

Dynamic Macroeconomics (Part I)

-Syllabus-

1 Aims and Purposes of the Course

This course introduces students to techniques that allow them to bring modern business cycle models to the data. This includes basic techniques for estimating *linearized* DSGE models, such as e.g. the Kalman filter and Bayesian estimation.

The course starts with a refresher on the basic RBC model and techniques to solve this model. We will then learn how to use the Kalman filter on the state-space representation of the RBC model to construct the likelihood function and how to estimate this model using ML and Bayesian methods. For the latter, we will make use of the Metropolis-Hastings algorithm. A particular focus will be on how to detect and remedy the typical problems arising in the estimation of linearized DSGE models. In particular, we will discuss convergence diagnostics and identification.

Importantly, this course is designed as a hands-on course that requires students to write their own Matlab/Dynare code to implement the concepts discussed in class!

2 Course Homepage

All relevant materials for the course can be found on Ecampus.

3 Matlab

You will need to bring your own laptop to all lectures. Matlab licenses will be made available in class. No previous knowledge of Matlab is required for the course, although some programming experience would be helpful. A Matlab primer is available on Ecampus.

Please also download the Tools-folder from Ecampus and store it in a directory you will be working in during the course.

We will be using Dynare 4.5 (Adjemian et al., 2011).

4 Organization of Lectures and Course Outline

This is the first half of a full semester course with 4 hours of lectures each week. The second half (starting June 6, 2018) will be taught by Christian Bayer. Tutorials/exercise sessions are integrated into the lectures. The class takes place on

- Wednesdays from 10:15 to 11:45, Lecture Hall F (Juridicum).
- Thursdays from 14:15 to 15:45, Lecture Hall F (Juridicum).

4.1 Background Reading

As the course sequence intends to bring students to the research frontier, there is no encompassing textbook yet. The course will thus move along a set of papers and textbook chapters. General textbooks covering (parts of) the material relevant in this course are:

- Dejong and Dave (2011)
- Herbst and Schorfheide (2015)
- Hamilton (1994)
- Ljungqvist and Sargent (2012)
- Durbin and Koopman (2012)
- Geweke (2005)
- Geweke, Koop, and Van Dijk (2011)

There will also be handouts covering the technical details of selected aspects of the course.

4.2 Selected Literature for the Covered Topics

1. The Basic RBC Model: Solution and Calibration
 - Blanchard and Kahn (1980)
 - Fernández-Villaverde and Krüger (2012), Ch. 7.4/Krüger (2007), Ch. 8
2. The Kalman Filter and Maximum Likelihood Estimation of DSGE Models
 - Hamilton (1994), Ch. 13
 - Ljungqvist and Sargent (2012), Ch. 2
3. Bayesian Estimation of DSGE Models
 - An and Schorfheide (2007)
 - Koop (2003), Ch. 1
 - Chib and Greenberg (1995)
 - Pfeifer (2013)
4. Simulated Method of Moments
 - Ruge-Murcia (2012, 2013)
5. Identification
 - Iskrev (2010)
 - Ratto and Iskrev (2011)

5 Assessment

100% of the grade will be based on an oral exam.

Changes in the schedule

There will be no classes on the following dates

- Thursday, April 12
- Wednesday, May 16
- Thursday, May 17

Replacement dates will be announced in class.

References

- Adjemian, Stéphane et al. (2011). “Dynare: reference manual, version 4”. Dynare Working Papers 1. CEPREMAP.
- An, Sungbae and Frank Schorfheide (2007). “Bayesian analysis of DSGE models”. *Econometric Reviews* 26 (2-4), 113–172.
- Blanchard, Olivier J. and Charles M. Kahn (1980). “The solution of linear difference models under rational expectations”. *Econometrica* 48 (5), 1305–11.
- Chib, Siddhartha and Edward Greenberg (1995). “Understanding the Metropolis-Hastings algorithm”. *The American Statistician* 49 (4), 327–335.
- Dejong, David N. and Chetan Dave (2011). *Structural macroeconometrics*. 2nd ed. Princeton, NJ: Princeton University Press.
- Durbin, J. and Siem J. Koopman (2012). *Time series analysis by state space methods*. Second Revised Edition. Oxford: Oxford University Press.
- Fernández-Villaverde, Jesús and Dirk Krüger (2012). “Advanced macroeconomics - a text for undergraduates”. Mimeo. University of Pennsylvania.
- Geweke, John (2005). *Contemporary Bayesian econometrics and statistics*. Hoboken, NJ: John Wiley & Sons.
- Geweke, John, Gary Koop, and Hermann Van Dijk, eds. (2011). *The Oxford handbook of Bayesian econometrics*. Oxford: Oxford University Press.
- Hamilton, James D. (1994). *Time series analysis*. Princeton, NJ: Princeton University Press.
- Herbst, Edward and Frank Schorfheide (2015). *Bayesian estimation of DSGE models*. Princeton University Press.
- Iskrev, Nikolay (2010). “Local identification in DSGE models”. *Journal of Monetary Economics* 57, 189–202.
- Koop, Gary (2003). *Bayesian econometrics*. Chichester: John Wiley & Sons.
- Krüger, Dirk (2007). “Quantitative macroeconomics: an introduction”. Mimeo. University of Pennsylvania.
- Ljungqvist, Lars and Thomas J. Sargent (2012). *Recursive macroeconomic theory*. 3rd ed. Cambridge, MA: MIT Press.
- Pfeifer, Johannes (2013). “A guide to specifying observation equations for the estimation of DSGE models”. Mimeo. University of Mannheim.
- Ratto, Marco and Nikolay Iskrev (2011). “Algorithms for identification analysis under the Dynare environment: final version of the software”. Mimeo. Joint Research Centre, European Commission.
- Ruge-Murcia, Francisco J. (2012). “Estimating nonlinear DSGE models by the simulated method of moments: with an application to business cycles”. *Journal of Economic Dynamics and Control* 36 (6), 914–938.

Ruge-Murcia, Francisco J. (2013). “Generalized Method of Moments estimation of DSGE models”. *Handbook of Research Methods and Applications in Empirical Macroeconomics*. Edward Elgar Publishing. Chap. 20, 464–485.