

**BUS-G350 Business Econometrics**

**Spring 2019**

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Office Hours: Wednesdays, 1pm-2pm, HH 3080N

Course Description:

Data is an increasingly common part of both everyday life and business analysis. In 2016, an election year, we heard again and again about the latest polls and what they meant. CEOs confront reams of data about the shopping and browsing habits of their employees and must guess the likely demand they will face months in the future. Separate from these *prediction* questions are *causal* questions. Managers setting prices for a product need to ask: if I change the price of this product, how will sales change? Individuals making critical life decisions must think in causal terms: if I go to graduate school, how will my career earnings change? Such questions also pervade public policy: how would national health insurance affect health care spending? Can credit card regulation reduce late fees and penalties for credit card uses?

*Econometrics* will give you a set of tools for answering these questions. You will learn how to use data for prediction—how to specify prediction methods and measure their accuracy—as well as how to use data to estimate causal effects. Along the way, you will hear again, and again that correlation is not causation. But you will also learn that measuring correlations can be valuable, too.

At the end of this course, students should be able to:

* Estimate, interpret and justify commonly-used econometrics models for cross-sectional, time series, and panel data.
* Extract information from datasets that businesses and/or government organizations will value, and properly address challenges to your econometric analyses if and when they arise.
* Identify strengths and weaknesses in others’ econometric analyses, as well as critique, and justify econometrics models.

These learning outcomes support Kelley undergrad learning goals 3 and 5. The appendix contains a complete list of these goals.

**Textbook:**

*Required:*

Angrist, Joshua D., and Jörn-Steffen Pischke. *Mastering ‘Metrics.* Princeton University Press 2015*.*

*Optional:*

Jeffrey M. Wooldridge, *Introductory Econometrics: A Modern Approach*, Sixth Edition, Cengage Learning 2016.

**Electronic Devices***:* You will be expected to bring your laptop to each class. We will use laptops for in-class exercises, and we will often practice programming in STATA (discussed below). Please be respectful of your classmates and only use your laptop or other electronics for academic purposes in class. Use of electronics for non-academic use will lead to a reduction in your participation grade.

**Evaluation:** There will be two exams. The midterm and the final will each be worth 30% of your final grade. Participation will count for 10%. Homework will count for 30%.

I will use the table below to determine letter grades.

|  |  |
| --- | --- |
| % of Points (%) | Grade |
| 94-100  90-93.9  87-89.9  83-68.9  80-82.9  77-79.9  73-76.9  70-72.9  67-69.9  63-66.9  60-63.9  Below 60 | A  A-  B+  B  B-  C+  C  C-  D+  D  D-  F |
|  |  |

**Grading Policy**: Students wishing a re-grade on an exam or homework should present their concern in person during office hours or after class. *The* statute of limitations on re-grade requests (not the actual meeting for the re-grade) is one week from the time the graded document was made available. Any granted re-grade request will result in a re-grade of the entire document**. Therefore, a regrade could result in a lower overall grade for the assignment.**

If you miss the Midterm, I will rescale your final exam so that it is worth 60% of your grade. If you miss the final for any reason, you must file a written explanation of absence with the Dean of Students Office (Franklin Hall 206).  The Dean of Students Committee on Absence will review these written explanations, and I will use their recommendation to determine an appropriate response.

**Attendance and Participation**: Attendance for each class is expected, and you will be graded based on participation. In nearly every class, you will discuss a question or work on problems, alone or in a group. After you have had time to work with a group, I will pick a name at random to answer the question or give the solution. You will get full credit if you are present and have a reasonably well-explained answer. If you come to class every day, participate with your classmates, and answer questions when called upon, you will get full credit for participation. If you are not present, you will get zero points for that occasion. If you expect to be absent, notify me ahead of time and I will excuse you. You may miss three classes without it affecting your participation grade.

If you need to miss class for an emergency, you will not lose credits for non-participation. If you need to miss class for religious reasons, please notify me within two weeks of the start of the semester. I also reserve the right to lower your participation grade for any inappropriate classroom including using electronic devices for non-academic uses.

**Problem Sets:** The most important skill learned in this course is problem-solving. There is no substitute for struggling through problems on your own or in a small group. Problem sets will be assigned on Monday and due the following Sunday at 11:59 pm. Submit all problem sets through Canvas. I will take off 25% for late problem sets turned if they are turned in before I post solutions. No credit will be given after solutions are posted. I will generally post solutions on Mondays. I encourage you to work on the problem set in a team. However, you must write up and turn in your own solution. If you work with a group, please write the names of any other students that you collaborated with at the top of the assignment. I will drop your lowest problem score when calculating your homework grade.

**Exams:** Exams will be closed book and in class. All the following details are tentative:

* Midterm: Wednesday, February 20. Roughly, covers the material on problem sets 1-5
* Final exam: Monday, April 29th. The exam time is 2:45 PM. The final will have an emphasis on second half of course.

**Course Materials:** I will be using Canvas to post materials for this class. Check it regularly. All announcements, class notes, assignments, and answers will be there.

**Software:** We will be using Stata to conduct data analysis. You may access Stata through IUanyware. The Canvas page will have detailed instructions, and we will go over this in class. You may find IUanyware somewhat slow or cumbersome. It is also possible to use Stata in the computer labs, or you can also purchase a student version of Stata. If you do, I recommend that you buy “Stata/IC” and not the cheapest option, Small Stata, which is unsuitable for some of the problem sets. The statistical software is an essential part of the learning econometrics. Learning it will also be valuable in other classes, and in many jobs post-graduation.

**Special Circumstances:** Every attempt will be made to accommodate qualified students with disabilities (e.g. mental health, learning, chronic health, physical, hearing, vision neurological, etc.) You must have established your eligibility for support services through the appropriate office that services students with disabilities. Note that services are confidential, may take time to put into place and are not retroactive; Captions and alternate media for print materials may take three or more weeks to get produced.  Please contact Disability Services for Students at http://disabilityservices.indiana.edu or 812-855-7578 as soon as possible if accommodations are needed.

Request for accommodation mustbe made two weeks in advance of need and mustbe authorized and acknowledged by me. Students who require accommodations for religiousbelief, scheduling conflict, or other causes must make a written request.

**Proctoring Announcement:** Portions of this course may be subject to electronic proctoring. Video camera may be used to monitor the room during student assessment activities, including but not limited to, exams, test, and quizzes. Video recordings maybe used to investigate or support disciplinary action. All access to and use of video equipment and recordings will follow applicable IU policies.

**Plagiarism and Academic Dishonesty:** Dishonesty of any kind with respect to examinations, course assignments, alteration of records, or illegal possession of examinations shall be considered cheating. It is the responsibility of the student not only to abstain from cheating but, in addition, to avoid the appearance of cheating and to guard against making it possible for others to cheat. Any student who helps another student to cheat is as guilty of cheating as the student he or she assists.

Any ideas or materials taken from another source for either written or oral use must be fully acknowledged. Offering the work of someone else as one’s own is plagiarism. If a student is caught cheating or plagiarising, that student will receive a score of zero for that assignment or the exam. In addition, any cheating or plagiarism will be reported to university officials.

**Sexual Misconduct and Title IX:** As your instructor, one of my responsibilities is to create a positive learning environment for all students. Title IX and IU’s Sexual Misconduct Policy prohibit sexual misconduct in any form, including sexual harassment, sexual assault, stalking, and dating and domestic violence.  If you have experienced sexual misconduct, or know someone who has, the University can help.

If you are seeking help and would like to speak to someone confidentially, you can make an appointment with:

The Sexual Assault Crisis Services (SACS) at (812) 855-8900 (counseling services)

Confidential Victim Advocates (CVA) at (812) 856-2469 (advocacy and advice services)

IU Health Center at (812) 855-4011 (health and medical services)

It is also important that you know that Title IX and University policy require me to share any information brought to my attention about potential sexual misconduct, with the campus Deputy Title IX Coordinator or IU’s Title IX Coordinator.  In that event, those individuals will work to ensure that appropriate measures are taken and resources are made available. Protecting student privacy is of utmost concern, and information will only be shared with those that need to know to ensure the University can respond and assist.

I encourage you to visit **stopsexualviolence.iu.edu** to learn more.

**Detailed course outline**

1. Review of probability and statistics
   1. Mean and variance
   2. Covariance and correlation
   3. Variability of the sample mean
   4. Hypothesis tests, confidence intervals, p-values
   5. Properties of the conditional expectations
2. Selection bias and experimental analysis
   1. Definition of causality
   2. Selection bias vs. treatment effects
   3. Randomization as a solution to selection bias
3. Ordinary least squares regression
   1. Simple regression model: assumptions and interpretation
   2. Residuals, predicted values, and goodness of fit
   3. Standard errors and inference for the simple regression model
   4. Multiple regression: assumptions and interpretation
   5. Standard errors and inference for the multiple regression model
   6. Omitted variable bias
   7. Categorical variables and dummy variables
   8. Linear transformation of regressors
   9. Transformations of independent or dependent variables
   10. The linear probability model
4. Probit and logit
5. Instrumental variables
   1. Definitions and general properties
   2. Wald Estimator
   3. Two-stage least squares
   4. IV inference
6. Time series analysis
   1. Estimating trends and seasonality
   2. Autocorrelation
   3. Pre/post comparisons and their problems
7. Panel data
   1. Difference in differences estimation in short panels
   2. Fixed effects estimation

**Tentative Course Schedule\***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Lecture # | Date | Topic | Problem set | Reading |
| 1 | 1/7 | Introduction; probability review | 1 | Ch 1A |
| 2 | 1/9 | Probability and statistics review |  |  |
| 3 | 1/14 | Causal questions, potential outcomes | 2 | Ch 1 |
| 4 | 1/16 | Selection bias and the analysis of experiments |  |  |
|  | 1/21 | No Class - MLK |  |  |
| 5 | 1/23 | Introduction to Ordinary Least Squares (OLS) | 3 | Ch. 2 |
| 6 | 1/28 | OLS Inference |  |  |
| 7 | 1/30 | Intro to Stata |  |  |
| 7 | 2/4 | Intro to Stata |  |  |
| 8 | 2/6 | Multiple Regression | 4 |  |
| 9 | 2/11 | Multiple regression inference |  |  |
| 10 | 2/13 | Omitted variable bias (OVB) | 5 | Ch. 2A |
| 11 | 2/18 | Dummy Variables + Review |  |  |
|  | 2/20 | Exam 1 |  |  |
| 12 | 2/25 | Interactions | 6 |  |
| 13 | 2/27 | Nonlinearities |  |  |
| 14 | 3/4 | Linear probability models | 7 |  |
| 15 | 3/6 | Probit model |  |  |
|  | 3/11 | No Class – Spring Break |  |  |
|  | 3/13 | No Class – Spring Break |  |  |
| 16 | 3/18 | Instrumental variables | 8 | Ch. 3 |
| 17 | 3/20 | Two-stage least squares |  |  |
| 18 | 3/25 | Two-stage least squares part 2 | 9 |  |
| 19 | 3/27 | Two-stage least squares part 3 |  |  |
| 20 | 4/1 | Time series | 10 |  |
| 21 | 4/3 | Time series part 2 |  |  |
| 22 | 4/8 | Difference-in-differences |  | Ch. 5 |
| 23 | 4/10 | Difference-in-differences part 2 |  |  |
| 24 | 4/15 | Panel data and fixed effects | 11 |  |
| 25 | 4/17 | Panel data and fixed effects part 2 |  |  |
| 26 | 4/22 | TBD |  |  |
| 27 | 4/24 | wrap up + review |  |  |

\* Exact dates subject to change. Problem sets will be posted on Mondays and due at 11:59 pm the following Sunday. Readings refer to the chapter (or appendix) in the textbook.

**Appendix: Undergraduate Program Learning Goals**

**Learning Goal 1: An Integrative Point of View**

Graduates of the Kelley School of Business Undergraduate Program will be able to evaluate and make business decisions from an integrative point of view, one that reflects an understanding of mutually interdependent relationships among competitive and environmental conditions, organizational resources, and the major functional areas of a business enterprise.

**Learning Goal 2: Ethical Reasoning**

Graduates of the Kelley School of Business Undergraduate Program will be able to recognize ethical issues, demonstrate familiarity with alternative frameworks for ethical reasoning, and discern tradeoffs and implications of employing different ethical frames of reference when making business decisions.

**Learning Goals 3: Critical Thinking & Decision Making**

Graduates of the Kelley School of Business Undergraduate Program will be able to use a variety of research methodologies to identify and critically evaluate implications of business decisions for organizational stakeholders (e.g., customers, colleagues, employees, suppliers, foreign governments, communities, cultures, regulatory agencies) and the natural environment.

**Learning Goal 4: Communication**

Graduates of the Kelley School of Business Undergraduate Program will be able to communicate effectively in a wide variety of business settings (e.g., live, virtual, synchronous and asynchronous), employing multiple mediums of communications (e.g., written, oral and visual).

**Learning Goal 5: Quantitative Analysis and Modeling**

Graduates of the Kelley School of Business Undergraduate Program will be able systematically apply tools of quantitative analysis and modeling to make recommendations and business decisions.

**Learning Goals 6: Team Membership & Leadership**

Graduates of the Kelley School of Business Undergraduate Program will be able to collaborate productively with others, functioning effectively as both members and leaders of teams.

**Learning Goal 7: Respect, Inclusiveness & Valuing People**

Graduates of the Kelley School of Business Undergraduate Program will be able to create and sustain personal and work environments that are respectful and inclusive, valuing the contributions of all persons.

**Learning Goal 8: Personal and Professional Development**

Graduates of the Kelley School of Business Undergraduate Program will be prepared to become the “authors” of their own futures, make informed and deliberate choices about personal and professional development, assume responsibility for their decisions, take pride in excellence, contribute to community, and demonstrate college-level mastery of the skills needed for pursuing and managing a career as a business professional.

**Learning Goal 9: Global Awareness**

Graduates of the Kelley School of Business Undergraduate Program will be conversant with major economic, social, political, and technological trends and conditions influencing foreign investment and development of the global economy and demonstrate an understanding of the cultural, interpersonal and analytical competencies required for engaging in global business activities.

**Learning Goal 10:** **Innovation and Creativity**

Graduates of the Kelley School of Business Undergraduate Program will know how to respond to the need for innovation or creativity by engaging in ongoing learning, broadening their points of view, exploring cross-contextual links, and consulting with others.