



University of Cyprus
TIME MBE - Cyprus
DATA ANALYTICS AND QUANTITATIVE METHODS (MBE5103)
Academic Year 2023-2024

Instructor

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Course Description

This course offers a comprehensive exploration of statistical data analysis, leveraging the user-friendly power of Python. In the dynamic realm of modern business, where vast datasets offer intricate insights into companies, the business landscape, and the economy, cultivating the ability to extract, dissect, and harness data is a crucial skill for managers.

Using the intuitive Pandas library in Python, this course equips students with the tools to navigate statistical data analysis adeptly, with special attention given to applications using economic and financial data. By developing proficiency in a standardized array of statistical and graphical techniques, participants gain invaluable skills for effectively processing and scrutinizing data, particularly in the context of economics and finance. Beyond analysis, the course is designed to empower managers with the ability to thoughtfully engage with data, ultimately leading to well-informed managerial decisions.

Throughout the curriculum, students delve into diverse case studies spanning management, marketing, finance, and economics. As data analysis becomes the focal point for unraveling these real-world scenarios, participants not only refine their technical abilities but also cultivate a keen sense for distilling insights that drive superior managerial strategies.

Course Website

<http://www.timembe.eu/en/program/course>

Course Objectives and Learning Outcomes

The primary objective of this course is to equip students with the essential quantitative and critical skills necessary to adeptly summarize, analyze, and interpret substantial volumes of data. Through the utilization of key statistical indices and tools, students will gain a profound understanding of these methodologies while being attuned to their inherent limitations.

By the conclusion of this course, students will have achieved the following learning outcomes:

- **Application of Appropriate Statistical Tools:** Students will confidently select and apply appropriate statistical tools tailored to diverse situations, demonstrating a nuanced grasp of when and how to utilize specific techniques.
- **Proficiency in Python Data Analysis:** Through hands-on experience, students will master the art of data analysis using Python, encompassing the domains of visualization, descriptive statistics, and inferential statistics.
- **Data Summarization and Visualization:** Students will harness the capabilities of Python to effectively summarize and visually represent various forms of data, facilitating the clear communication of insights.
- **Interpretation of Confidence Intervals and Hypothesis Tests:** Students will proficiently interpret the outcomes of confidence intervals and hypothesis tests, providing them with the skill to extract meaningful conclusions from statistical analyses.
- **Comprehension and Execution of Regression Analysis:** Students will demonstrate competence in both performing and interpreting regression analysis, grasping the underlying concepts and implications of this crucial technique. They will understand the underlying assumptions and how to diagnose potential misspecification issues.
- **Informed Decision-Making:** Armed with a solid foundation in statistical data analysis, students will exhibit the ability to make well-informed decisions grounded in rigorous analysis.
- **Team work and and Individuality:** Students will cultivate the capacity to effectively contribute within team dynamics while also excelling in individual tasks, fostering versatility in their approach to data-driven challenges.

Upon completing this course, students will emerge with a comprehensive skill set, prepared to navigate the complexities of data analysis using Python and to leverage their insights for astute decision-making across various professional domains.

Course Materials and Readings

Instructor's notes.

Anderson D.R., Sweeney D.J., Williams T.A., Camm J.D. and J.J. Cochran (2014) *Statistics for Business and Economics*, South-Western College Pub, 12th edition. (ASWCC)

Heiss, Florian and Brunner, Daniel (2020) *Using Python for Introductory Econometrics*. Author: Florian Heiss, Daniel Brunner. (HB)

Course Requirements and Assessment

Students are expected to attend all the lectures and labs. The course is assessed by means of a formal final examination and homework assignments. The formal examination should take the form of a single two-hour test, the time and location of this test will be announced during the first week of the course and posted on the MBE's website. In the case of homework assignments, these will consist of both problem sets and computer exercises and submission details will be arranged by the Lecturers. Late coursework will get a mark of zero.

Assessment Summary

Assignments 30%

Participation and Presentations 10%

Final 60%

There will be one empirical homework assignment due at the end of week two. The homework assignments will count for 30% of your final grade while the exam counts for 50%.

Labs

In the lab students will be exposed to practical theoretical or empirical problems and they designed to help students comprehend the material and think critically about the data, the econometric techniques, and the results. For the empirical analysis we will rely on Python.

Clear and concise instructions will be provided to students to complete the assignments and presentations exercises.

Course Schedule and Content

The course structure comprises six two-hour lectures and six-hour lab sessions. Following each two-hour lecture, students will engage in a one-hour hands-on lab session focused on practical applications using Python.

Lectures

Lecture/Lab 1 - Data and Basic Statistics: Data, Data Sources, Data Types, Tabulating Data, Describing Data using Graphs, Tabulating and Visualizing Data, Describing Data using Statistical Measures, Location Measures, Measures of Variability, Empirical examples in Economics and Finance.

Lecture/Lab 2 - Elements of Probability Theory Introduction to Probability, Axioms and Rules in Probabilities, Conditional Probability, Discrete Probability Distribution , Continuous Probability Distributions. Applications using Python.

Lecture/Lab 3 - Elements of Statistical Inference Sampling and Sampling Distributions, Confidence Interval Estimation (mean, proportion, mean differences, proportion differences), Deriving Confidence Intervals using Stata, Hypothesis Testing (mean, proportion, mean differences, proportion differences), Using Python's pandas to obtain statistical inference.

Lecture/Lab 4 Simple Regression : Exploratory Data Analysis. Specification, Estimation, and Inference of the Single Linear Model: Testing and Confidence Intervals, Measures of Fit, Dummy Variables. Empirical examples using Python.

Lecture/Lab 5 - Multiple Regression: Multiple Regression model, Estimation, Measures of Fit, Joint tests (F-tests), Misspecification Tests.

Lecture/Lab 6 - Topics in Regression Nonlinearities, Elements of time-series analysis. Empirical examples using Python.