

## ***Economics 103A***

### ***Introduction to Econometrics & Research Methods***

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**Office**

**Hours:** by email only

**Text:** **Required**

***Real Econometrics: The Right Tools to Answer Important Questions 2e***, Michael A. Bailey, Oxford University Press, 2<sup>nd</sup> Edition, 2020. Available online. (<https://learninglink.oup.com/access/bailey-real-econometrics2e>)

***Primer on Bayesian Statistics***, T. S. Means, 2011

(<http://www.sjsu.edu/people/tom.means/courses/econ3/>)

***R Companion to Real Econometrics***, Tony Carilli, (2019)

<https://bookdown.org/carillitony/bailey/> (***also posted on canvas***)

***Guide to R: Data Analysis for Economics***, William A. Sundstrom & Michael J. Kevane, online @ [rpubs.com/wsundstrom/home](http://rpubs.com/wsundstrom/home), 2012 (***also posted on canvas***)

**Recommended**

***Basic Econometrics***, Damodar N. Gujarati and Dawn C. Porter, McGraw-Hill/Irwin, 5<sup>th</sup> edition, 2009. (***also posted on canvas***)

***Mastering Metrics***, Joshua Angrist, and Jorn-Steffan Pischke, Princeton University Press, Princeton, N.J. 2015. (***also posted on canvas***)

***Mostly Harmless Econometrics***, Joshua D. Angrist & Jorn-Steffan Pischke, 2008. ***(also posted on canvas)***

***Principles of Econometrics***, R. Carter Hill, William E. Griffiths, & Guay C. Lim, John Wiley & Sons Inc., 5<sup>th</sup> edition, 2018. ***(also posted on canvas)***

### Course

**Description:** Research methods and core econometric techniques for analysis of causal effects, from difference-in-means tests of experimental data through multiple regression analysis of observational data. Topics include selecting an appropriate research question, reviewing the relevant literature, and obtaining data. Core econometric techniques used to analyze data in an original term paper

**Prerequisite(s):** Econ 101, Introductory Statistics ([SOVI 15](#), [STAT 95](#), [UNVS 15S](#) or equivalent).

**Software:** The Bailey text uses R Studio and STATA. I will use both in the classroom. The text provides all of the data and code for both software products. You must install R and R Studio on your home computers.

### Course

**Information:** This is an introductory course in Econometrics and Research Methods. You must have a good working knowledge of basic economics, statistics and probability theory. The class has a weekly fixed time meeting. It is highly recommended that you attend zoom meetings, since this is where I will explain text material and software techniques. Recorded zoom meeting material will also be emphasized on quizzes. If you are having problems with the course material, please see me early on in the course. I might be able to help you achieve better results if I know of your problem soon enough.

This is a 4-unit course. This syllabus has learning objectives, rigor, class meeting times, and assignments commensurate with the expectation of 12 hours of work per week across 15 weeks in a semester. For reference, under a traditional three-unit course, you are expected to complete 9 hours of work per week inclusive.

### Course and Program Learning Objectives

This course reinforces PLO3: **research methods** and PLO5: **communication**, and introduces PLO4: **areas: quantitative methods**. Specific CLOs for this course include:

## CLO1

Explain basic methods in econometrics and identify correct procedures

- Explain the difference between variables and a statistic in the context of a regression equation.
- Define the terms "causal effect" and "ideal experiment". Explain the difference between descriptive statistics, inferential statistics, and causal inference.
- Give two examples of difference-in-means tests, using experimental and observational data, and explain when we can and cannot interpret a difference-in-means as an estimate of a causal effect.
- Describe how to use a simple (bivariate) regression model to carry out a difference in means test.
- Give an example of a regression coefficient estimate that suffers from omitted variable bias, and explain how the *regression control* technique could reduce bias in the example. Use the OVB equation to illustrate the two OVB conditions.
- Describe all the numbers in a regression results table in an economics book or journal article; write the regression equation, identifying the independent and dependent variables; identify the main independent variable of interest; interpret the models, including polynomial and log models; test their statistical significance; evaluate them in terms of any potential bias.
- Discuss best practices in estimating standard errors.
- Discuss an example of a natural experiment, where: 1.) a *difference-in-means* is a plausible causal effect, and 2.) where a *difference-in-differences* (D-in-D) in means is a plausible causal effect. Finally, explain how an interaction model automates estimation of a D-in-D estimate.

## CLO 2

Use technology to analyze data

- Create summary statistics for variables in a data set using the R software program.
- Estimate a regression model (coefficients and standard errors) and create a scatterplot with a regression line in R.
- Download data from the Internet and read it into a statistical software package
- Run an R script associated with a published research study by modifying the directory path, installing required packages, loading data, and obtaining results.
- Create a new script by modifying an existing script, and use your original results in a term paper

**CLO 3**

Prepare a scholarly research paper describing an original regression analysis:

- Formulate an interesting and important research question.
- Locate and describe data from Internet or other sources.
- Search and analyze scholarly literature related to research question.
- Write a review of econometric literature that is integrated and not merely an annotated bibliography; list and describe relevant studies and their research questions, the data and methods they used, and the results they found. Highlight any studies that provide compelling estimates of well-defined causal effects, or explain why a study does not.
- Develop, estimate and interpret a statistical model that can be used with the data to answer a question which is original and contributes to the literature.

**Exams, Paper and Exercises:**

Grading will be based on **quizzes, final, computer exercises, and a term paper**. The term paper will be evaluated on three components: **abstract and outline, rough draft and presentation, and final paper**. Quizzes are open book, open notes. Incomplete grades will only be considered if you have a grade of C or better. Grading will be done on a curve.

Quizzes	30%
Final	20%
Exercises	30%
<u>Term Paper</u>	<u>20%</u>
	100%

**Add/**

**Drops:**

You are responsible for all University and Department guidelines regarding the adding and dropping of a class. Please consult the SCHEDULE OF CLASSES.

**Disability:**

Any student with a disability requiring an accommodation should make this need known to the instructor during the first class period. Every effort will be made to accommodate your needs

**Academic Integrity:**

Due to online teaching, student cheating has increased. Faculty members are required to report all infractions. Cheating or plagiarism (presenting the work of another as your own) will result in a zero for the assignment,

filing a report to the Student Conduct Office, and may result in a failing grade.

For further information consult the University Academic Integrity Policy S07-2 at <http://www.sjsu.edu/senate/docs/S07-2.pdf> , which requires you to be honest in all your academic course work. Faculty members are required to report all infractions to the office of Student Conduct and Ethical Development. [The Student Conduct and Ethical Development website](http://www.sjsu.edu/studentconduct/) is available at <http://www.sjsu.edu/studentconduct/>.

### **Class**

#### **Protocol:**

**For online Zoom meetings, please be on time and avoid any disruptive activities. Typically students will be muted, but can text via chat with questions at any time. Portions of Zoom meetings may be recorded and posted on Canvas for student reference. For privacy purposes during recordings, all students will be muted with the video gallery hidden on my screen. During these recordings students may continue to send questions via chat.**

[University Policy S12-7](http://www.sjsu.edu/senate/docs/S12-7.pdf), <http://www.sjsu.edu/senate/docs/S12-7.pdf>, requires students to obtain instructor's permission to record the course.

“Common courtesy and professional behavior dictate that you notify someone when you are recording him/her. You must obtain the instructor's permission to make audio or video recordings in this class. Such permission allows the recordings to be used for your private, study purposes only. The recordings are the intellectual property of the instructor; you have not been given any rights to reproduce or distribute the material.”

“Course material developed by the instructor is the intellectual property of the instructor and cannot be shared publicly without his/her approval. You may not publicly share or upload instructor generated material for this course such as exam questions, lecture notes, or homework solutions without instructor consent.”

### **Course**

#### **Outline:**

On Mondays I will assign readings for you to read and prepare for the weekly zoom meetings. Quizzes are also scheduled on Wednesday during the class period.

### **INTRODUCTION**

01/27(W)      Statistics Review, Introduction to Econometrics  
Bailey: Appendices: Math & Probability Background  
Hill: Chapter 1 and Probability Primer

**THE LINEAR REGRESSION MODEL**

02/01(M)      Install R and R Studio  
Sundstrom and Kevane: Chapter 1

02/03(W)      Introduction to R  
Bailey: Chapter 2

02/08(M)      Using Scripts and Data In R  
Sundstrom and Kevane: Chapter 2  
Assigned YouTube Video

02/10(W)      Basic Regression: The 2-Variable Model  
Bailey: Chapter 3  
Hill: Chapter 2

02/15(M)      Basic Statistic and Plots Using R  
Sundstrom and Kevane: Chapter 3,4  
Assigned YouTube Video

02/17(W)      The 2-Variable Model – Estimation and Hypothesis Testing  
Bailey: Chapter 4  
Hill: Chapter 3, 4

02/22(M)      Regression Analysis Using R  
Sundstrom and Kevane: Chapter 5

02/24(W)      The 2-Variable Model - Causality and Specification Error  
Bailey: Chapter 1  
Hill: Chapter 10.2, 10.4  
Angrist-Pischke (MM): Chapter 1

03/01(M)      Multiple Regression

03/03(W)      Multiple Regression  
Bailey: Chapter 5  
Hill: Chapter 5

03/08(M)      Multiple Regression Using R  
Sundstrom and Kevane: Chapter 6

03/10(W)      Multiple Regression – Hypothesis Tests and Inference  
Bailey: Chapter 5  
Hill: Chapter 6

03/15(M)      Multiple Regression

03/17(W) Multiple Regression – Linear Restrictions  
Bailey: Chapter 5  
Hill: Chapter 6

03/24(W) Multiple Regression - Indicator Variables  
Bailey Chapter 6  
Hill Chapter 7

**03/26(F) TERM PAPER PROPOSAL DUE**

**03/29 – 04/02 SPRING BREAK – no classes**

**ASSUMPTION VIOLATIONS**

04/05(M) Indicator Variables Using R  
04/07(W) Model Selection, Functional Form  
Bailey: Chapter 5, 7  
Hill: Chapter 4.3, 4.4, 4.5, 5.6, 6.3

04/12(M) Functional Forms Using R  
04/14(W) Heteroscedasticity  
Bailey: Chapter 3  
Hill: Chapter 8

04/19(M) Adjusting for Heteroscedasticity Using R  
04/21(W) Multicollinearity  
Bailey: Chapter 5  
Hill: Chapter 6.5  
Handouts

**SELECTED TOPICS**

04/26(M) Multicollinearity Using R  
04/28(W) Panel Data, Treatment Models  
Bailey: Chapter 8, 10  
Hill: Chapter 7.5, 7.6, 15

05/03(M) Treatment Methods Using R  
05/05(W) Linear Probability Model Using R  
Bailey: Chapter 12.1  
Hill: Chapter 7.4

**05/10(M) ROUGH DRAFT PRESENTATION**  
**05/12(W) ROUGH DRAFT PRESENTATION**

**05/14(F)      TERM PAPER DUE**

**05/20 (R)      Section 1 - Final Exam 9:45 am– 12:00 pm**  
**05/21 (F)      Section 2 - Final Exam 12:15 pm – 2:30 pm**