

ECON 6XX0
Applied Bayesian Statistics
SPRING 2023 SYLLABUS

CLASS INFORMATION

Time: Monday 6:00pm–9:15pm

Location: Davis-Shaughnessy Hall XXX

Off. Hrs: TR 1:00pm–2:00pm & by appt.

INSTRUCTOR CONTACT

Instructor: Fei Tan

Office: Davis-Shaughnessy Hall 467

E-mail: tanf@slu.edu

GENERAL INFORMATION

COURSE DESCRIPTION

This course provides a detailed coverage of Bayesian inferential methods and their applications to a variety of problems drawn from economics and business. Starting with basic concepts of probability and inference, the treatment covers prior and posterior distributions, classical and MCMC simulation methods, regressions for univariate and multivariate outcomes, computation of the marginal likelihood and model choice, and estimation of dynamic stochastic general equilibrium (DSGE) models. The key learning objective is for students to develop *hands-on* Bayesian skills required to conduct data analysis useful for economic and financial decision making. The course will help prepare students entering doctoral education or starting careers in economics, finance, marketing, operations, accounting, political science, statistics, and biostatistics.

PREREQUISITES

Although the lectures will be self-contained, student are assumed to have completed ECON 4770 (Advanced Econometrics) or an equivalent undergraduate course in statistics and econometrics. Students are also expected to be familiar with basic operations in Python, an interpreted high-level general-purpose programming language.

TEXTBOOKS

- **Required:** *Introduction to Bayesian Econometrics*, 2nd Edition, by Edward Greenberg.
- **Optional:** *The Bayesian Choice*, 2nd Edition, by Christian P. Robert.
- **Online resources:** econdojo.github.io/courses (instructor's home page).

GRADING POLICY

PROBLEM SETS

There will be three required problem sets. Late submission is not graded and will be nullified. Each problem set is worth 20 points of the course grade.

RESEARCH PROJECT

The project consists of a 10–15 pages term paper that makes judicious use of the statistical tools covered in this course to study an empirical topic of your interest. The project accounts for 40 points of the course grade.

ATTENDANCE REWARD

Attendance is mandatory. Five **unannounced** attendance will be taken throughout the semester and your properly documented attendance will be rewarded with a maximum of 10 extra-credit points.

GRADING SCALE

There is no grading curve used 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.

	Max Points	Grade	Points
Problem Set 1	20	A	100–91
Problem Set 2	20	A-	90–86
Problem Set 3	20	B+	85–81
Research Project	<u>40</u>	B	80–76
Total	100	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. If you are also enrolled in any other courses that have a time conflict, please drop all but one of these conflicting courses now unless you can resolve the conflict with your instructor(s) in the other course(s). You can find information about the academic calendar on the following webpage: www.slu.edu/registrar/calendars.
2. 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 assists students with academic-related services and is located in the Busch Student Center (Suite, 331). 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, and academic coaching) by visiting the Student Success Center or by going to www.slu.edu/life-at-slu/student-success-center.
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 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 through which SLU fulfills 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 full University-level Academic Integrity Policy can be found on the Provost's Office website at: www.slu.edu/provost/policies/academic-and-course/policy_academic-integrity_6-26-2015.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: www.slu.edu/business/current-students/undergraduate-academic-resources.php.

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 harassment, including sexual assault, stalking, domestic or dating violence, we encourage you to report this to the University. If you speak with a faculty member about an incident that involves a Title IX matter, **that faculty member must notify SLU's Title IX Coordinator and share the basic facts of your experience.** This is true even if you ask the faculty member not to disclose the incident. 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.

Anna Kratky is the Title IX Coordinator at Saint Louis University (DuBourg Hall, room 36; anna.kratky@slu.edu; 314-977-3886). If you wish to speak with a confidential source, you may contact the counselors at the University Counseling Center at 314-977-TALK or make an anonymous report through SLU's Integrity Hotline by calling 1-877-525-5669 or online at www.lighthouse-services.com/slu. To view SLU's policies, and for resources, please visit the following web addresses: www.slu.edu/about/safety/sexual-assault-resources/index.php and www.slu.edu/general-counsel.

Note: SLU's Title IX Policy (formerly called the Sexual Misconduct Policy) has been significantly revised to adhere to a new federal law governing Title IX that was released on May 6, 2020. Please take a moment to review the new policy and information at the following web address: www.slu.edu/about/safety/sexual-assault-resources/index.php. Please contact the Anna Kratky, the Title IX Coordinator, with any questions or concerns.

6. Throughout the COVID-19 pandemic, key safeguards like face masks have allowed SLU to safely maintain in-person learning. If public health conditions and local, state, and federal restrictions demand it, the University may require that all members of our campus community wear face masks indoors. **Therefore, any time a University-level face mask requirement is in effect, face masks will be required in this class.** This expectation will apply to all students and instructors, unless a medical condition warrants an exemption from the face mask requirement (see below). When a University-wide face mask requirement is in effect, the following will apply:

(a) Students who attempt to enter a classroom without wearing masks will be asked by the instructor to put on their masks prior to entry. Students who remove their masks during a class session will be asked by the instructor to resume wearing their masks.

(b) Students and instructors may remove their masks briefly to take a sip of water but should replace masks immediately. The consumption of food will not be permitted.

(c) Students who do not comply with the expectation that they wear a mask in accordance with the University-wide face mask requirement may be subject to disciplinary actions per the rules, regulations, and policies of Saint Louis University, including but not limited to those outlined in the Student Handbook. Non-compliance with this policy may result in disciplinary action, up to and including any of the following: dismissal from the course(s), removal from campus housing (if applicable), dismissal from the University.

(d) 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 a University-wide face mask requirement.

When a University-wide face mask requirement is not in effect, students and instructors may choose to wear a face mask or not, as they prefer for their own individual comfort level.

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 (students) or Human Resources (instructors) to initiate the accommodation process identified in the University's [ADA Policy](#). Inquiries 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).

7. The health and well-being of SLU's students, staff, and faculty are critical concerns, as is the quality of our learning environments. Accordingly, the following University policy statements on in-person class attendance are designed to preserve and advance the collective health and well-being of our institutional constituencies and to create the conditions in

which all students have the opportunity to learn and successfully complete their courses.

(a) Students who exhibit any [potential COVID-19 symptoms](#) (those that cannot be attributed to some other medical condition the students are known to have, such as allergies, asthma, etc.) shall absent themselves from any in-person class attendance or in-person participation in any class-related activity until they have been evaluated by a qualified medical official. Students should contact the [University Student Health Center](#) for immediate assistance.

(b) Students (whether exhibiting any of potential COVID-19 symptoms or not, and regardless of how they feel) who are under either an isolation or quarantine directive issued by a qualified health official must absent themselves from all in-person course activities per the stipulations of the isolation or quarantine directive.

(c) Students are responsible for notifying their instructor of an absence as far in advance as possible; when advance notification is not possible, students are responsible for notifying each instructor as soon after the absence as possible. Consistent with the [University Attendance Policy](#), students also are responsible for all material covered in class and must work with the instructor to complete any required work. In situations where students must be absent for an extended period of time due to COVID-19 isolation or quarantine, they also must work with the instructor to determine the best way to maintain progress in the course as they are able based on their health situation.

(d) Consistent with the [University Attendance Policy](#), students may be asked to provide medical documentation when a medical condition impacts a student's ability to attend and/or participate in class for an extended period of time.

(e) As a temporary amendment to the current [University Attendance Policy](#), all absences due to illness or an isolation/quarantine directive issued by a qualified health official, or due to an adverse reaction to a COVID-19 vaccine, shall be considered "Authorized" absences.

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	Introduction
Week 01	Syllabus & Lecture 1: “Basic Concepts of Probability and Inference”
Week 02	Lecture 2: “Posterior Distributions and Inference”
Week 03	Lecture 3: “Prior Distributions”
XXX	Problem set 1 due

Part II	Simulation
Week 04	Lecture 4: “Classical Simulation”
Week 05	Lecture 5: “Basics of Markov Chains”
Week 06	Lecture 6: “Simulation by MCMC Methods”
XXX	Problem set 2 due

Part III	Applications
Week 07	Lecture 7: “Linear Regression and Extensions”
Week 08	Lecture 8: “Semiparametric Regression”
Week 09	Lecture 9: “Multivariate Responses”
Week 10	Lecture 10: “Time Series”
Week 11	Lecture 11: “Endogenous Covariates and Sample Selection”
Week 12	Lecture 12: “Bayesian DSGE Models”
XXX	Problem set 3 due
XXX	Research project due
