Freie Universität Berlin **Sommersemester 2020**

Methods for Monetary and Fiscal Policy Analysis

Instructor:

Dr. Frank Schorfheide

Professor of Economics, University of Pennsylvania

Bundesbank Gastprofessor, Freie Universität Berlin

Email: *schorf@ssc.upenn.edu*

Topic:

This course provides an introduction to empirical methods for the analysis of monetary and fiscal policy questions with estimated dynamic stochastic general equilibrium models (DSGE). While the course will be self-contained, the material is complementary to the lectures on *Macroeconomic Analysis* by Prof. Trabandt and *Structural Vector Autoregressive Analysis* by Prof. Lütkepohl.

The term DSGE model encompasses a broad class of macroeconomic models that spans the standard neoclassical growth model discussed in King, Plosser, and Rebelo (1988, JME) as well as New Keynesian monetary models with numerous real and nominal frictions along the lines of Christiano, Eichenbaum, and Evans (2005, JPE) and Smets and Wouters (2003, JEEA). A common feature of these models is that decision rules of economic agents are derived from assumptions about preferences, technologies, information, and the prevailing fiscal and monetary policy regime by solving intertemporal optimization problems. As a consequence, the DSGE model paradigm delivers empirical models with a strong degree of theoretical coherence that are attractive as a laboratory for policy experiments. Modern DSGE models are flexible enough to accurately track and forecast macroeconomic time series fairly well. They have become one of the workhorses of monetary policy analysis in central banks.

Unfortunately, the barriers to entry into the DSGE literature are quite high. The solution of DSGE models demands familiarity with numerical approximation techniques and the estimation of the models is nonstandard for a variety of reasons, including a state-space representation that requires the use of sophisticated filtering techniques to evaluate the likelihood function, a likelihood function that depends in a misspecification that renders traditional econometric techniques based on the "axiom of correct specification" inappropriate.

The goal of this course is to lower the barriers to entry into this field by providing an overview of what have become the "standard" methods of solving and estimating DSGE models in the past decade and by surveying the most recent technical developments. The course focuses on methods more than substantive applications. We will work through numerous numerical illustrations and I will provide detailed references to applied research during the lectures.

Readings:

The main readings for this course are a handbook chapter and a book that I have written with several co-authors.

Herbst, Edward and Schorfheide, Frank (2015): *Bayesian Estimation of DSGE Models,* Princeton University Press, Princeton. See [Link]

Fernandez-Villaverde, Jesus, Juan Rubio-Ramirez, and Frank Schorfheide (2016) "Solution and Estimation Methods for DSGE Models," in: H. Uhlig and J. Taylor (eds.): *Handbook of Macroeconomics*, Vol 2., p.527-724, Elsevier, New York. See [Link]

I will subsequently refer to these documents as HS and FVRRS, respectively. Additional references will be provided throughout the lectures. You can find all of my papers as well as replication code on my academic website [Link].

Course Outline and Schedule

The goal of this course is to teach you state-of-the-art computational techniques that are used in the solution and estimation of monetary and fiscal DSGE models. The course will enable you to follow current research in empirical macroeconomics that is based on estimated DSGE models and allow you to conduct your own research in this area.

The course will be offered online through Blackboard and will comprise asynchronous recorded lectures as well as real-time video conferencing sessions. The course will run over a period of four weeks. The schedule for the video conferencing sessions is provided in Table 1.

Here is how the mechanics of this online course will work:

1. On each video conferencing day, starting with May 7, I will post recorded lectures and MATLAB tutorials for the next meeting day. I will also post some short homework exercises that are due on the next meeting day.

2. You, as course participant, are expected to view the recordings prior to the next video conferencing session and solve the home work exercises.

3. During the video conferencing sessions you have the opportunity to ask questions that you would normally ask in the classroom during the lectures or in the computer lab. Note that I will not simply repeat the recorded lectures. You do have to view the recordings prior to the online meetings to be able to engage and follow the discussions. The sessions are scheduled for 90 minutes, but might end earlier if there are no questions about the course material.

Normally, this course would have been offered as a block-course with lectures and computer lab sessions over a two week period. Because online learning can be quite intense, I decided to spread the material over a period of four weeks. To be able to follow the material and succeed in this course, it is very important that you listen continuously to the recorded lectures and computer sessions and solve the homework exercises.

Table 1: Timetable for Real-Time Video Conferencing Sessions

Date/Time	Contents
Thu May 7, 17:00-17:30	Brief introduction, course organization
Mon May 11, 17:00-18:30	Introduction to DSGE Modeling. MATLAB: solving a DSGE model, state-space representation. Readings: HS 1.1, 1.2, 2.1; FVRRS 8.1
Thu May 14, 17:00-18:30	DSGE Model Implications: autocovariances, forecast error variances, impulse response functions. MATLAB: computing empirical analogs. Readings: FVRRS 8.2, 8.3.
Mon May 18, 17:00-18:30	Statistical Inference. MATLAB: computing the likelihood function of a DSGE Model with the Kalman Filter. Readings: HS 2.2, 3.1, 3.2; FVRRS 9, 10, 10.2.
Thu May 21, 17:00-18:30	Frequentist estimation of DSGE models: MLE, simulated minimum distance, IRF Matching, GMM. MATLAB: frequentist estimation of DSGE models. Readings: FVRRS 11.
Mon May 25, 17:00-18:30	Bayesian estimation of DSGE models: Metropolis-Hastings Algorithm. MATLAB: Bayesian estimation techniques in practice. Readings: FVRRS 12.1, 12.2.
Thu May 28, 17:00-18:30	Applications to Monetary Policy Analysis. MATLAB: Applications. Readings: To Be Announced.
Tue June 2, 17:00-18:30	Applications to Fiscal Policy Analysis. Readings: To Be Announced.
Tue June 4, 17:00-18:30	Applications. Readings: To Be Announced.

Additional Logistical Information:

- Information about the final exam will be posted on Blackboard once it becomes available from the Prüfungsamt.
- We will use MATLAB for the quantitative exercises. The university offers a MATLAB license. To register for a personal account (requires FU account), please go to
  https://de.mathworks.com/academia/tah-portal/freie-universitat-berlin-31461246.html
- Information on how to join the video conferencing sessions will be posted on Blackboard.