GIBBS SAMPLING ON A STEADY MODEL

Gül Ergün*

Received 04. 04. 2003 : Accepted 30. 09. 2003

Abstract
In this study Gibbs sampling, a widely used simulation method, is applied to the steady model, a simple variation of the dynamic linear model, and the model parameters are estimated. The estimates obtained from Gibbs sampling and the results for the standard Kalman filter are compared and are found to be close. These similarities in the results indicate the success of the stochastic simulation. In this study, a variance modulation on the steady model is also applied and Gibbs sampling is proposed to overcome analytic problems. In the variance adaptation, defined as \[ a \mu^2 + b \] (\( a, b > 0 \)), estimates for the model parameters are obtained for different values of \( a \) and \( b \).

Keywords: Bayesian approach, BUGS, Gibbs sampling, Steady model, Variance modulation

1. Introduction
Statistical inference is concerned with drawing conclusions about quantities that are not observed. Once a model is built, there are many ways to proceed with inference. The Bayesian approach considers all unknown quantities as random variables. Obtaining the posterior distribution for the unknown parameter is an important step, but not the final one. One must be able to extract meaningful information from this distribution. This is usually achieved by evaluation of point estimates such as mean, mode or interval summaries given by probability intervals. This extraction or summary can be performed analytically, that is, an exact appraisal of the situation can be made. In most cases, however, the complexity of the model prevents the analytical solution. There are many examples that fall into the category of large dimensional models, such as dynamic models, hierarchical models and random effects models [6].

Dynamic linear models provide a flexible and fairly simple tool for modelling time series data. Estimators are computed using the Kalman filter, which gives the optimal solution under some assumptions. When the models are complicated, it is no longer possible to perform exact Bayesian inference. Therefore, it is necessary to use alternative approaches for analysing time series data within the Bayesian framework in real life applications. A stochastic simulation method, Gibbs Sampling, is considered in this study.

*Hacettepe University, Faculty of Science, Department of Statistics, Ankara, Turkey