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| **Data Analytics III**  **MSBA 650-77** |
| **Spring 2021** |

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| **Instructor** | Jose M. Fernandez |
| **Contact information** | Office: College of Business, Room 137  Office Phone: (502) 852-4861  Email: jose.fernandez@louisville.edu |
| **Office hours** | Make appointment here <https://calendly.com/jmfern02/meet-the-chair> |
| **Teaching Assistant** |  |
| **Available** | 3-5 pm on Monday-Thursday or by appointment |

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| **II. Course Information** | |
| **Class time / Room** | Tuesday and Thursday from 6pm-9:30pm in BAB 129 |
| **Required texts** | There are several free text you can use for this class.  [Principles of Econometrics with R](https://bookdown.org/ccolonescu/RPoE4/)  [Introduction to Econometrics with R](https://www.econometrics-with-r.org/)  [Econometrics Academy – Introduction to R](https://sites.google.com/site/econometricsacademy/econometrics-software/r)  [Using R for Introductory Econometrics](http://www.urfie.net/read.html) (a companion for the Wooldridge book mentioned below)  [Causal Inference: The Mixtapes by Scott Cunningham](https://www.scunning.com/mixtape.html) |
| **Recommended text** | Actual Books  Mastering ‘Metrics: The Path from Cause to Effect or Mostly Harmless Econometrics by Joshua Angrist and Jörn-Steffen Pischke (easy to read and very little math)  If you need a technical reference book, then pick up Introductory Econometrics by Jeffrey M. Wooldridge |
| **Required Software** | • We require the R Statistical Software, which is powerful and free. R can be downloaded at the link below: http://www.cran.r-project.org/  • Rstudio is a free platform for both writing and running R, available at www.rstudio.org. Some students find it friendlier than basic R.  • We do assume that you have used R in a previous class. I will provide limited software instruction, in-class demonstration, and code to accompany lectures and assignments. However, this is not a class on R. Like any language, R is only learned by doing. You should install R as soon as possible and familiarize yourself with basic operations.  • Students can become proficient in a few weeks. Some manuals are very helpful to learn R, e.g., <http://cran.r-project.org/manuals.html>  • Additional resources: (a) Tutorials at data.princeton.edu/R are fantastic (and there are many others out there). (b) Youtube intros to R, e.g. the series from Google Developers. |
| **Course Description** | The course presents advance business analytics using R. The concepts learned in this class should help you identify opportunities in which business analytics can be used to improve performance and support important decisions. It will teach you important tools that can be used to transform data into high-impact business decisions. Lastly, it should make you alert to the ways that analytics can be used — and misused — within an organization.  Course topics include a review of basis statistical ideas, numerical and graphical methods for summarizing data, linear regression, logistic regression, multinomial logit, propensity score matching, count models, sample selection, and survival analysis. The course presents real-world examples where a significant competitive advantage has been obtained through large-scale data analysis. Examples include advertising, eCommerce, finance, health care, marketing, and revenue management. The ultimate goal is, of course, help to make better business decisions using advanced analytics. |
| **Prerequisites** | Introduction to R; Data Analytics I and II |
| **Learning Objectives** | * Provide an introduction to causal inference. * Perform data analysis with binary, censored, and count data * Methods for handling big data with R |
| **Learning Outcomes** | * Demonstrate an understanding of the assumptions underlying commonly used empirical approaches for the identification of causal effects, including:   + Ordinary least squares   + Matching   + Difference in differences   + Fixed effects   + Instrumental variables   + Probit/Logit (Conditional, Multinomial, Ordered)   + Sample Selection Model   + Censored/Truncated Data   + Count Data Models   + Survival Analysis   + Quantile Regression (possibly) * Demonstrate an understanding of the interplay between economic theory and empirical work. * Apply modern empirical methods using data analysis exercises. |
| **Final drop date** | Please contact the MBA Office |

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| **III. Evaluation** | | |
| **Grading scale** | 97.0 - 100 : A+ 94.0 -  96.9 : A 90.0 -  93.9 : A- 87.0 -  89.9 : B+ 84.0 -  86.9 : B 80.0 -  83.9 : B- 77.0 -  79.9 : C+ 74.0 -  76.9 : C 70.0 -  73.9 : C- 67.0 -  69.9 : D+ 64.0 -  66.9 : D 60.0 -  63.9 : D- 00.0 -  59.9 : F | |
| **Grading scheme** | *Grading component* | *Weighted grading percentage* |
| Group Exercises | 60% |
| Quizzes (5) Lowest one Dropped | 40% |
| **Grade Items** | Group Assignments will be graded using a √+ = 100%, √ = 90%, √- = 80%. Each assignment has a grading rubric available to help guide students. The quizzes focus on statistical knowledge such as correctly identifying the appropriate model with the appropriate data. | |

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| IV. Schedule | | | |
| Class | Date | | Topic |
| 1-2 | Feb. 16 - 18 | | Review of Linear Regression in R   * Simple Linear Regression * Multiple Regression * Interaction Variables, Log Transformations, Dummy Variables |
| 3-4 | Feb. 23 - 25 | | The Search for Causality   * Experiments * Difference in Differences * Instrumental Variables * Regression Discontinuity |
| 5 | March 2 | | * Propensity Score Matching |
| 6 | March 4 | | Latent Choice Variables   * Logistic Regression * Conditional Logit * Multinomial Logistic Regression * Demand Estimation |
| 7 | March 9 | | Censored/Truncated Data   * Tobit * Truncated Regression * Sample Selection: Heckman |
| 8 | March 11 | | Count Data   * Ordered Logit * Poisson Regression * Negative Binomial * Zero-Inflated Poisson Regression |
| 9 | March 16 | | Introduction to Survival Analysis   * Exponential * Weibul * Kaplan-Meyer * Cox Proportional Hazard |
| 10 | March 18 | | Catching up or Quantile Regression |
| **Changes in the syllabus** | | Syllabus is subject to change. In particular the order of topics to be presented may change. | | |

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| **V1. Student Responsibilities / College and University Issues** | |
| **University of Louisville student**  **conduct and responsibilities** | This course will abide by University of Louisville student  conduct and responsibilities with regards to ethics and related issues:  <http://louisville.edu/dos/students/policies-procedures/student-handbook.html#codeofstudentconduct> |
| **College of Business student conduct and responsibilities** | This course will abide by College of Business student  conduct and responsibilities with regards to ethics and related issues:  <http://business.louisville.edu/students/college-of-business-academic-dishonesty-policy> |
| **Religious holiday conflict policy** | <http://louisville.edu/diversity/resources/work-restricted-holy-day-policies-calendar.html> |
| **University policy on equal access** | <http://louisville.edu/disability/policies-procedures> |
| **Title IX/Clery Act Notification** | Sexual misconduct (including sexual harassment, sexual assault, and any other nonconsensual behavior of a sexual nature) and sex discrimination violate University policies.  Students experiencing such behavior may obtain **confidential** supportfrom the PEACC Program (852-2663), Counseling Center (852-6585), and Campus Health Services (852-6479). To report sexual misconduct or sex discrimination, contact the Dean of Students (852-5787) or University of Louisville Police (852-6111).  Disclosure to **University faculty or instructors** of sexual misconduct, domestic violence, dating violence, or sex discrimination occurring on campus, in a University-sponsored program, or involving a campus visitor or University student or employee (whether current or former) is **not confidential** under Title IX. Faculty and instructors must forward such reports, including names and circumstances, to the University’s Title IX officer.  For more information, see the Sexual Misconduct Resource Guide  (<http://louisville.edu/hr/employeerelations/sexual-misconduct-brochure>). |