessary to sample not only the parameters describing the model but also the latent variable (i. e., volatility), from the posterior distribution simultaneously. In this study, we propose to estimate the parameters of the SV model by Bayesian estimation using the Hamiltonian Monte Carlo method. We explain the SV with the leverage model, which is an extension of the SV model, and the SV model using not only the normal distribution but also the *t* distribution for the distribution of the error term. Finally, we provide an example of the application of these models to the return data of Nikkei 225.

Analysis of Stock Prices using Symmetry Models for Multi-way Contingency Tables

Kiyotaka Iki

This study introduces models representing symmetric structures for the analysis of square contingency tables. These models have also been extended to multi-way contingency tables. The present paper represents the stock price data of companies listed in the 1st section of the Tokyo Stock Exchange in a multi-way contingency table. In addition, we propose seven types of models to maintain symmetry with respect to time transition. The proposed models have a inclusive relationship, and were applied to stock price data.