# Econometrics
# Exercise sheet III

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Please submit your answers on learn@wu by Friday, 25th of May 2018 with the subject line "Econometrics - Assignment III".
Make sure that all results are formatted in a reasonable way and verbally discussed.

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 (2000, JAE) 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 tau0 and tau1. What happens to the posterior inclusion probabilities (PIP.mean) if tau0 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 tau0 and tau1 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, JoE) in your SSVS function. This amounts to first estimating the OLS standard deviations and then scaling tau0 and tau1 using the corresponding OLS standard deviations. Hint: Check the code we discussed in class for the threshold model

## 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 tau0 and tau1?