ECO 519_270
BUSINESS ANALYTICS TOOLS
WINTER 2024
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COURSE DESCRIPTION:
This course provides a comprehensive review of some basic mathematical and statistical methods and stresses their practical applications in economics and finance. The course will equip the student with the quantitative skills required in the MBA program and will also provide a good foundation for addressing typical problems that arise in finance and business.
This course will stress learning through applications/problem-solving using Excel software for data analyses. However, the course must be analytical and theoretical to the extent that is necessary to develop a correct understanding of the topics presented. The topics covered in the course include relevant mathematical concepts: graphing functions, solving a system of equations, understanding logarithms and exponential functions, and calculating slopes of linear and nonlinear functions. It also focuses on relevant statistical concepts: probability theory, statistical distributions, hypothesis testing and regression analysis (time series and panel data).

COURSE MODALITY:
This course is labeled as "Online-Asynchronous". This means we will have **no online Zoom** lecture meetings. The course is organized to be self-study using D2L. D2L contains all information you need for the course: (1) course outline and organization, (2) Audio Power-Point-Presentation lectures for each topic, and (3) assignments. I will communicate with all of you through email. If you have questions, please email them to me. Write clearly and concisely. Your email exchanges with me will be good writing practice for you. In the event that your questions cannot be addressed through email, I will arrange a Zoom meeting with you. I am teaching a Hybrid GSB 519 this quarter and will have 5 Zoom Lecture recordings from that class. I will post these Zoom recordings on your D2L website every other week.

TEXT:
1) Math portion of the course: No text. I have online lectures (available on DePaul D2L) and problems to help you through this part of the course.
2) Statistics portion of the course: *Business Statistics a First Course Global Edition*., 8th Edition; Levine, Szabat and Stephan (LSS). We will not refer to the text until after the 3rd class, so you have some time to buy or rent it.

SOFTWARE PACKAGE: All of the mathematics and many of the statistical concepts/techniques taught in this course are best learned through problem solving. For ease in computation, we will use Excel at the end of the statistics part of the course for regression analysis.

LECTURES AND FOCUS:
There are online PowerPoint/Audio lectures for all math topics and some statistics topics (on DePaul D2L). Additional statistics lectures will be posted in the next couple of weeks.

EXAMS: There will be an online Mid-term Exam (Available on DePaul D2L 03-13FEB) and an online Final Exam (Available on DePaul D2L 13-22MAR). The online exams will be multiple choice, but will consist of problems drawn from online lectures, assignments and readings. The

Final Exam will be multiple-choice. It will not be comprehensive, per se, but the material in the latter part of the class builds on material covered in the first half of the course.

ASSIGNMENTS: The only way to learn mathematics and statistics is to work problems, problems and more problems. My D2L site contains problems and solutions for the mathematics portion of the course. My website also lists assignment problems in your statistics text and the site has a link for the solutions to the problems in the statistics text. The text is composed mainly of exercises, many of which are interesting applications of the statistical concepts explained in the book. You will have frequent reading assignments and problem solving assignments from the text The assignments will not be graded, but answers are provided on D2L.

GRADES: The two exams will comprise 100% of your course grade (40% for the mid-term exam and 60% for the final exam). I always grade of a curve and I curve generously.

TENTATIVE SCHEDULE:

Mathematics Review – Review Sheet on DePaul D2L

Review of Algebra and Slopes: [Week 1-2]
Topics: Functions, manipulating equations, solving linear equations in two unknowns, solving quadratic equations, and logarithmic and exponential functions.

Applications: Solving for a system of equations. Linearizing production functions. Models of population and economic growth. Financial topics on present/future value and compounding.

Introduction to slopes and how they are used.
Applications: Discrete versus continuous growth, and compounding. Growth rates and elasticity. Role of variation in correlation/causality. Partial effect of changes in a right-hand-side (RHS) variable on a left-hand-side (LHS) variable (i.e., when all other RHS variables are held constant).

Probability and Statistics [Week 3] (TEXT: *Business Statistics a First Course,* 8th Edition; Levine, Szabat and Stephan (LSS))

By the start of the second Lecture you should have already read your textbook

- Chapter 1: Introduction (browse)
- Chapter 1 Appendix: Use of Excel
- Chapter 2: Presenting Data in Tables and Charts (browse)

I will not lecture on these chapters, but you should peruse them.

Descriptive Statistics: **[Week 3]** (LSS Chapter 3, Sections 3.1-3.4)

Measures of central tendency (mean, median, mode). Measures of spread (variance, standard deviation, skewness) correlation. Measures of association (covariance, correlation coefficient).

Basic Probability: [Week 4] (LSS Chapter 4, Sections 4.1-4.4)

Understanding and computing probabilities (simple, joint, conditional, independence)

Probability Models/Distributions: **[Week 4]** (LSS Chapter 5, Sections 5.1-5.3)

Concept of Probability Models (Random Variables (RV), Mean and Variance of RVs, probability density functions).
Discrete Probability Models (Binomial distribution)

Probability Models/Distributions (cont.): [Week 5] (LSS Chapter 6, Sections 6.1-6.3)

Continuous Probability Models (the Normal distribution)

Mid-term Exam online (Multiple-Choice. Includes material on mathematics and statistics up to this point) [Exam Available on D2L: 03 – 13FEB]

Hypothesis Testing: [Week 6] (LSS Chapters 9 and 10, Sections 9.1-9.5 and 10.1 – 10.5)

Hypothesis Test Methodology, Z-statistics, critical value of test statistic, p-value, connection to interval estimation One-tailed tests. Two-tailed tests using same concepts.)

Simple Linear Regression: [Week 7] (LSS Chapter 12 (Sections 12.1 through 12.4, and 12.7)

Basic Linear Regression (Least Squares Method, computing regression coefficients, measures of variation and fit, residual analysis, autocorrelation, inference about slope coefficient, confidence intervals for slope coefficient)

Multiple Regression: [Week 8] LSS Chapter 13 (Sections 13.1 and 13.2)

Development of Multiple Regression Model (interpretation of multiple coefficients, R-squared and adjusted R-Squared, residual analysis, inference about the slope coefficients, confidence interval estimation,

Dummy Variables: [Week 9] LSS Chapter 13 (Section 13.5)
Use of qualitative variables.

Regression Techniques with various Types of Data: [Week 10]

In-Class example of multiple regression with dummy variables. Introduction to Cross-sectional, Time-Series, and Big Data. What questions are we trying to answer with the data? These questions dictate what type of data we need.

Final Exam online (Multiple-Choice. Not comprehensive – covers material since the mid-term exam)
[13-22MAR]