Advanced Bayesian Methods: Theory and Applications in R

04-Summaries - Exercises

In this example we analyze rent index data from Munich, Germany (Fahrmeir et al., 2013).

1. Download the Munich rent data set from

   https://nikum.org/dmr/Data/MunichRent.rds.

   You can use the following R code

```
R> download_data <- function(data = "MunichRent.rds") {
+    file <- paste0("https://nikum.org/abm/Data/", data)
+    tdir <- tempfile()
+    dir.create(tdir)
+    download.file(file, file.path(tdir, data))
+    return(readRDS(file.path(tdir, data)))
+  }
R> MunichRent <- download_data("MunichRent.rds")
```

2. Analyze the distribution of the `rent` variable. Calculate and interpret the mean, median, and measures of variability. Assess the shape–symmetric, skewed, or multi-modal. Summarize your findings and consider their implications for statistical analysis and modeling.

3. Estimate a linear regression model with `rent` as the dependent variable using JAGS with 1000 iterations. For the moment, only include covariates `area` and `yearc` as explanatory variables.

4. For each iteration of the MCMC sampler, compute the model residuals.

5. Using the samples of the residuals, create a Q-Q plot, i.e., compute the 2.5%, 50% and 97.5% quantiles of the residuals to create intervals for the final Q-Q plot.

6. Now use orthogonal polynomials instead (see `?poly`). Does the DIC and the Q-Q plot improve?

7. To ease estimating linear regression models using JAGS, consider writing a little interface function `lmJAGS()`, similar to function `lm()`.

References

Fahrmeir, L., T. Kneib, S. Lang, and B. Marx (2013). *Regression – Models, Methods and Applications*. Berlin: Springer-Verlag. ISBN 978-3-642-34332-2.