GIBBS SAMPLING FOR TIME SERIES OF SMALL COUNTS

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In this presentation Bayesian estimation of models for time series of counts using data augmentation and MCMC methods is considered. The main contribution of this presentation is to show that straightforward Gibbs sampling of all parameters, involving only draws from simple distributions such a multivariate normal, inverse Gamma, exponential and low-dimensional discrete distributions, is feasible for most parameter-driven models suggested for analyzing time series of count data. Gibbs sampling is achieved by introducing two sequences of latent variables through data augmentation. The first sequences are unobserved inter arrival times of a suitably chosen Poisson process. The introduction of this first sequence eliminates the non-linearity of the Poisson model, whereas the non-normality of the error term remains which follows a log exponential distribution. This distribution is then approximated by a mixture of normal distributions. By introducing the component indicator as a second sequence of missing data, we obtain a conditionally Gaussian model, which allows easy sampling of all model parameters. Finally we show that the latent sequences are easily sampled, conditional on knowing the model parameters. This new Gibbs sampler is applied to various models for time series of counts, e.g. Poisson regression models (as in [1]), and to state space models for Poisson time series (as in [2]) and issues of variable selection are adressed.

References

[1] S. Frühwirth-Schnatter and H. Wagner. Data Augmentation and Gibbs Sampling for Regression Models of Small Counts. Research Report IFAS, http://www.ifas.jku.at/, 2004.

[2] S. Frühwirth-Schnatter and H. Wagner. Gibbs Sampling for Parameter-driven Models of Time Series of Small Counts with Applications to State Space Modelling. Research Report IFAS, http://www.ifas.jku.at/, 2004.