Macroeconometrics
Assignment II

florian.huber@plus.ac.at

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Please submit your answers by Monday, July 31 2022 with the subject line "Macroeconometrics – Assignment" via email to florian.huber@plus.ac.at. Make sure that all results are formatted in a reasonable way (i.e. do not send me R code files but put the main points in a PDF) and discussed verbally. Including R codes only is not sufficient!

Part I: Writing complex functions in R

Task 1: Functions to estimate regression models using the SSVS prior
Read the following introduction to functions in R (Advanced R by Hadley Wickham). In this task, you have to write a function that performs Bayesian inference in a regression model with a stochastic search variable selection prior based on the code discussed in class (see code_SSVS.R). Use the economic growth dataset of Fernandez, Ley, and Steel (2001, *J. Applied Econometrics*) provided in the BMS package in R. To get this data, type *data(datafls)* after loading the BMS package.

- Write a function that takes the explanatory variables $\boldsymbol{X}$ as well as the endogenous variable $\boldsymbol{y}$ as input. In the growth dataset, the first column contains the endogenous variable whereas the remaining columns are the explanatory variables. Think about what additional inputs might be helpful! (Hint: you might want to vary *nsave* and *nburn*.) Also think carefully about the potential output of the function! (Hint: R functions can only return a single object, so use a list object.)
- Run the function using different values for τ_0 and τ_1. What happens to the posterior inclusion probabilities (PIP.mean) if τ_0 is set equal to $1e-15$? Describe this finding verbally and graphically!

- The variables in $\boldsymbol{X}$ all feature a different scale. This causes problems since the simple implementation of the code sets τ_0 and τ_1 equal to fixed values that are independent of the scaling of the data. Try to standardize the data such that all columns of $\boldsymbol{X}$ (and $\boldsymbol{y}$) have mean zero and variance one.
- (*ADVANCED*) Try to implement the semi-automatic approach of George, Sun, and Ni (2008, *J. Econometrics*) in your SSVS function. This amounts to first estimating the OLS standard deviations and then scaling τ_0 and τ_1 using the corresponding OLS standard deviations.

Part II: Model uncertainty in economic growth regressions

Task 1: Bayesian Normal Linear Regression
Read the paper by Fernandez, Ley and Steel (2001, *J. Applied Econometrics*) as well as Chapter 11 in Gary Koop's textbook. Consider the data for the paper by Fernandez, Ley and Steel (2001, *J. Applied Econometrics*), available from the BMS package

- Reproduce the results in Table 11.1 (in Koop) using the BMS package in R.
- Use your custom function for the SSVS prior to reproduce Table 11.1.
- How do results differ? To what extent is this related to the specific choices of τ_0 and τ_1?