Wayne State University - Department of Economics
ECO 5100 (001) 14233 - Introductory Statistics and Econometrics (Fall 2019)

Instructor: Vitor Kamada
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MW, 4:10 – 5:10 pm in my office, or by appointment.

1) Course Description

This course introduces the main statistical and econometric methods that are frequently used in economic consulting, big corporations, and academic sector. An important emphasis is put on practical application and on the use of Tableau and Python Computer Language to analyze real-world datasets. The first part of this course covers Probability, Statistics, and Regression. The second part generalizes the concepts learned in the first part to Big Data and Google Data.

2) Learning Outcomes

The main goal of this course is to develop statistical/econometric reasoning. Statistical reasoning involves understanding the logic behind the statistical procedures and being able to fully interpret the results. Furthermore, after this course students will become proficient in using Tableau and Python to perform a variety of statistical and econometric analysis, specially forecasting economic variables.

3) Required Textbook

Diez, D. M., Barr, C. D., Çetinkaya-Rundel, M. (2014). Introductory Statistics with Randomization and Simulation. Available for free at: https://www.openintro.org/stat/textbook.php?stat_book=isrs

Loth, Alexander (2019). Visual Analytics with Tableau. John Wiley & Sons. Available for free via Wayne State LIbrary at: https://onlinelibrary-wiley-com.proxy.lib.wayne.edu/doi/book/10.1002/9781119561996

Sargent, T. J. and Stachurski, J. (2019). Lectures in Quantitative Economic. Available for free at: https://lectures.quantecon.org/py/

Stephens-Davidowitz, Seth. (2017). Everybody Lies: Big Data, New Data, and What the Internet Can Tell Us About Who We Really Are. Dey Street Books.

4) Required Software

4.1) Tableau Desktop

Tableau is the most popular Business Intelligence software for live visual analytics and data exploration. It is an entry-level and user-friendly software for fast data prototyping. You can create fancy and complex graphics just using the mouse. Tableau also accepts Python scripts for more advanced statistical analysis.

A free student license can be obtained from: https://www.tableau.com/academic/students . Fill the form with your Wayne State University e-mail, and you will receive the license and link to download Tableau Desktop.

4.2) Python

Python is an open-source programming language. It tends to be the dominant language in many branches of Data Science, such as: Machine Learning, Deep Learning, Natural Language Processing, Network Analysis, and deployment of Big Data infrastructure; etc.

There are several ways to run Python Code. I will use the Google Colab, a free Jupyter notebook environment that runs entirely in the cloud.

If you don't have a Google Account, you will need to create one, before accessing Google Colab at: https://colab.research.google.com/

5) Course Schedule

Part I –Probability and Statistics

Date	Topics/Key Concepts	Reference
Week 1 **Aug 28**	**1) Probability** Law of Large Numbers, Mutually Exclusive Outcomes, Probability Distributions, Independence, Conditional Probability, Marginal and Joint Probabilities.	Diez et al. (2014): Appendix A1 Appendix A2

Week 2 **Sep 2**	**Labor Day**	
Week 2 **Sep 4**	**2) Random Variables** Expectation, Variance, Standard Deviation, and Linear Combinations.	Diez et al. (2014): Appendix A3
Week 3 **Sep 9**	**3) Introduction and Getting Started with Tableau**	Loth (2019): Ch 1
Week 3 **Sep 11**	**4) Experiment** Association vs Causation, Treatment and Control Group, Population and Sample, Random Sample, Bias, and Randomized Experiment.	Diez et al. (2014): Ch 1
Week 4 **Sep 16**	**5) Adding Data Sources in Tableau**	Loth (2019): Ch 2
Week 4 **Sep 18**	**6) Introduction to Data** Mean, Variance, Standard Deviation, Scatterplots, Histograms, Box Plots, Quartiles, Median, Outliers, Contingency Tables, Bar Plots and Pie Chart.	Diez et al. (2014): Ch 1
Week 5 **Sep 23**	**7) Creating Data Visualizations**	Loth (2019): Ch 3
Week 5 **Sep 25**	**8) Statistical Test** Null Hypothesis, Alternative Hypothesis, p-value, Statistical Significance, Test Statistic, Type 1 Error, and Type 2 Error.	Diez et al. (2014): Ch 2 and 3.1
Week 6 **Sep 30**	**9) Aggregate Functions, Calculated Fields, and Parameters**	Loth (2019): Ch 4
Week 6 **Oct 2**	**10) Normal Distribution** Central Limit Theorem, Z score, Normal Probability, Standard Error (SE), Confidence Interval, and Margin of Error.	Diez et al. (2014): Ch 2
Week 7 **Oct 7**	**11) Table Calculations and Level of Detail Calculations**	Loth (2019): Ch 5
Week 7 **Oct 9**	**12) t-distribution** t-confidence Interval for the Mean, One Sample t-test, Paired t-test, Difference of Two Means.	Diez et al. (2014): Ch 4
Week 8 **Oct 14**	**13) Maps**	Loth (2019): Ch 6
Week 8 **Oct 16**	**14) Analysis of Variance (ANOVA)** F-test, Mean Square Between Groups (MSG), and Mean Square Error (MSE).	Diez et al. (2014): Ch 4
Week 9 **Oct 21**	**15) Empirical Report I**	
Week 9 **Oct 23**	**16) Linear Regression (Least Squares Line)** Line Fitting, Residuals, R-squared, Extrapolation, Categorical Predictors, Outliers, and Inference.	Diez et al. (2014): Ch 5

Week 10 Oct 28	**17) Advanced Analytics: Trends, Forecasts, Clusters, and other Statistical Tools**	Loth (2019): Ch 7
Week 10 Oct 30	**18) Multiple Regression** Adjusted R-squared, Model Selection and Assumptions	Diez et al. (2014): Ch 6.1 to 6.3
Week 11 Nov 4	**19) Interactive Dashboards**	Loth (2019): Ch 8

Part II – Student Presentations based on Davidowitz (2017) and Complementary Reference

Week 11 Nov 6	**Introduction: The Outlines of a Revolution** **1. Your Faulty Gut** **2. Was Freud Right?**	Davidowitz (2017): Introduction, Ch 1, and, Ch 2.
Week 12 Nov 11	**3. Data Reimagined** Bodies as Data Words as Data Pictures as Data	Davidowitz (2017): Ch 3
Week 12 Nov 13	**4. Digital Truth Serum** The Truth About Sex The Truth About Hate and Prejudice The Truth About the Internet	Davidowitz (2017): Ch 4
Week 13 Nov 18	**4. Digital Truth Serum** The Truth About Child Abuse and Abortion The Truth About Your Facebook Friends The Truth About Your Customers Can We Handle the Truth?	Davidowitz (2017): Ch 4
Week 13 Nov 20	**5. Zooming In** What's Really Going On in Our Counties, Cities, and Towns? How We Fill Our Minutes and Hours Our Doppelgangers Data Stories	Davidowitz (2017): Ch 5
Week 14 Nov 25	**6. All the World's a Lab** The ABCs of A/B Testing Nature's Cruel—but Enlightening—Experiments	Davidowitz (2017): Ch 6
Week 14 Nov 27	**Holiday - No Classes**	
Week 15 Dec 2	**7. Big Data, Big Schmata? What It Cannot Do** The Curse of Dimensionality The Overemphasis on What Is Measurable **8. Mo Data, Mo Problems? What We Shouldn't Do** The Danger of Empowered Corporations The Danger of Empowered Governments Conclusion: How Many People Finish Books?	Davidowitz (2017): Ch 7, Ch 8, and Conclusion

Part III - Final

Week 15 Dec 4	**Draft Empirical Report**	
Week 16 Dec 9	**Study Day**	
Week 16 Dec 11	**Final Exam Empirical Report II**	

6) Grading

6.1) Your final grade will be assessed as follows:

Assignment	Weight	Date
Surveys*	1%	Wednesday, Sep 25 (at 4:00 pm)
Homework	54%	Check on Canvas
Presentation	15%	Check on Canvas
Empirical Report I	10%	Wednesday, Oct 21
Empirical Report II	20%	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

6.2) Instructions for Surveys, Homework, Lab, and Empirical Report

Guidelines and detailed instructions about Surveys, Homework, Lab, Empirical Report are available on Canvas.

6.3) 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.

7. Course Expectations

7.1) 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 appointment.

7.2) 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.

7.3) 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.