Instructor: Maria E Canon.
Time: M W 10:00am – 11:20am
Classroom: Seigle L003 (lectures), Seigle L016 (computer lab, F 11:00am-12:00pm)
Office hours: Monday and Wednesday 2:20 pm– 3:20pm by appointment (Seigle 315A)
e-mail: mcanon@wustl.edu
Assistant to instructor: Zach Zhu (zhu.zheliang@email.wustl.edu)
AI office hours: Tuesdays 2pm-3pm, Seigle 356

Prerequisites
ECON 4011, and MATH 2200 or equivalent.

Required Text
Style: Lessons in Clarity and Grace, 12th Edition, Joseph Williams and Joseph Bizup

Recommended References
Econometrics by Example, Damodar N. Gujarati
Introductory Econometrics A Modern Approach, 4th edition, Jeffrey M. Wooldridge

Computer Software
We will be using Stata. Washington University participates in the "STATA Campus GradPlan." Link to discounted packages: http://www.stata.com/order/new/edu/gradplans/campus-gradplan/

Philosophy and Goals
Econometrics is the development and application of statistical techniques for the measurement of economic phenomena. This course will provide you a background in econometric theory and practice.

The course will combine theory with hands-on experience in econometric modeling. My hope is that the statistical models and econometric methods that will be analyzed during the semester will give you some of the tools necessary to conduct solid empirical business and economic research. The writing assignments and final paper will provide you an opportunity to formulate an economic model, estimate the model with appropriate data, and interpret the results. This experience will help you understand how econometrics relates to other economics courses which focus on theoretical models for how the world operates. Econometrics provides a method of testing the validity of these economic models. Additionally, the term paper will improve your writing skills and give you a chance to write clearly and concisely about technical material.
The course will also prepare you for additional higher level courses in econometrics. Accordingly, the course will emphasize empirical applications in the computer lab, while lectures will focus on the mathematics of econometrics and the relation to economic models.

The material in ECON 413W can be difficult and the workload substantial, particularly for people who find math courses challenging. Count on spending more time in this class than a typical undergraduate economics class. Your payoff for all this work is a set of skills and analytical tools that are extremely useful and in high demand in the marketplace.

**Intended Learning Outcomes**
- Learn basic econometric techniques and their applications to business and economics.
- Understand how to postulate and test hypotheses related to economic issues or problems.
- Develop the tools necessary to conduct empirical work in business and economics.
- Build experience in estimating economic models with econometric modeling software.
- Learn to use statistical software to estimate regressions.
- Analyze the strengths and weaknesses of the basic regression model.
- This course emphasizes critical thinking and the application of both logical and quantitative skills. To succeed in this course, you must communicate clearly and effectively in writing, and you must learn to relate econometric techniques to written arguments.
- This course stresses the application of econometric techniques to economic theory and real-world problems.

**Academic Dishonesty**
The tests and the final exam are to be your own work. As such, evidence to the contrary will result, initially, in a failing grade on the assignment, and immediate academic disciplinary action. You may work with others on the homework assignments; but you must submit your solutions individually. If you ever feel that these standards of academic integrity are not being met, please notify me or an undergraduate advisor immediately. If you are uncertain about the policy on academic integrity at Washington University, refer to your undergraduate advisor, to the university’s Student Judicial Procedures, or to your school’s statement of student academic integrity. (For ArtSci students, the latter is published each semester in the Course Listings booklet.)

**Grading**
The following weights will be used to determine your course grade:
- Homework: 5%
- Midterm 1: 20%
- Midterm 2: 20%
- Writing Assignments: 15%
- Paper: 40%
**Homework**
Homework is an integral part of this course, because the best way to learn econometrics is to do it. I will periodically assign homework throughout the semester. I will assign homework on Wednesday and they will be due the following Wednesday in class. **Late problem sets will not be accepted for any reason.**
Both the homework assignments and the term paper will require you to apply the methods taught in class to actual data. No previous programming or spreadsheet experience is required, but familiarity with computers is assumed. The TA will cover some guidelines for STATA during the labs.

**Tests**
Exam 1: During the regular course meeting time, October 9th
Exam 2: During the regular course meeting time, December 4th

There will be no make-up exams. If the first midterm exam is missed for a legitimate reason that has been pre-approved, the second midterm exam will count towards 40% of the final grade.

**Writing Assignments**
There are three assignments leading up to the final paper.

**Assignment #1**: Due at the beginning of class on Monday September 23, 2019.
Write up a one to two page memo, which motivates why the topic you have chosen might be interesting. Find at least one article (from a newspaper, academic journal, or popular periodical) that may be used as support or motivation for your topic. Briefly refer to this article in your memo. Chapter 19, *Introductory Econometrics A Modern Approach*, 4th edition, Jeffrey M. Wooldridge is a recommended reading for working on your project. **Late assignments will not be accepted.** All students will receive individual feedback from me (most likely by email) by October 5.

**Assignment #2**: Due at the beginning of class on Wednesday October 23, 2019.
Submit a revised version of Assignment #1 incorporating provided feedback, and add the data section to the paper. Collect your data and create a table with summary statistics of the variables you plan to use in your project. In one to two pages, describe the variables you are using and highlight any interesting numbers from your table of summary statistics. Explain how the data will help you answer your question. **Late assignments will not be accepted.** Individual emails with feedback and suggestions to move forward will be sent by November 4th.

**Assignment #3**: Due at the beginning of class on Monday November 18, 2019.
Submit a rough draft of your paper. While your paper does not have to be complete, you should at least submit a revised version of Assignment #2, describe your model, and have some preliminary results. **Late assignments will not be accepted.** I will have individual meetings November 20-22 to discuss your rough draft.
Paper
All students are required to submit the final paper on Tuesday December 10th, 2019 at 10:00 am, late papers will not be accepted. The final paper will be an extended and revised version of Assignment #3.

Paper structure
I. Title page.
II. Abstract. This should be less than 50 words and summarize the topic, methodology, and main findings. It should appear on your title page.
III. Introduction. This section should state the nature and objectives of the project along with a brief review of any relevant literature. Make sure to provide some background or motivation for why your project is interesting.
IV. Description of the model. The model should be clearly stated and any equations carefully explained.
You should write out the econometric model you plan to estimate, and discuss the expected impact of the exogenous variables in your model.
V. Data description and model estimation. You should use the techniques developed in class to analyze your data and estimate your model. Make sure to describe the dataset you are using by providing summary statistics of important variables. Your results should be reported and discussed in this section and could include: parameter estimates, standard errors, t-statistics, F-statistics, $R^2$, tests for autocorrelation, heteroskedasticity, and possible multicollinearity, as appropriate.
VI. Conclusion. Review the major findings as well as possible extensions for future work. Make sure to mention any limitations of your approach as well as alternative explanations of your results. Policy implications, if any, could also be included in this section.
VII. Tables and graphs. Your paper must include at least one table and one graph. The tables and graphs should be well-labeled and accessible to the reader—do not merely print out your regression output with cryptic variable names.
Appendix
If you have a lot of regression results or other details in your theoretical/statistical model that merit to be included yet, they may distract the reader, you may include them in an Appendix.
Checklist for Paper

______ Introduction: Describe your research question and include any supporting evidence from other articles, etc.

______ Theoretical Model and hypothesized signs: For example the theoretical model for a simple demand equation would be:

\[ Q_{\text{Demand}} = f(\text{Price}, \text{Income}, \text{Price of substitutes}, \text{Price of complements}, \text{etc}) \]

______ Data Description: This should include a verbal description of the sources of the data, the number of observations, (years), and basic descriptive statistics for each variable, mean, standard deviation, minimum, maximum. You should also include a table which you can refer to in your verbal description.

______ Empirical model to be estimated, including a description as to why you chose a particular functional form for each variable. Remember you can have a mixed model, for example:

\[ Y = B_1 + B_2 \ln X_2 + B_3 \left( \frac{1}{X_3} \right) + B_4 \text{time} + B_5 X_2^2 + u_i \]

______ Estimation and results, including estimated coefficients, standard errors, t-statistics, R-squared, adjusted R-squared, F-statistic, Durbin-Watson test statistic. If you have several regressions you may wish to make a table.

______ Additional tests of the empirical model, autocorrelation (time series models), heteroscedasticity (cross-sectional models), and multicollinearity.

______ Final estimated model (may be the same as above model, in which case you are done and proceed to the next step). If there are econometric issues based on the above tests, you must correct for those problems and re-estimate the model.

______ Interpretation of the final estimated model, including an interpretation of each coefficient (Do the signs agree with you’re a priori assumptions) and tests of significance.

______ Concluding remarks: Ideas for future research, here you should discuss how you would go about re-estimating the model (if you had the time in the future) to correct for potential theoretical issues or empirical issues you found with your final model.

If you haven’t done so you should look at an academic article e.g. American Economic Review and make your paper look like that, including citations, tables, etc. Formatting properly will be an important component of your grade. Do not simply copy and paste Excel tables, they must be properly labeled and easy to follow.

Use subheadings in your paper, the bold terms above would be appropriate subheadings.