ECON 6120
A Primer on Bayesian DSGE Models
SUMMER 2023 SYLLABUS

<u>CLASS INFORMATION</u>

Course: ECON 6120.01

Time: asynchronous online

Zoom ID: 366 140 2531

Discord: discord.gg/SsrNPEeP2P

<u>INSTRUCTOR CONTACT</u>

Instructor: Fei Tan

Department of Economics

E-mail: tanf@slu.edu

Homepage: econdojo.github.io

GENERAL INFORMATION

<u>COURSE DESCRIPTION</u>

This course covers a range of Bayesian techniques for estimating dynamic stochastic general equilibrium (DSGE) models. Using a prototypical new Keynesian DSGE model, we study how to solve a linear rational expectations model and compute impulse responses to structural disturbances. To link the model to data, we cast the model solution into the state space representation whose likelihood function can be evaluated with the Kalman filter. This likelihood function is then combined with a prior to construct the parameters' posterior distribution and evaluate the model's empirical performance. Finally, we survey several advanced topics on DSGE applications. The key learning objective is for students to develop *hands-on* technical and judgmental skills required to conduct macroeconometric research useful for economic and financial decision making.

<u>PREREQUISITES</u>

Although the lectures will be self-contained, student are assumed to have completed advanced level undergraduate courses in macroeconomics and econometrics. Students are also expected to be familiar with basic operations in MATLAB, a powerful program for numerical computation and visualization. No prior knowledge of DSGE modeling or Bayesian econometrics is required.

<u>TEXTBOOKS</u>

- **Required:** *Bayesian Estimation of DSGE Models*, by Edward Herbst and Frank Schorfheide.

- **Optional:** *Structural Macroeconometrics*, 2nd Edition, by David DeJong and Chetan Dave.

- **Online resources:** econdojo.github.io/courses/e6120 (instructor's home page).

OFFICE HOURS

Available by appointment. My general policy is that e-mail or Discord messages will be answered within 12 hours, or we can set up a Zoom or Discord virtual meeting, usually within a day. You also have the option of posting questions in the "Help!" discussion forum, which you can access by clicking on the Discussions link from Canvas' navigation menu.

DISTANCE EDUCATION ETIQUETTE

Your actions in distance education contexts are just as important as in on-ground, face-to-face educational contexts – and sometimes require additional attention and commitment, as some distance education technologies might be less familiar to us. Accordingly, all students are expected to follow the guidelines below:

1. When using the "Discussion Board" or similar features of Canvas, remember that your course-related communications to the instructor or other students should be considered "professional" (they are not like texts to your friends). Remember that course context and all related written work—including discussion board transcripts—can be recorded and retrieved.

2. Be cautious when using humor or sarcasm; without the context of facial expressions or other body language, your tone or intent could be missed or misunderstood by others.

3. Respect and be attentive to the diversity of your classmates and instructor. Before communicating, consider your message in the context of the class' diversity in race, ethnicity, religion, disabilities, gender, sexual orientation, age, social class, marital status, geography, etc. Consider the diversity you can see or know as well as that you cannot.

4. Respect others' time and life circumstances, which often don't allow for an immediate response to a question or comment.

GRADING POLICY

PROBLEM SETS

There will be three biweekly problem sets. Late submission is not graded and will be nullified. Each problem set is worth 30 points of the course grade. To prepare a submission, please type up your work in LaTeXand upload all source files (including MATLAB programs) onto Canvas.

- LaTeXtypesetting: www.overleaf.com

- SLU software: www.slu.edu/its/downloads-and-discounts

<u>DISCUSSION</u>

There will be three biweekly discussions on Canvas. Late participation is not graded and will be nullified. Each discussion is graded based on both your initial posting and response to other classmates. Discussions are worth 10 points of the course grade.

<u>GRADING RUBRIC</u>

The following criteria will be applied to evaluate your ability to articulate economic reasoning in weekly discussions. A successful response consists of:

1. Position statement: provide clearly defined position statement/central hypothesis.

2. Content development: clearly present relevant theoretical/empirical rationale for the work.

3. Sources/evidence: skillfully use theoretical/empirical methods to support position statement/central hypothesis.

4. Grammar, punctuation and spelling: work needs little/no editing.

Additionally, the following criteria will be used to evaluate your ability to conduct quantitative reasoning in weekly quizzes. A successful response consists of:

1. Interpretation: provide accurate explanations of information presented in mathematical or statistical forms. Make appropriate inferences based on that information.

2. Representation: skillfully convert relevant information into an insightful mathematical or statistical portrayal in a way that contributes to a further or deeper understanding.

3. Calculation: calculations attempted are essentially all successful and sufficiently comprehensive to solve the problem.

4. Inference: use the quantitative analysis of data available as the basis for deep and thoughtful judgments, drawing insightful, carefully qualified conclusions from this work.

5. Assumptions: explicitly describe assumptions and provide compelling rationale for why each assumption is appropriate. Show awareness that confidence in final conclusions is limited by the appropriateness of the assumptions made.

<u>GRADING SCALE</u>

All grades will be available on Canvas within two days of submission. There is no curve used for the final grade other than the scale below. However, the instructor reserves the right to adjust the grading scale based on overall class performance at the end of the semester. The final grade for the course is based on the percentage of the **adjusted** total points earned. **Please periodically**

check your grade on Canvas throughout the semester for accuracy.

	Max Points	Grade	Points
Problem Set	90	A	100–91
Discussion	<u>10</u>	A-	90–86
Total	100	B+	85–81
		B	80–76
		B-	75–71
		C+	70–66
		C	65–61
		C-	60–56
		D	55–51
		F	50 or less

IMPORTANT MISCELLANEOUS

Please read the following information thoroughly and carefully. I would assume that you have fully understood these rules. Some modification of policies may become necessary during the semester. The instructor will make explicit announcements pertaining to any such changes.

1. In recognition that people learn in a variety of ways and that learning is influenced by multiple factors (e.g., prior experience, study skills, learning disability), resources to support student success are available on campus. The Student Success Center, a one-stop shop, which assists students with academic and career related services, is located in the Busch Student Center (Suite 331) and the School of Nursing (Suite 114). Students who think they might benefit from these resources can find out more about: [i.] course-level support (e.g. faculty member, departmental resources, etc.) by asking your course instructor; and [ii.] university-level support (e.g., tutoring services, university writing services, disability services, academic coaching, career services, and/or facets of curriculum planning) by visiting the Student Success Center or by going to www.slu.edu/student-success-center.

2. The University's Interim Policy on Face Masks governs all students, faculty, staff, and campus visitors in all University-owned, leased, or operated facilities. All persons physically present in any such University facility associated with this course shall comply fully with this policy at all times. Masks must be worn before entry to all such University facilities

(as well as outdoors on all University property when six feet of distance is unpredictable or cannot be maintained).

Saint Louis University is committed to maintaining an inclusive and accessible environment. Individuals who are unable to wear a face mask due to medical reasons should contact the Office of Disability Services or Human Resources to initiate the accommodation process identified in the University's ADA Policy. Inquires or concerns may also be directed to the Office of Institutional Equity and Diversity. Notification to instructors of SLU-approved ADA accommodations should be made in writing prior to the first class session in any term (or as soon thereafter as possible).

As the instructor of this course, I shall comply fully with SLU's policy and all related ADA regulations.

Students who attempt to enter a classroom without wearing masks will be asked by the instructor to wear masks prior to entry. Students who remove their masks at any time during a class session will be asked by the instructor to resume wearing their masks.

Note: Accordingly, no consumption of any food will be allowed in class.

Students who do not comply with a request by a SLU instructor to wear a mask in accordance with the University's Interim Policy on Face Masks may be subject to disciplinary actions per the rules, regulations, and policies of Saint Louis University, including but not limited to the Student Handbook. Non-compliance with this policy may result in disciplinary action, up to and including any of the following:

(a) dismissal from the course(s)

(b) removal from campus housing (if applicable)

(c) dismissal from the University

To immediately protect the health and well-being of all students, instructors, and staff, instructors reserve the right to cancel or terminate any class session at which any student fails to comply with faculty or staff request to wear a mask in accordance with University policy.

Students are strongly encouraged to identify to their instructor any student or instructor not in compliance. Non-compliance may be anonymously reported via the SLU Integrity Hotline at 1-877-525-5669 (or confidentially via the Integrity Hotline's website at www.lighthouse-services.com/slu.

3. Students with a documented disability who wish to request academic accommodations must formally register their disability with the University. Once successfully registered, students also must notify their course instructor that they wish to use their approved accommodations in the course. Please contact the Center for Accessibility and Disability Resources

(CADR) to schedule an appointment to discuss accommodation requests and eligibility requirements. Most students on the St. Louis campus will contact CADR, located in the Student Success Center and available by email at accessibility_disability@slu.edu or by phone at 314.977.3484. Once approved, information about a student's eligibility for academic accommodations will be shared with course instructors by email from CADR and within the instructor's official course roster. Students who do not have a documented disability but who think they may have one also are encouraged to contact to CADR. Confidentiality will be observed in all inquiries.

4. Academic integrity is honest, truthful and responsible conduct in all academic endeavors. The mission of Saint Louis University is "the pursuit of truth for the greater glory of God and for the service of humanity." Accordingly, all acts of falsehood demean and compromise the corporate endeavors of teaching, research, health care, and community service via which SLU embodies its mission. The University strives to prepare students for lives of personal and professional integrity, and therefore regards all breaches of academic integrity as matters of serious concern. The governing University-level Academic Integrity Policy was adopted in Spring 2015, and can be accessed on the Provost's Office website: www.slu.edu/Documents/provost/academic_affairs/University-wide%20Academic%20 Integrity%20Policy%20FINAL%20%206-26-15.pdf.

Additionally, each SLU College, School, and Center has adopted its own academic integrity policies, available on their respective websites. It is the policy of Chaifetz School of Business that the "Giving and receiving of unauthorized assistance on any graded exercise constitutes academic dishonesty and may result in grade reductions and/or probation, suspension, or dismissal." You can find information about the academic misconduct policy on the following webpage: business.slu.edu/programs-of-study/undergraduate-business-programs/resources/academic-misconduct.

All SLU students are expected to know and abide by these policies, which detail definitions of violations, processes for reporting violations, sanctions, and appeals. Please direct questions about any facet of academic integrity to your faculty, the chair of the department of your academic program, or the Dean/Director of the College, School or Center in which your program is housed.

5. Saint Louis University and its faculty are committed to supporting our students and seeking an environment that is free of bias, discrimination, and harassment. If you have encountered any form of sexual misconduct (e.g. sexual assault, sexual harassment, stalking, domestic or dating violence), we encourage you to report this to the University. If you speak with a faculty member about an incident of misconduct, that faculty member must notify SLU's

Title IX coordinator, Anna R. Kratky (DuBourg Hall, room 36; akratky@slu.edu; 314-977-3886) and share the basic fact of your experience with her. The Title IX coordinator will then be available to assist you in understanding all of your options and in connecting you with all possible resources on and off campus.

If you wish to speak with a confidential source, you may contact the counselors at the University Counseling Center at 314-977-TALK. To view SLU's sexual misconduct policy and for resources, please visit the following web address: www.slu.edu/general-counsel-home/office-of-institutional-equity-and-diversity/sexual-misconduct-policy.

6. **Valid Excuses:** many possible events may occur that would result in your inability to attend class, exams, or perform at a minimally acceptable level during an examination. The followings can be legitimate reasons to miss class or to be excused from a scheduled examination.

   (a) Illness or injury: a note from a physician, physician's assistant, or a nurse-practitioner that says, among other things, "...unable to attend..." is required. If the note leaves any ambiguity on this point you will not be excused. Further, the note must be provided to the instructor within three days of the missed course event.

   (b) Family emergencies: you must provide verifiable documentation of the emergency. Given the vast array of family emergencies the instructor will provide precise guidance as to what constitutes adequate documentation. With the exception of illness or *critical* emergencies, any absence must be excused in advance of the missed course event. In cases of critical emergencies, you must notify the instructor within three days of your absence.

   (c) University-approved curricular and extra-curricular activities: verifiable documentation is required. The student should obtain from the unit or department sponsoring the activity a letter (or class absence form) indicating the anticipated absence(s). The letter must be presented to the instructor at least one week prior to the first absence.

   (d) Religious holidays: the student should notify the instructor by the second week of the course of any potential conflicts.

TENTATIVE COURSE OUTLINE

Below is a tentative outline; the instructor reserves the right to change it whenever needed. My goal is to proceed at an optimal pace: slow enough that important concepts are thoroughly learned, yet fast enough that the course does not drag. It is a delicate balance.

Part I	**Solving Linear Rational Expectations Models**
	1. DSGE Modeling
	2. Sims' (2001) Method
	3. Impulse Response Functions
	4. MATLAB Session
Part II	**Likelihood Evaluation of Linear DSGE Models**
	1. Linear State Space Models
	2. Kalman Filter and Derivation
	3. MATLAB Session
Part III	**Bayesian Inference for DSGE Models**
	1. Markov Chain Monte Carlo Methods
	2. DSGE Application
	3. MATLAB Session
Part IV	**DSGE-SVt MATLAB Toolkit**
	1. DSGE Models with Student-t Shocks
	2. DSGE Models with Stochastic Volatility
	3. DSGE-VAR