Course Syllabus

Bayesian Econometrics (440.616.51)
Masters in Applied Economics Program
Johns Hopkins University

Fall Semester, 2017
Dr. Sang-Sub Lee
(slee193@jhu.edu)

Thursday 6:00 – 08:30

1. General Course Objective:

This course is designed as an introduction to the theory and practical methods of Bayesian econometrics. The main goal of this course is to provide the students the alternative viewpoint of the Bayesian approach vis-à-vis the classical econometric approach based on the frequentist perspective. The course will present the basic principles of Bayesian inference, Bayesian Analysis of the linear regression model and extensions of the regression model, and the numerical methods used for Bayesian implementation.

Students will develop practical experience with posterior simulation through hands on computer exercises involving computer programming.

2. Class Schedule:

Thursday: 6:00 – 8:30 (PM)

Office Hour:

Thursday: 5:00-6:00

When class is missed for some reason, make-up class will be scheduled.

3. Grading:

Grades for the course will be determined as follows:

35% in-class midterm exam (tentatively scheduled on Oct 19 or 26)
30% HW problems
35% term paper due on last day of the semester.

HW:

A few words about HW problems. You are fully expected to turn in (typed) answers to all your HW problems, but **not all** HW questions will necessarily be graded. Also, do not expect that you will get your HWs back immediately. However, answer keys to HW problems will be available on the course BB on the due dates.

Term Paper:

Write an empirical term paper using Bayesian methods and presents to the class at the end of the semester.

Paper should include some literature review, theoretical basis, and empirical evidence from own data analysis. The research paper should be typed. The paper should consist of two sections. The first briefly describes some of the related literature with a clear description of one or more previous papers and a statement of the relation or model you would propose to estimate. You do not need to propose an original model, but it should be something that has not been estimated with Bayesian methods or for which you would add something different from previous Bayesian analysis of that model. The second section should provide a detailed description of the methods and algorithm you would use to perform Bayesian estimation of the model. Note that this second section must be self-contained-- you should not assume that the reader is familiar with the algorithms or Bayesian approach, and you will be graded based on how clearly and accurately you explain them here.

3. Lecture Contents:

Textbook:

Bayesian Econometrics by Gary Koop, Wiley.

The course will cover the **topics** in Koop's book for the most part. The actual contents can be somewhat different from the book depending on topics. Lecture notes and other class related material will be available before each class on the Course BB site.

Modern Bayesian Econometrics relies heavily on the computer and some basic programming skills are essential. We will use several softwares in this course, including Matlab, R (and R-studio), and WinBUGs. No prior knowledge of this software is required.

Tentative Course Outline:

1. Topic 1: Introduction and Overview

Koop, Chapter 1

2. Topic 2: Main Elements of Bayesian Framework

Koop, Chapter 1

3. Topic 3: Bayesian Computation

Koop, Chapter 3.8, 4.2.3, 5.5, 12.2

4. Linear Regression Models

Koop, Chapter 2, 3, 4, and 6.

5. Non-Linear Regression Models

Koop, Chapter 9 and 5

6. Panel Data

Koop, Chapter 7.

7. Time Series Models and Other Topics

Koop, Chapter 8, 10, and 12.

8. Model Averaging

Koop, Chapter 11.

4. Softwares:

4.1. Matlab

Matlab is available for free to all JHU students. Contact software@jhu.edu to request your license file code. Once you download matlab, go through a quick tutorial available (Choose Home-> Help -> Matlab -> Getting Started with Matlab). Several topics and examples are also available. We will use Matlab mainly for the examples in the Koop's text book. There is a companion website (http://www.wiley.co.uk/koopbayesian) where the matlab programs and data sets used in the text book are available. Download the zip file and install the programs and data sets as instructed in the "readme" pdf file.

4.2. R

R is a comprehensive statistical package. Base R package is available for download from http://www.r-project.org/. You will get a faster download if you choose a nearby mirror site. To install basic R simply run the install program. If you are working in 64-bit windows you can install both the 64-bit and 32-bit versions. If you are installing (or updating) R packages in Windows 7 start R as administrator (Right click on R icon on desktop and select "run as administrator"). The packages can then be installed or updated from within R.

If you are not familiar with R, you might start by reading through An Introduction to R (click help-> Manuals)**.** You might browse through the list of contributed documentation at http://cran.r-project.org/**.**

Here are a few selective tutorial sites you may try.

YouTube R Tutorial for Google Developer:
https://www.youtube.com/playlist?list=PLOU2XLYxmsIK9qQfztXeybpHvru-TrqAP

Tutorial at Princeton University:
http://data.princeton.edu/R

A short R reference Card is available at CTAN site:
https://cran.r-project.org/doc/contrib/Short-refcard.pdf

We will use R along with Matlab and WinBugs.

4.2-1. Rstudio (Optional):

If you are going to use R you need to use a program/script editor to write your program/script files. There is a simple editor included in the base R windows GUI (graphical user interface). Once you begin to do more advanced work you need a better development environment. Several are available at the moment. RStudio is recommend

highly. RStudio is an integrated development environment (IDE) for R. It includes a console, syntax-highlighting editor that supports direct code execution, as well as tools for plotting, history, debugging and workspace management. Rstudio can be downloaded for free at https://www.rstudio.com/products/rstudio/download/

A short tutorial for R studio is available at

Princeton: http://dss.princeton.edu/training/RStudio101.pdf

UCLA: http://web.cs.ucla.edu/~gulzar/rstudio/basic-tutorial.html

4.4. Winbugs

Download winbugs at https://www.mrc-bsu.cam.ac.uk/software/bugs/the-bugs-project-winbugs/

a) Download the zip file and unzip the file into \programs directory. It will create \winzip14\ directory and extract files into the directory.
b) Download and install the patch for 1.4.3. The file is a text file. Once you download, follow the instruction given in the file for installation.

More Instruction about Winbugs to come later in the semester.