Econ 512
Empirical Methods
Fall 2019-Spring 2020

Instructors:	Paul L. E. Grieco and Mark Roberts
E-mail:	paul.grieco@psu.edu and mroberts@psu.edu
Office:	508 Kern and
Office Phone:	814-867-3310 and 814-863-1535
Office Hours:	Grieco: Thursdays 9:30-11 or by appointment Roberts: TBD.

TA:	Carlos Rangel
E-mail	rji5040@psu.edu
Office:	TBD
Office Hours:	TBD

Description: This is a required one-year course for second-year Ph.D students in economics. It will meet once per week for both fall and spring semester. There will be 1.0 credit for the fall course and 2.0 credits in the spring.

Its goal is to provide students with practical experience using computational tools to solve economic models numerically, program econometric methods, and present empirical results.

Grading: The grade in the fall semester will be based on homework exercises that use the computer, class attendance and participation. The grade in the spring semester will be based on the same criteria plus a computational research project.

In the fall, we will be distributing homework through a *git* repository. The github organization for the class can be found at: https://github.com/PSUEcon512

The TA will help everybody getting up and running using *git* and MATLAB in a breakout session on Wednesday, August 28 at 2:30am in 210 Chambers.

The computational project requires either replicating and extending an existing empirical paper or developing a new application that involves either econometric estimation or numerical solution of a theoretical model. The project is to be written in the form of a journal article with motivation, model development, data explanation, and clearly documented empirical results. In addition to homework exercises, which will due throughout the course, there are several deadlines for the computational project.

November 18 – All students will give a short (3-4 minutes) presentation outlining their computational project. This is intended to be an abstract of the project, so that we can give a final approval of the idea and limit duplicate projects. If you do not hear from us after your presentation, you can assume that we approve the project as you presented.

December 9 (last class in the fall semester) - An outline of the computational project is due. This should describe the project, the data and computational methods that will be used, and the relevant literature it is based on. Ideally, 1-3 pages is sufficient to outline the project

March 16 (the first day after spring break. It is a Monday) - A complete first draft of the computational project is due. Students will present their project during the last seven weeks of the semester and complete revisions during this time. There will be approximately 3-4 presentations each week.

May 1 (last day of classes in the spring) - Final draft of the computational project is due.

University Related Material:

See the following webpage for university policies that apply in this class:
http://senate.psu.edu/faculty/syllabus-statement-examples/

Recommended Textbooks:

Applied Computational Economics and Finance by Mario J. Miranda and Paul L. Fackler, MIT Press, 2002.

Numerical Methods in Economics by Kenneth L. Judd, MIT Press, 1998.

Dynamic Economics: Quantitative Methods and Applications, by Jérôme Adda and Russell Cooper, MIT Press, 2003.

Microeconometrics, by A. Cameron. and P. Trivedi, Cambridge University Press: Cambridge, MA, 2005

Numerical Mathematics and Computing by Ward Cheney and Davis Kincaid, Brooks/Cole Press: 2013 (7th edition).

Matlab References (optional):

Getting Started With Matlab: A Quick Introduction for Scientists and Engineers, Rudra Pratap, Oxford University Press, 2010

Matlab Guide, Second Edition, Desmond J. Higham and Nicholas J. Higham, SIAM, 2005.

Other Computational References:

Git cheat sheet: http://rogerdudler.github.io/git-guide/

Below is a rough schedule for the class. A more detailed class schedule with reading assignments will be distributed at the start of each semester.

Fall 2017   (15 classes)

1. Solving Linear and Nonlinear Equations.

2. Optimization.

3. Numerical Integration.

4. Constrained Optimization

5. Extended Application.   Estimating discrete choice models of demand.

Nevo, Aviv, "A Practitioner's Guide to Estimation of Random-Coefficients Logit Models of Demand," *Journal of Economics and Management Strategy*, , 1998, Vol 9, No. 4, pp.   513-548.

Nevo, Aviv "Measuring Market Power in the Ready-to-Eat Cereal Industry," *Econometrica,* 2001, pp. 307-342.

Spring 2018 until spring break (8 classes, weeks of Jan 10 – February 28)

6.   Dynamic Programming: Collocation Methods, Dynamic Games, Homotopy Methods

MF Chapter 7,8,9, Judd Chapter 6, 12

Doraszelski, U and A. Pakes "A Framework for Dynamic Analysis in IO" *Handbook of Industrial Organization.* 2007. Vol 3, Ch 30.

Dunne, T., S. Klinek, M. Roberts, and D. Xu (2013), "Entry, Exit, and the Determinants of Market *RAND Journal* Fall, Volume 40, No. 3, pp. 462-487.

7.   Function Approximation

8.   Bayesian Estimation Methods

Rossi, P., G. Allenby and R. MuCulloch, *Bayesian Statistics and Marketing.* 2005. John Wiley and Sons: West Sussex, UK.

Spring 2018 after spring break (7 classes).   Student presentations, 2 students/week.