

# Matrix Exponential Stochastic Volatility Model with Leverage Effects

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## Abstract

A multivariate stochastic volatility model with the dynamic correlations and the leverage effects is described and estimated. The matrix exponential transformation is used to keep the time-varying covariance matrices positive definite. An efficient Bayesian estimation method using Markov chain Monte Carlo is proposed. Of particular interest is our approach to sample the latent state variables from the conditional posterior distribution. A blocked multi-move Metropolis-Hastings sampling, in which the proposal density is derived from an approximating linear Gaussian state space model, is applied. The model and the techniques are illustrated with daily stock, bond, and exchange rate returns data of Japan. Model comparison with constant correlation multivariate stochastic volatility model with leverage effects is conducted.

*Key words:* Asymmetry, Dynamic correlation, Leverage effect, Matrix exponential, Markov chain Monte Carlo, Multi-move sampler, Multivariate stochastic volatility

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