Econometrics

Dr. Ryan Safner

Course: ECON 480 Fall 2020
Room: ON ZOOM
Meets: TuTh 11:30 A.M.–12:45 P.M.

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Hours: TuTh 3:30–5:00PM ON ZOOM

"There are three kinds of lies: lies, damned lies, and statistics." – Benjamin Disraeli

Econometrics is the application of statistical tools to quantify and measure economic relationships in the real world. It uses real data to test economic hypotheses, quantitatively estimate causal relationships between economic variables, and to make forecasts of future events. The primary tool that economists use for empirical analysis is ordinary least squares (OLS) linear regression, so the majority of this course will focus on understanding, applying, and extending OLS regressions.

I assume you have *some* working knowledge of economics at the intermediate level and some basic statistical tools.[1] We will do some basic review of some necessary statistics and probability at the beginning until everyone is comfortable, before jumping right into regressions.

Hybrid Course Format

This course is taught in a **hybrid** format, providing a mixture of regular synchronous activity where we all can interact in real time, with asynchronous material, which can be done remotely at your own pace.

I will be holding all synchronous class sessions remotely (for reasons I will make clear to you by the first day) on Zoom. You can attend these sessions on your computer or device from your dormitory or home, and a classroom is available for you to use (socially-distanced, and in masks), but I will not be in the classroom.

During the synchronous, scheduled times for the course (Monday/Wednesday 2:00 P.M.-3:15 P.M.), I will lecture on the material, hold in-class discussions, and answer questions in real time *on Zoom.* Attendance to the live portion is strongly encouraged, but not required.

Lecture slides, videos, and other synchronous materials will be posted online by the end of the day in which the live session occurs.

Assignments will always be submitted *online* and due at regular times (typically 11:59 PM Sunday) so that students unable to join in the live sessions can complete them asynchronously.

Students are strongly encouraged to join the course Slack channel to maintain an active channel of communication, ask questions, and to build our course community together. Official course-related announcements will always come via Blackboard announcement and automatically sent to your Hood email accounts.

Learning in a Time of Coronavirus

Everything is awful right now. None of us signed up for this. None of us are really okay, **we're all just pretending for everyone else.**

Many of you may be dealing with hardships at home and at work, and are generally juggling many more problems than usual. Everyone's future plans have been completely put on hold or cancelled to a large degree. We all miss the sense of normalcy and human sense of community from being isolated for so long.

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[1] The formal prerequisites for this course are **ECON 205** and **ECON 206**; **ECMG 212** or **MATH 112**; and **ECON 305** or **ECON 306**

For this unique semester, we are going to prioritize supporting each other as human beings during this crazy era, and use simple, accessible solutions that make sense for the most people, and above all, to be flexible. I have designed the course to maintain some common structure but be flexible to your varied needs. Please see the policies and expectations below. I hope you use this course as an opportunity to escape the boredom and insanity of social isolation, and to help keep interest in understanding the world around us.

If you tell me you're having trouble, I will do whatever I can to help, and not judge you or think less of you. I hope you will extend me the same courtesy.

Course objectives

By the end of this course, you will:

1. apply the models of microeconomics (constrained optimization and equilibrium) towards explaining real world behavior of individuals, firms, and governments

2. explore the effects of economic and political processes on market performance (competition, market prices, profits and losses, property rights, entrepreneurship, market power, market failures, public policy, government failures)

3. apply the economic way of thinking to real world issues in writing

4. understand how to evaluate statistical and empirical claims;

5. use the fundamental models of causal inference and research design;

6. gather, analyze, and communicate with real data in R.

I am less concerned with forcing you to memorize and recite proofs of statistical estimator properties, and more concerned with the development of your intuitions and the ability to think critically as an empirical social scientist—although this will require you to demonstrate proficiency with some intermediate statistical and mathematical tools.

Given these objectives, this course fulfills all three of the learning outcomes for the George B. Delaplaine, Jr. School of Business Economics B.A. program:

- Use quantitative tools and techniques in the preparation, interpretation, analysis and presentation of data and information for problem solving and decision making [...]
- Apply economic reasoning and models to understand and analyze problems of public policy [...]
- Demonstrate effective oral and written communications skills for personal and professional success[...]

Fair warning: Econometrics is hard. *It will be one of the hardest economics courses that you will take, primarily due to the mathematical content.* I will do my best to make this class intuitive and helpful, if not interesting. If at any point you find yourself struggling in this course for any reason, please come see me. Do not suffer in silence! Coming to see me for help does not diminish my view of you, in fact I will hold you in *higher* regard for understanding your own needs and taking charge of your own learning. There are also a some fantastic resources on campus, such as the Center for Academic Achievement and Retention (CAAR) and the Beneficial-Hodson Library.

See my tips for success in this course.

Required Course materials

This course requires regular online internet access. If you know you will be unable to access the internet regularly, please let me know and we can make arrangements.

You can find all course materials at my **dedicated website** for this course: metricsF20.classes.ryansafner.com. Links to the website are posted on our Blackboard course page. Please familiarize yourself with the website, see that it contains this syllabus, guides for your reference, and our schedule. On the schedule page, you can find each module with its own class page (**start there!**) along with all related readings, lecture slides, practice problems, and assignments.

My lecture slides will be shared with you, and serve as your primary resource, but our main "textbook" below is **recommended** as the next best resource and will be available from the campus bookstore. I will discuss more about textbooks and materials in the first module.

Books

The following book is **required**[2] and will be available from the campus bookstore.

- Bailey, Michael A, 2019, *Real Econometrics*, New York: Oxford University Press, 2nd ed.

You are welcome to purchase the book by other means (e.g. Amazon, half.com, etc). I have no financial stake in requiring you to purchase this book. The (cheaper) 1st edition is sufficient, but makes significantly less use of R (in favor of STATA).

The following two books are **recommended**, and are free online[3]:

- Grolemund, Garrett and Hadley Wickham, *R For Data Science*
- Ismay, Chester and Albert Y Kim, *Modern Dive: Statistical Inference Via Data Science*

The first book is the number one resource for using R and tidyverse, and is written for beginners. I still look at it *frequently*. The second is another great reference for using tidyverse in the context of basic statistics.

Software

You are **strongly recommended** to download copies of R and R Studio on your own computers. These software packages are available on all computers in the trading room, and you will have access to them during the week to work on assignments.

We will also have a shared class workspace in RStudio.cloud that runs a full instance of R Studio in your web browser (so no need to install anything!) will let you access files and assignments.

Articles

Throughout the course, I will post both required and supplemental (non-required) readings that enrich your understanding for each topic. Check Blackboard *frequently* for announcements and updates to assignments, readings, and grades.

Assignments and Grades

Your final course grade is the weighted average of the following assignments. You can find general descriptions for all the assignments on the assignments page and more specific information and examples on each assignment's page on the schedule page.

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[2]You are not *obligated* to buy it, I just **strongly recommend** it in the sense that you will still have access to all data and assignments without possessing the book. But this is a course where you really will want to understand the derivations or get additional context beyond just my slides...

[3]You can purchase a hard copy of the first one if you really want.

	Assignment	Percent
1	Research Project	30%
n	Problem sets (Average)	25%
1	Midterm	20%
1	Final	25%

Each assignment is graded on a 100 point scale. Letter-grade equivalents are based on the following scale:

Grade	Range	Grade1	Range1
A	93–100%	C	73–76%
A–	90–92%	C–	70–72%
B+	87–89%	D+	67–69%
B	83–86%	D	63–66%
B–	80–82%	D–	60–62%
C+	77–79%	F	< 60%

See also my Grade Calculator app where you can calculate your overall grade using existing assignment grades and forecast "what if" scenarios.

These grades are firm cutoffs, but I do of course round upwards (≥ 0.5) for final grades. A necessary reminder, as an academic, I am not in the business of *giving* out grades, I merely report the grade that you *earn*. I will not alter your grade unless you provide a reasonable argument that I am in error (which does happen from time to time).

Policies and Expectations

This syllabus is a contract between you, the student, and me, your instructor. It has been carefully and deliberately thought out[4], and I will uphold my end of the agreement and expect you to uphold yours.

In the language of game theory, this syllabus is my commitment device. I am a very understanding person, and I know that exceptions to rules often need to be made for students. However, to be *fair* to *all* students the syllabus artificially constrains my ability to make exceptions at a whim for anyone. This prevents clever students from exploiting my congenial personality at everyone else's expense. Please read and familiarize yourself with the course policies and expectations of you. Chances are, if you have a question, it is answered herein.

Online Attendance and Participation

This is a hybrid course with synchronous (live) and asynchronous (on your own time) parts.

You are generally expected to join (online via Zoom) our **synchronous** class sessions unless circumstances prevent you from doing so. Day-to-day attendance is not graded per se, but I strongly recommend you join in all live sessions in which you are able, since we all can provide live feedback and I can answer questions and address concerns as soon as they come up. You will also benefit from a rigid schedule and shared community.

If you are unable to make a particular class, you generally do not need to let me know. **The videos from all class sessions are posted on Blackboard** so please review videos of classes you were unable to attend live.

All assignmnents are able to be completed **asynchronously** during the week, and are **generally due by 11:59PM Sunday each week** to allow you flexibility in your hectic schedules.

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[4]A syllabus can and will be used as a legal document for disputes tried at a court of law. Ask me how I know.

Late Assignments

I will accept late assignments, but will subtract a specified amount of points as a penalty. Even if it is the last week of the semester, I encourage you to turn in late work: some points are better than no points!

Homeworks: If you turn in a homework after it is due but before it is graded or the answer key posted, I generally will not take off any points. However, **if you turn in a homework *after* the answer key is posted, I will automatically deduct 20 points (so the maximum grade you can earn on it is an 80).**

Exams: If you know that you will be unable to complete an *exam* as scheduled for a legitimate reason, please notify me at least *one week* in advance, and we will schedule a make-up exam date. Failure to do so, including desperate attempts to make arrangements only *after* the exam will result in a grade of 0 and little sympathy. I reserve the right to re-weight other assignments for students who I believe are legitimately unable to complete a particular assignment.

Research Project: Starting at the deadline, I will take off 1 point for every hour that your Op-ed is late.

Grading

I will try my best to post grades on Blackboard's Grading Center and return graded assignments to you within about one week of you turning them in. There will be exceptions. Where applicable, I will post answer keys once I know most homeworks are turned in (see Late Assignments above for penalties). Blackboard's Grading Center is the place to look for your most up-to-date grades. See also my Grade Calculator app where you can calculate your overall grade using existing assignment grades and forecast "what if" scenarios.

Communication: Email, Slack, and Virtual Office Hours

Students must regularly monitor their **Hood email accounts** to receive important college information, including messages related to this class. Email through the Blackboard system is my main method of communicating announcements and deadlines regarding your assignments. **Please do not reply to any automated Blackboard emails - I may not recieve it!**. My Hood email (safner@hood.edu) is the best means of contacting me. I will do my best to respond within 24 hours. If I do not reply within 48 hours, do not take it personally, and *feel free to send a follow up email* in the very likely event that I genuinely did not see your original message.

Our slack channel is available to all students and faculty in Economics and Business. I have invited all of my classes and advisees. It will not be extended to non-Business/Economics students or faculty. All users must use their **hood emails** and **true first and last names**. Each course has its own channel, exclusive for verified students in the course, and myself, by my invite only. As a third party platform, you agree to its Terms of Service. I have created this space as a way to stay connected, to help one another, and to foster community. Behaviors such as posting inappropriate content, harassing others, or engaging in academic dishonesty, to be determined solely at my discretion, will result in one warning, the content will be deleted, and subsequent behavior will result in a ban.

I will host general **"office hours"** on Zoom. You can join in with video, audio, and/or chat, whichever you feel comfortable with. Of course, if you are not available during those times, we can schedule our own time if you prefer this method over email or Slack. If you want to go over material from class, please have *specific* questions you want help with. I am not in the business of giving private lectures (particularly if you missed class without a valid excuse).

Watch the excellent and accurate video explaining office hours (on website syllabus page).

Netiquette

When using Zoom and Slack, please follow appropriate internet etiquette ("Netiquette"). Written communications, like blog posts or use of the Zoom chat, lacks important nonverbal cues (such as body language, tone of voice, sarcasm, etc).

Above all else, please respect one another and think/reread carefully about how others may see your post before you submit a comment. You are expected to disagree and have different opinions, this is

inherently valuable in a discussion. Please be civil and constructive in responding to others' comments: writing *"have you considered 'X'?"* is a lot more helpful to all involved than just writing *"well you're just wrong."*

Posting content that is wilfully incindiary, illegal, or that constitutes academic dishonesty (such as plagarism) will automatically earn a grade of 0 and may be elevated to other authorities on campus.

When using the chat function on Zoom or public Slack channels, please treat it as official course communications, even though I may not be grading it. It may be a quick and informal tool - don't feel you need to worry about spelling or perfect grammar - but please try to avoid *too* informal "text-speak" (i.e. say "That's good for you" instead of "thas good 4 u").

Privacy

Maryland law requires all parties consent for a conversation or meeting to be recorded. If you join in, and certainly if you participate, **you are consenting to be recorded.** However, as described below, videos are *not accessible* beyond our class.

Live lectures are recorded on Zoom and posted to Blackboard via Panopto, a secure course management system for video. Among other nice features (such as multiple video screens, close captioning, and time-stamped search functions!), Panopto is authenticated via your Blackboard credentials, ensuring that *our course videos are not accessible to the open internet.*

For the privacy of your peers, and to foster an environment of trust and academic freedom to explore ideas, **do not record our course lectures or discussions.** You are already getting my official copies.

The Family Educational Rights and Privacy Act prevents me from disclosing or discussing any student information, including grades and records about student performance. If the student is at least 18 years of age, *parents (or spouses) do not have a right to obtain this information*, except with consent by the student.

Many of you may be tuning in remotely, living with parents, and may have occasional interruptions due to sharing a space. This is normal and fine, but know that I will protect your privacy and not discuss your performance when parents (or anyone other than you, for that metter) are present, without your explicit consent.

Enrollment

Students are responsible for verifying their enrollment in this class. The last day to add or drop this class with no penalty is **Thursday, August 27**. Be aware of important dates.

Honor Code

Hood College has an Academic Honor Code which requires all members of this community to maintain the highest standards of academic honesty and integrity. Cheating, plagiarism, lying, and stealing are all prohibited. All violations of the Honor Code are taken seriously, will be reported to appropriate authority, and may result in severe penalties, including expulsion from the college. See here for more detailed information.

Van Halen and M&Ms

When you have completed reading the syllabus, email me a picture of the band Van Halen and a picture of a bowl of M&Ms. If you do this *before* the date of the first exam, you will get bonus points on the exam.[5] Yes, this is real.

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[5]If 75-100% of the class does this, you each get 2 points. If 50-75% of the class does this, you each get 4 points. If 25-50% of the class does this, you each get 6 points. If 0-25% of the class does this, you each get 8 points.

Accessibility, Equity, and Accommodations

College courses can, and should, be challenging and bring you out of your comfort zone in a safe and equitable environment. If, however, you feel at any point in the semester that certain assignments or aspects of the course will be disproportionately uncomfortable or burdensome for you due to any factor beyond your control, please come see me or email me. I am a very understanding person and am happy to work out a solution together. I reserve the right to modify and reweight assignments at my sole discretion for students that I belive would legitimately be at a disadvantage, through no fault of their own, to complete them as described.

If you are unable to afford required textbooks or other resources for any reason, come see me and we can find a solution that works for you.

This course is intended to be accessible for all students, including those with mental, physical, or cognitive disabilities, illness, injuries, impairments, or any other condition that tends to negatively affect one's equal access to education. If at any point in the term, you find yourself not able to fully access the space, content, and experience of this course, you are welcome to contact me to discuss your specific needs. I also encourage you to contact the Office of Accessibility Services (301-696-3421). If you have a diagnosis or history of accommodations in high school or previous postsecondary institutions, Accessibility Services can help you document your needs and create an accommodation plan. By making a plan through Accessibility Services, you can ensure appropriate accommodations without disclosing your condition or diagnosis to course instructors.

Tentative Schedule

Below is a rough sketch of the weekly schedule we will aim to follow this semester. Each module should take approximately one class meeting.

You can find a full schedule with much more details, including the readings, appendices, and other further resources for each class meeting on the course website's schedule page.

Week	Topics	Readings	Assignments
8/16-8/22	Introduction		
	Meet R	W&G Ch. 1	
8/23-8/29	Data Visualization with ggplot2	W&G Ch. 3	
	Data Wrangling with the tidyverse	W&G Ch.5,10,11,12,18	
8/30-9/5	Optimize Workflow	W&G Ch.8,27,28,29,30	HW 1
	Data 101 & Descriptive Statistics	Bailey A.A	
9/6-9/12	Random Variables & Distributions	Bailey A.B-I	HW 2
	OLS Linear Regression	Bailey Ch.3.1, A.D-E	
9/13-9/19	OLS: Goodness of Fit & Bias	Bailey Ch.3.2-3.4,3.7-3.8	HW 2
	OLS: Precision & Diagnostics	Bailey Ch.3	
9/20-9/26	Inference for Regression'	Bailey Ch.4	HW 3, Midterm Exam
	Causal Inference	TBD	
9/27-10/3	Omitted Variable Bias	Bailey Ch.5.1	
	Multivariate OLS Estimators: Bias, Precision, & Fit	Bailey Ch.5.1,5.2,5.4	HW 4
10/4-10/10	Model Specification	TBD	
	Regression with Categorical Data	Bailey Ch.6.1-6.2	
10/11-10/17	Regression with Interaction Effects	Bailey Ch.6.3-6.4	
	Polynomial Regression	Bailey Ch.7.1	
10/18-10/24	Logarithmic Regression	Bailey Ch.7.2-7.4	HW 5
	Panel Data and Fixed Effects Models	Bailey Ch.8.1-8.4	
10/25-10/31	Difference-in-Difference Models	Bailey Ch.8.5	HW 6
	Instrumental Variables Models	TBD	
11/1-11/7	Regression Discontinuity Models	TBD	
	Binary Dependent Variables Models	TBD	
11/8-11/14	Classification & Machine Learning	TBD	
	TBD	TBD	
11/15-11/21	TBD	TBD	
	TBD	TBD	
11/22-11/28	Review	TBD	
	Review	TBD	Final Exam