Code for power link functions in modeling dependent ordinal data

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This readme file describes the details of the code, inputs and outputs of the splogit model and logit model with 1-dimensional correlation (ordinal time series data). It helps to replicate the analysis of one data example in the paper "Power Link Functions in Modeling Dependent Ordinal Data" by Dan Li, Xia Wang and Dipak K. Dey.

- Software needed: R, Stan
- R package needed: rstan, loo, Formula, mvtnorm
- Platform: Ubuntu 16.04.4 LTS

A quick start

Once you have downloaded the zipped file, unzip it and get the directory '`example`'. All the source codes are in this repository.

In the folder named '`R`':

`ordinal_splogit.R`: The R functions used to simulate data set, pre-process the data for fitting, and compute model comparison criteria. For other details of functions, see comments in the R file.

The Stan codes for model fitting are located in the subdirectory '`inst/stan`':

`ordinal_fit_splogit_ts.stan`: Stan code implementing the MCMC sampler of splogit model for the ordinal time series data.

`ordinal_fit_logit_ts.stan`: Stan code implementing the MCMC sampler of logit model for the ordinal time series data.

The main R file for the data example and the output fitted results are located in the subdirectory '`vignettes`':

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`simulation_splogit_r0.5.R`: This main file is used to generate the data example, fit the dependent regression models (splogit and logit models), get inference results, and compute model comparison criteria.

How to use the code

Simply run

```
simulation_splogit_r0.5.R
```

to simulate the data example, generate posterior samples from the splogit and logit models, post-process the inference results to draw plots and get summary, and compare the models based on DIC and LPML. The generated data set and the fitted results are stored in the folder '`vignettes`'. Details of some output files are as follows.

Output:

`data_example.txt`: The data set generated from the splogit model ($r = 0.5$).

`results/splogit_results_full.rdata`: The returned object which contains the output derived from fitting the splogit model.

`results/splogit_results.rdata`: The summaries for all chains by fitting the splogit model, including means, standard deviations, quantiles, effective sample sizes, and the potential scale reduction.

`results/logit_results_full.rdata`: The returned object which contains the output derived from fitting the logit model.

`results/logit_results.rdata`: The summaries for all chains by fitting the logit model.

We also provide a report of the simulated example '`vignettes/report_example.pdf`' for more details.