Quantitative Finance > Computational Finance

Model Selection and Adaptive Markov chain Monte Carlo for Bayesian Cointegrated VAR model

Gareth W. Peters, Balakrishnan Kannan, Ben Lasscock, Chris Mellen

(Submitted on 22 Apr 2010)

This paper develops a matrix-variate adaptive Markov chain Monte Carlo (MCMC) methodology for Bayesian Cointegrated Vector Auto Regressions (CVAR). We replace the popular approach to sampling Bayesian CVAR models, involving griddy Gibbs, with an automated efficient alternative, based on the Adaptive Metropolis algorithm of Roberts and Rosenthal, (2009). Developing the adaptive MCMC framework for Bayesian CVAR models allows for efficient estimation of posterior parameters in significantly higher dimensional CVAR series than previously possible with existing griddy Gibbs samplers. For a n-dimensional CVAR series, the matrix-variate posterior is in dimension $3n^2 + n$, with significant correlation present between the blocks of matrix random variables. We also treat the rank of the CVAR model as a random variable and perform joint inference on the rank and model parameters. This is achieved with a Bayesian posterior distribution defined over both the rank and the CVAR model parameters, and inference is made via Bayes Factor analysis of rank. Practically the adaptive sampler also aids in the development of automated Bayesian cointegration models for algorithmic trading systems considering instruments made up of several assets, such as currency baskets. Previously the literature on financial applications of CVAR trading models typically only considers pairs trading (n=2) due to the computational cost of the griddy Gibbs. We are able to extend under our adaptive framework to $n >> 2$ and demonstrate an example with n = 10, resulting in a posterior distribution with parameters up to dimension 310. By also considering the rank as a random quantity we can ensure our resulting trading models are able to adjust to potentially time varying market conditions in a coherent statistical framework.

Comments:	to appear journal Bayesian Analysis
Subjects:	**Computational Finance (q-fin.CP)**; Portfolio Management (q-fin.PM); Statistical Finance (q-fin.ST); Computation (stat.CO); Methodology (stat.ME)
Cite as:	**arXiv:1004.3830v1 [q-fin.CP]**

Submission history

From: Gareth Peters Dr [view email]
[v1] Thu, 22 Apr 2010 02:26:17 GMT (841kb)

Which authors of this paper are endorsers?