

Dynamic Macroeconomics

Economics 630

Date: Tues/Thurs 9:50-11:20

Module 3 (Spring 2017)

RAWLS 2077

Purdue University
Krannert School of Management
Department of Economics

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Prerequisites

Economics 608, 611, 612

To complete the Macroeconomics sequence, you are required to take 4 courses: ECON 630, Dynamic Macroeconomics (this course); ECON 632, Search Theory and Applications; ECON 690 MHA, Macroeconomics with Heterogeneous Agents; and ECON 690 H, Computational Economics.

Course description

The course will consider both the theory of macroeconomic models along with the methodology for solving them. The course will focus on numerical methods for solving dynamic stochastic general equilibrium (DSGE) models. The numerical methods will focus on evaluating the steady state and the impulse response functions of these stochastic models, found after log-linearizing the nonlinear system of equilibrium equations. The software Dynare is ideally suited for this task and will be required to complete the problem sets in the course.

The numerical methods are rudimentary compared to the tools introduced in ECON 690 H, Computational Economics. The goal of the log-linearization and Dynare approach is to efficiently solve the models and quantify the effects of shocks on the steady state. In terms of tools, this course will add complementary tools to those acquired in ECON 690 H, Computational Economics.

Three classes of macroeconomic models that closely complement the classes of models to be introduced in this course are:

- (i) search and matching models, taught in ECON 632,
- (ii) incomplete markets models, taught in ECON 690 MHA,
- (iii) heterogeneous firm models, also taught in ECON 690 MHA.

These models can be solved using either the tools in this course or the tools from ECON 690 H, Computational Economics.

Additionally, the course will show how the methods of this course can be applied to solve macroeconomic models using Bayesian estimation. This closely complements the material from ECON 690 BE, Bayesian Econometrics.

Course materials

Required

Miao, Jianjun (2014): *Economic Dynamics in Discrete Time* (MIT Press: Cambridge, MA).

Dynare software.

Stéphane Adjemian, Houtan Bastani, Michel Juillard, Frédéric Karamé, Ferhat Mihoubi, George Perendia, Johannes Pfeifer, Marco Ratto and Sébastien Villemot (2011), “*Dynare: Reference Manual, Version 4*”, *Dynare Working Papers*, 1, CEPREMAP.

Recommended

Galí, Jordi (2015): *Monetary Policy, Inflation, and the Business Cycle: An Introduction to the New Keynesian Framework*, 2nd Edition (Princeton University Press: Princeton, NJ).

Herbst, Edward P. and Frank Schorfheide (2016): *Bayesian Estimation of DSGE Models* (Princeton University Press: Princeton, NJ).

Torres, José L. (2015): *Introduction to Dynamic Macroeconomic General Equilibrium Models*, 2nd Edition (Vernon Press: Wilmington, DE).

Additional material (all available in pdf on Blackboard)

Textbook chapter on New Keynesian Monetary Theory.

Textbook chapter on New Keynesian Labor Market Theory.

Textbook chapter on Asset Pricing.

Dynare User Guide (by Tommaso Mancini Griffoli, 2007-2008).

Course structure (8 weeks)

Jan 10, 12, 17, 19 Difference equations (deterministic and stochastic)
Linear quadratic equations
Log-linearization
Bayesian estimation
References: Chapters 1, 2, 9, 14, 15 of Miao (2014).
Herbst and Schorfheide (2016)

Jan 24 and 26 Applications of the RBC model: Investment and technological change
References: Chapters 5, 6 of Torres (2015)

Jan 31, Feb 2, 7, 9 New Keynesian models
References: Chapter 19 of Miao (2014).
Chapters 1, 2, 3, 6, and 7 of Galí (2015).
Textbook chapter on New Keynesian Monetary Theory.

Textbook chapter on New Keynesian Labor Market Theory.

Feb 14 and 16 Bayesian estimation of a medium scale DSGE model
References: Section 6.2 of Herbst and Schorfheide (2016)

Feb 21 and 23 Asset pricing
References: Sections 13.6-13.8 and 20.4 of Miao (2014).
Textbook chapter on Asset Pricing.

Feb 28, Mar 2 Student presentations

Note: Chapter 17 of Miao (2014) review the incomplete markets model and Chapter 18 of Miao (2014) reviews the search and matching model. This allows students who have not yet taken ECON 630 and ECON 690 MHA to complete a research proposal using these classes of models.

Methodology

The course will be based on a series of lectures. The lectures are comprehensive, but can be supplemented by the reference texts cited above and the reference list below. The lectures are supported by:

1) Homework

I will assign three large homework sets throughout the course:

Homework 1 is due **Thursday, January 26** at the beginning of class and includes:

- First and second order approximations of a neoclassical growth model using Dynare.
- Bayesian estimation of the RBC model using Dynare.

Homework 2 is due **Thursday, February 16** at the beginning of class and includes:

- Solving the RBC model with investment adjustment costs.
- Solving the RBC model with technological change.
- New Keynesian theory exercises.

Homework 3 is due **Thursday, March 2** at the beginning of class and includes:

- Solving the New Keynesian model using Dynare.
- Bayesian estimation of the Smets-Wouters model.

2) Paper presentation

At the beginning of class on **Thursday, January 19**, students will sign up to present a new paper in the literature. Each student will be assigned a date to present the paper. The assigned date will be chosen to match the lecture given on that particular date.

Student presentations will last for 15-20 minutes. Students are welcome to use slides. The presentation should flow seamlessly from the lecture that I deliver on that particular day. This means that all notation and terminology must be consistent with Miao (2014). It is not permissible to simply copy equations or results directly from the article without placing them in the context of the course.

A selected paper must satisfy the following three criteria:

- a. The paper cites one of the papers in the Reference List in the Miao (2014), Galí (2015), or Herbst and Schorfheide (2016) chapters covered in the course.
- b. The paper is approved by me (mostly to avoid duplication, or papers that are too closely related).
- c. The paper is either a working paper as of January 1, 2017, a paper published in 2015 or 2016, or a paper accepted for future publication.

3) *Research proposal*

In the final week of class (February 28 and March 2), students will present their research proposal on a topic related to material covered in the class. The proposal must use one of the models introduced in class and must contain a numerical solution using Dynare.

In addition to the models from class, students are permitted to choose from either the class of incomplete markets models (from ECON 690 MHA) or the class of search and matching models (from ECON 632), provided that Dynare is used for the numerical solution.

Students that are not selecting Macroeconomics as either their primary or secondary field (as defined in the Student Guide) have the option to skip the research proposal, but the course grade would then be capped at B+.

Students taking the course while in their first year of the PhD program are exempt from the research proposal requirement.

Assessment

Homework	60%	(20% for each assignment)
Paper presentation	20%	
Research proposal	20%	