OBJECTIVE OF THE COURSE

This course covers some of the essential computational methods frequently used in macroeconomics. The topics range from solving and estimating representative-agent models, some useful methods in time-series econometrics such as structural VARs to solving heterogenous-agent models. At the end of this course, you will be able to solve and/or estimate most models that are widely used in macroeconomics, or at least you will know where to start!

PREREQUISITES

ECON 601 and ECON 602. Students who have not taken these courses and/or students from other departments must talk to me before taking this course.

GRADING

Problem Sets (60%)

Throughout the course I will assign six problem sets. You will have about one to two weeks to work on each of these. You will work in groups of two that will rotate. These problem sets will require you to write codes in MATLAB and/or work with Eviews. See below for how you can access these.
Problem Set 1: Assigned on 8/31. Due on 9/7 by 5 pm via email.

Problem Set 2: Assigned on 9/19. Due on 10/3 by 5 pm via email.

Problem Set 3: Assigned on 10/3. Due on 10/21 by 5 pm via email.

Problem Set 4: Assigned on 10/26. Due on 11/2 by 5 pm via email.

Problem Set 5: Assigned on 11/9. Due on 11/23 by 5 pm via email.

Problem Set 6: Assigned on 11/30. Due on 12/14 by 5 pm via email.

**Final Project (40%)**

You will complete a final project, which will be substantially longer than a problem set and will involve replicating the results of a paper. There will be two explicit deadlines, one for producing intermediate results and a final deadline which is the day before classes start in the Spring.

**Attendance in Fall Department Seminars**

You are required to attend the student brown bag (ECON 709) on Tuesdays at 12:30 and the Macro/International Finance Seminar on Wednesdays at 3:30. I will take attendance and consistent non-attendance will gave consequences on your grade in ECON 630.

**TEXTBOOKS AND OTHER READING MATERIAL**

Most of the course will be based on articles which are listed on the course outline and these will be available electronically on the course webpage.

The following books may be useful in certain parts of the course.


**Handbook of Computation Economics (Vol.3)**, edited by Schmedders and Judd, North-Holland, 2014

SOFTWARE

There are two key software that you will need access to for this class, MATLAB and Eviews. You can get MATLAB for your personal computer. See

https://terpware.umd.edu/Linux/title/1849

For Eviews, you can use the computers in the computer lab, or, you can obtain your own license for $110. This is only available for Windows machines. It is available through this link (select Academic Enterprise Edition, Stand-alone): (be sure to use your UMD email address)


Please see the University's website for graduate course-related policies at:
https://gradschool.umd.edu/course-related-policies

READING LIST

Papers with (*) are required readings. Paper with (x) are important papers that apply the methods discussed. They are also required. The others are optional. All papers are available on the course website and more material may be posted there as we make progress. Don’t print all these papers immediately. As we progress, it will become clear which ones you will study in greater detail.

Lecture 1 – Tools and Software Engineering for Economists


Lecture 2 – Basic Numerical Methods
Chapters 1, 2, 5, and 7.7 in Judd (1998). [If you need a reference]

Chapter 3 in Adda and Cooper (2003). [If you need a reference]

Tauchen, George (1986), “Finite State Markov-Chain Approximations to Univariate and Vector Autoregressions”, *Economic Letters*, 20, 177-181

**Lecture 3 – Value Function Iteration**


**Lecture 4 – Local Approximation Methods and Dynare**

Dynare User Guide by Tommaso Mancini Griffoli.


**Lecture 5 – Global Approximation Methods**


**Lecture 6 – Comparison of Methods**


**Lecture 7 – Solving Models with Occasionally Binding Constraints**


(*) Aruoba, S. Boragan, Pablo Cuba-Borda, Kenji Higa-Flores, Frank Schorfheide and Sergio Villalvazo (2020), “Piecewise-Linear Approximations and Filtering for DSGE Models with Occasionally-Binding Constraints”, *mimeo*


**Lecture 11 - Identifying Effects of Shocks**


(*) Uhlig, Harald (2005), “What are the effects of monetary policy on output? Results from an agnostic identification procedure,” *Journal of Monetary Economics*, 52, 381-419


**Lecture 12 – State Space Methods and the Kalman Filter**


Durbin, J. and S.J. Koopman (2012), Time Series Analysis by State Space Methods


**Lecture 13 – Estimation of DSGE Models (Linear)**


Lecture 14 – An Introduction to the Particle Filter and Estimation of DSGE Models (Nonlinear)


Lecture 15 – Solving Heterogenous-Agent Models without Aggregate Uncertainty


Lecture 16 – Solving Firm-Dynamics Models without Aggregate Uncertainty


Lecture 17 – Solving Heterogenous-Agent Models with Aggregate Uncertainty


Lecture 18 – Solving Heterogenous-Agent Models with Aggregate Uncertainty Redux (With An Application to Heterogenous-Agent New Keynesian Models)


# COURSE OUTLINE

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<td>Tools and Software Engineering for Economists</td>
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<td>2</td>
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<td>Basic Numerical Methods</td>
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<td>Sep 7-12-14-19</td>
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<td>8</td>
<td>Oct 24</td>
<td>Crash Courses in Classical (Frequentist) and Bayesian Econometrics</td>
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<td>9</td>
<td>Oct 26</td>
<td>Introduction to Eviews</td>
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<td>10</td>
<td>Oct 31</td>
<td>Vector Autoregressions (VARs) and Bayesian VARs</td>
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<td>11</td>
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<td>Identifying Effects of Shocks</td>
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<td>State Space Methods and the Kalman Filter</td>
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