Wayne State University - Department of Economics
ECO 7110 (001) 11457 - Econometrics II (Fall 2019)

Instructor: Vitor Kamada
Class: MW, 12:30 - 02:10 pm in 8 PRENTIS
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MW, 4:10 – 5:10 pm in my office, or by appointment.

1) Course Description

In the previous PhD course ECO 7100 Econometrics I, I taught Causal Inference topics such as Randomized Experiment and Matching Estimators. We also covered several Machine Learning techniques that complement and potentialize Causal Inference Methods. Now we are going to cover other Causal Inference methods, such Fuzzy Regression Discontinuity Design, Correlated Random Effects, Spatial Regression, and Bayesian Structural Time Series with Google Data. We are also going to cover Deep Learning (Neural Networks) and Sentiment Analysis.

It is worth mentioning that in 2019 (few months ago), Microsoft released EconML, a Python package, to estimate treatment effects from observational data via Machine Learning (https://github.com/microsoft/EconML). For example, EconML allows the combination of Instrumental Variables with Deep Learning. Keep in mind that we are in a process of "creative destruction", in which the traditional econometrics approach is becoming obsolete, and being substituted/complemented by "Data Science".

2) Learning Outcomes

Develop a solid understanding of several econometric methods useful to read empirical papers and carry out your own empirical research. Specifically, by the end of the course, you will be able to pursue your own empirical questions by choosing an appropriate research design and being aware of its strengths and limitations.

3) Recommended Textbooks

All textbooks below are open source or available online for free via Wayne Library or author website. Check the links:

Angrist, J. D. and Pischke, J. (2009). **Mostly Harmless Econometrics: An Empiricist's Companion**. Princeton University Press. https://ebookcentral.proquest.com/lib/wayne/detail.action?docID=475846

Chollet, F. (2019). **Deep Learning with Python**. Manning Publications. https://www.manning.com/books/deep-learning-with-python

Goodfellow, I., Bengio, Y., and Courville, A. (2016). **Deep Learning**. MIT Press. https://www.deeplearningbook.org/

Sargent, T. J. and Stachurski, J. (2018). **Lectures in Quantitative Economic**. Available for free at: https://lectures.quantecon.org/py/

Sheppard, K. (2018). **Introduction to Python for Econometrics, Statistics and Data Analysis**. Available for free at: https://www.kevinsheppard.com/Python_for_Econometrics

Wooldridge, J. (2010). **Econometric Analysis of Cross Section and Panel Data**. 2ed, Cambridge: MIT Press. https://ebookcentral.proquest.com/lib/wayne/detail.action?docID=3339196&query=Econometric+Analysis+of+Cross+Section+and+Panel+Data

Angrist and Pischke (2009) cover the intuition of modern experimentalist paradigm. Wooldridge (2010) covers several topics of this course, but is relatively more advanced, and discusses assumptions of models in more detail. Wooldridge (2010) is highly recommended for IV and panel data.

Goodfellow et al. (2016) provide rigorous theoretical/mathematical treatment for Deep Learning; whereas Chollet (2019), the creator of Keras, focus on application and coding aspects. If you want to learn Python, I recommend Sargent and Stachurski (2018) and Sheppard (2018). There is no reference for R, because I assume that you already learned from my previous PhD course: ECO 7100 Econometrics I.

4) Course Schedule

Date	Topics/Key Concepts
Week 1 **Aug 28**	**1) Quantile Regression** Angrist and Pischke (2009): Ch 7 Wooldridge (2010): Ch 12.10

Week 2 **Sep 2**	**Labor Day**
Week 2 **Sep 4**	**2.1) Omitted Variables** Wooldridge (2010): Ch 4.3 **2.2) Measurement Error** Wooldridge (2010): Ch 4.4
Week 3 **Sep 9**	**3) Generalized Method of Moments (GMM)** Wooldridge (2010): Ch 8
Week 3 **Sep 11**	**4.1) Proxy vs Indicator Variable** Wooldridge (2010): Ch 5.3 **4.2) Control Function Approach** Wooldridge (2010): Ch 6.1, 6.2, and 6.3
Week 4 **Sep 16**	**5) Sharp Regression Discontinuity Design** Cattaneo et al. (2018): Ch 2, 3, and 4. A Practical Introduction to Regression Discontinuity Designs: Volume I, Cambridge University Press.
Week 4 **Sep 18**	**6) Fuzzy Regression Discontinuity Design** Cattaneo et al. (2018): Ch 5 Angrist and Pischke (2009): Ch 6
Week 5 **Sep 23**	**7) Difference-in-Difference (DiD)** Angrist and Pischke (2009): Ch 5.2 Wooldridge (2010): Ch 6.5
Week 5 **Sep 25**	**8.1) Correlated Random Effects** Wooldridge (2010): Ch 10.7 **8.2) Simultaneous Equations** Wooldridge (2010): Ch 9
Week 6 **Sep 30**	**9) Spatial Autoregressive (SAR) and Spatial Durbin Model (SDM)** LeSage (2008). Revue d'économie industrielle.
Week 6 **Oct 2**	**10) Spatial Econometrics with PySAL** Rey and Arribas-Bel (2018). Geographic Data Science with PySAL.
Week 7 **Oct 7**	**11) Poisson and Negative Binomial Regression** Wooldridge (2010): Ch 18.1 to 18.3
Week 7 **Oct 9**	**12) Draft Research Proposal I**
Week 8 **Oct 14**	**13.1) Seemingly Unrelated Regressions (SUR)** Wooldridge (2010): Ch 7.7 **13.2) Three-Stage Least Squares (3SLS)** Wooldridge (2010): Ch 9
Week 8 **Oct 16**	**14) Deep Learning and Neural Network** Goodfellow et al. (2016): Ch 1. Chollet (2018): Ch 1 and 2.1.
Week 9 **Oct 21**	**15) Tensor Operations and Stochastic Gradient Descent (SGD)** Chollet (2018): Ch 2. Goodfellow et al. (2016): Ch 2, 4, and 8.

Week 9 **Oct 23**	**16.1) Deep Feedforward Networks** Goodfellow et al. (2016): Ch 6. **16.2) Cross-Entropy, Sigmoid, and Softmax** Goodfellow et al. (2016): Ch 3 and 6.
Week 10 **Oct 28**	**17) Sentiment Analysis on Movie Reviews** Chollet (2018): Ch 3.4.
Week 10 **Oct 30**	**18) Predicting House Prices with Neural Network** Chollet (2018): Ch 3.6.
Week 11 **Nov 4**	**19) Convolutional Neural Networks Padding, Strides, Max-Pooling** Chollet (2018): Ch 5.1 Goodfellow et al. (2016): Ch 9.
Week 11 **Nov 6**	**20.1) Training a Convnet on a Small Dataset** Chollet (2018): Ch 5.2. **20.2) Using a Pretrained Convnet** Chollet (2018): Ch 5.3.
Week 12 **Nov 11**	**21) Working with Text Data Word Embedding** Chollet (2018): Ch 6.1 Goodfellow et al. (2016): Ch 10.
Week 12 **Nov 13**	**22.1) Recurrent Neural Network (RNN) Long Short-Term Memory (LSTM)** Chollet (2018): Ch 6.2 **22.2) Sequence Processing with Convnets** Chollet (2018): Ch 6.4
Week 13 **Nov 18**	**23) Google Trends, Google Correlate, and Google Surveys** Stephens-Davidowitz & Varian (2015). Working Paper.
Week 13 **Nov 20**	**24) Unreported Victims of an Economic** Stephens-Davidowitz et al. (2013). Working Paper.
Week 14 **Nov 25**	**25) Super Returns to Super Bowl Ads** Stephens-Davidowitz et al. (2017). Quant Mark Econ, 15:1-28.
Week 14 **Nov 27**	**Holiday - No Classes**
Week 15 **Dec 2**	**26) The Cost of Racial Animus on a Black Candidate Evidence using Google Search Data** Stephens-Davidowitz (2014). Journal of Public Economics.118, 26-40
Week 15 **Dec 4**	**27) Draft Research Proposal II**
Week 16 **Dec 9**	**Study Day**
Week 16 **Dec 11**	**Final Exam** **Research Proposal II**

5) Grading

5.1) Your final grade will be assessed as follows:

Assignment	Weight	Date
Surveys*	1%	Wednesday, Sep 25 (at 4:00 pm)
Homework	19%	Check on Canvas
Lab	40%	Check on Canvas
Research Proposal I	15%	Wednesday, Oct 16 (at 4:00 pm)
Research Proposal II	25%	Wednesday, Dec 11 (at 4:00 pm)
Total	100%	

* You can answer the surveys "Demographics and Study Methodology" and "Early Course Evaluation" on Canvas.

Grading Scale

94+ = A
90+ = A-
87+ = B+
84+ = B
80+ = B-
77+ = C+
74+ = C
70+ = C-
67+ = D+
64+ = D
61+ = D-
Below 61 = F

5.2) Instructions for Surveys, Homework, Lab, and Research Proposal

Guidelines and detailed instructions about Surveys, Homework, Lab, Research Proposal are available on Canvas.

5.3) Makeup Policy for any Assignment

If you miss any Assignment, I will provide a makeup activity in the case of an excused and unavoidable absence. Then it is YOUR RESPONSIBILITY to provide satisfactory written documentation of an excused and unavoidable absence as soon as possible. For example, if you are ill – the accompanying doctor's note must say that you cannot (or could not) do the Homework or Lab. If the doctor's note does not state this clearly, your score will be zero.

6. Course Expectations

6.1) Clarifying Expectations

To succeed in this course, you'll need to invest a good amount of time and energy doing exercises outside the class time. If at any time you feel you're investing the required time and energy but aren't learning the material or improving your skills, contact me and I'll do my best to

help you and to suggest additional resources and options. If you have questions or concerns that you believe can be handled via e-mail, feel free to contact me that way. If I cannot adequately respond to your question via e-mail, I'll ask you to come to my regular office hours or make an

6.2) Academic Integrity

Wayne State University aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. For information on Student Code of Conduct, please see https://doso.wayne.edu/conduct/codeofconduct.pdf. Students who commit or assist in committing dishonest acts are subject to sanctions described in the Student Code of Conduct.

6.3) Special Accommodations

If you have a documented disability that requires accommodations, you will need to register with Student Disability Services (SDS) for coordination of your academic accommodations. The Student Disability Services (SDS) office is located at 1600 David Adamany Undergraduate Library in the Student Academic Success Services department. SDS telephone number is 313-577-1851 or 313-577-3365 (TDD only). Once you have your accommodations in place, I will be glad to meet with you privately during my office hours to discuss your special needs. Student Disability Services' mission is to assist the university in creating an accessible community where students with disabilities have an equal opportunity to fully participate in their educational experience at Wayne State University.