

ECON 700: Economic Analytics

Fall Semester, 2026
Department of Economics
Strome College of Business
Old Dominion University
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Office: Constant 2042
Class Hours: Asynchronous Instruction
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Accelerated Instruction
Additional Office Hours: By Appointment

1 Course Description

ECON 700 provides the foundation of skills necessary to successfully identify, acquire, manage, and analyze economic data from public and private sources. This course focuses on the theory and application of statistical methods in support of economic analysis and provides a foundation for the graduate courses in econometrics. The application of tools is centered around: (1) developing a testable research hypothesis; (2) identifying socio-economic data to test the hypothesis of interest; (3) utilizing programming techniques to access and obtain data, (4) using descriptive statistics to discuss the properties of the data, (5) understanding discrete and continuous probability distributions, (6) using data to test hypotheses about descriptive statistics.

In ECON 700, students will utilize a research framework where questions of interest motivate testable hypothesis that lead to the acquisition of economic data. Students will learn to program using a widely available statistical package to obtain, modify, and analyze economic data. Students will first use the programming language to obtain existing data sets and then move to using Application Programming Interfaces (APIs) to obtain data from a variety of public sources. Students will learn to obtain data from the United States Census, World Bank, and other institutions using available packages. Students will also learn how government data sources are collected and measured, including data sources from the BLS, BEA, and Census Bureau. These coding techniques will form the foundation for following classes in graduate econometrics.

2 Use of Statistical Software - R and R Studio

As this course focuses on the learning and application of econometric techniques, a computer or laptop with R and R Studio installed is required for class participation, homework, and exams. Students can obtain the latest version of R from <https://www.r-project.org/>. Students can obtain a free version of R-studio from <https://posit.co/download/rstudio-desktop/>. While students can directly code in R, it is recommended that student use R-studio to facilitate interactions with the R language. Students will also install numerous open source packages that will facilitate economic analysis in R.

Students are required to create and submit their assignments using R Markdown. This will help students develop their skills in R and also learn Latex. There are significant deductions if an assignment is not created in R Markdown and examinations not created in R Markdown will receive zero credit.

3 Prerequisites/Corequisites

Prerequisite: Admission to a graduate program in Economics, Finance, or related field

Recommended Pre/Co-requisites: Mathematical Economics (ECON 625)

4 Course Objectives

At the end of this course, students will be able to:

1. Formulate economic research questions and testable hypotheses that can be examined using publicly available data sources.
2. Acquire, manage, and prepare economic data by applying programming techniques in R, including data extraction from APIs and other official sources.
3. Apply descriptive statistics, probability concepts, and sampling methods to summarize, visualize, and interpret economic data.
4. Conduct hypothesis testing and interval estimation to draw valid inferences from economic and financial data.
5. Utilize R and RStudio to implement statistical techniques and effectively communicate results through reproducible code, visualizations, and written analysis.

5 Textbooks and Other Materials

The required textbooks are an integral part of the class. Students should expect to read the textbooks prior to class and to be prepared to answer discussion questions from the textbook. These textbooks provide a foundation upon which the course is built and students will succeed if they take the time to read and review the material in the textbooks.

The first textbook (Hanck, et. al.) provides students with an introduction to applied econometrics using the R programming language. The second textbook (Irizarry) provides an introduction to data science methods using R and covers many of the same topics that we discuss in class. These textbooks are free.

As this course focuses on the learning and application of statistical techniques, a computer with R and R Studio installed is necessary. You will need access to a laptop, tablet, or other computing device to complete the assignments and exams.

You may also use R Studio Cloud instead of a locally installed version of R. You can create a free R-Studio cloud account at <https://posit.co/download/rstudio-desktop/>

All other course materials are on Canvas or can be accessed through Canvas. You are required to know how to use Canvas to access and submit assignments, quizzes, and examinations. You should also be comfortable using ODU email to communicate.

5.1 Required Texts

Christoph Hanck, Martin Arnold, Alexander Gerber, and Martin Schmelzer. *Introduction to Econometrics with R*. Available for free online at <https://www.econometrics-with-r.org>, 2025.

Rafael A. Irizarry. *Introduction to Data Science: Data Wrangling and Visualization with R*. Available for free at <https://rafalab.dfci.harvard.edu/dsbook-part-1/>.

5.2 Reference Texts

David R. Anderson, Dennis J. Sweeney, Thomas A. Williams, Jeffrey D. Camm, and James J. Cochran. *Statistics for Business and Economics 14th Edition. Earlier editions will suffice*

Angrist, J.D. & Pischke, Jorn-Steffen. (2013). *Mostly Harmless Econometrics: An Empiricist's Companion*. Content Technologies Inc.

Chan, S. (2021) *Introduction to Probability for Data Science*. Michigan Publishing. Available for free at: <https://probability4datascience.com>

Kennedy, P. (2003). *A Guide to Econometrics*. MIT Press.

Baruffa, O. (2022). *The Big Book of R*. Available for free at: <https://www.bigbookofr.com/>

Wooldridge, J.M. (2019). *Introductory Econometrics: A Modern Approach*. Cengage Learning.

6 Instructional Methodologies

Students should familiarize themselves with the course schedule, assignment due dates, and examination dates. The expectation is that students will watch lecture videos, read the appropriate material, complete assignments and take quizzes and examinations on schedule. Office hours are available on Zoom and by appointment and students are encouraged to participate in office hours. All materials are hosted on Canvas.

7 Requirements and Grading

The evaluation for this course consists of the following elements: assignments, cumulative weekly quizzes, and a cumulative final examination. Due to the nature of the course, late submissions of any assignment will receive a score of zero once the answer key is posted (typically within 12 hours of the due date and time for the assignment). Quizzes and examinations must be taken on schedule.

Under extraordinary and documented circumstances, makeups are allowed for the quizzes only.

Grading will be conducted on a traditional linear scale that is not subject to a curve, that is, 100-90=A, 80-89=B, 70-79 = C, 60-69 = D, 59 – below = F. Grades will be broken down 3-4-3, that is, 80-82 = B-, 83-86 = B, 87-89 = B+ and so on.

The final grade is comprised of the following elements:

1. Weekly assignments: 30% of the final course grade
2. Weekly cumulative quizzes: 40% of the final course grade
3. Final examination: 30% of the final course grade

8 Weekly Assignments

Students will have the opportunity practice skills using R and RStudio and apply concepts and theory on a weekly basis. Weekly assignments are cumulative in nature, that is, the skills learned in one assignment are used to build skills in succeeding assignments. Timely submission of assignments is imperative due to the accelerated nature of the class.

9 Weekly Quizzes

Each week, students will take a short quiz. The quizzes are cumulative and increase in length as the course progresses. Students will have a limited amount of time to take each graded quiz. A quiz may include multiple choice and short response questions as well as small coding questions.

10 Cumulative Final Examination

The final examination is time limited, and students are expected to complete the examination without assistance (see the ODU Academic Honesty policy).

The final examination consists of problems, short responses, and may include short essay questions. The final examination covers all the material in the course.

11 Timely Submission of Assignments, Quizzes, and Examinations

Weekly assignments are due at 2359 on the due date. Students may complete weekly assignments as soon as the assignments are made available to the entire class. Late submission of a weekly assignment will incur a one letter grade per day penalty and late assignments will not be accepted once the answer key is posted to Canvas.

Under extraordinary, documented circumstances, students may schedule an alternative time for the final examination. Students should have no expectation of additional or extra-credit assignments.

Except for grades of “Incomplete”, all grades are considered final when reported by a faculty member at the end of a semester. A change in grade may only be requested when a calculation, clerical, administrative, or recording error is discovered in the original assignment of a course grade or when a decision is made by the faculty member to change the course grade because of the disputed academic evaluation procedures. Grade changes necessitated by a calculation, administrative, or recording error must be reported within a period of six months from the time the grade is awarded. **No grade may be changed as the result of a re-evaluation of a student’s work or the submission of supplemental work following the close of a semester.**

Students should clearly communicate any difficulties with the instructor as soon as possible. It is the student’s responsibility to inform the instructor of any issues with Canvas, R or RStudio, or scheduling that may impact their performance in the course.

12 Communication

Students should feel welcome to contact me via email at `\url{mcnab@odu.edu}`, drop by Zoom office hours, or, if on campus, drop by my office. I have an ‘open door’ policy for student questions and strongly encourage students to communicate with me. I will try to answer emails within 2 business days (often much sooner) for course related topics.

Students should take the time to craft complete, professional emails. The more information that you can provide about a question or problem, the more likely that my response will be helpful. Avoid non-professional language and practice communicating in the corporate workplace. Emails that are unprofessional may be returned with no action.

As this is an asynchronous, accelerated course, students should proactively communicate with me regarding any concerns with the course. Students should also pay attention to course announcements on Canvas for timely updates of course content and schedule.

13 University Policy: Code of Student Conduct and Academic Integrity

The [Office of Student Conduct & Academic Integrity](#) (OSCAI) oversees the administration of the student conduct system, as outlined in the Code of Student Conduct. Old Dominion University is committed to fostering an environment that is: safe and secure, inclusive, and conducive to academic integrity, student engagement, and student success. The University expects students and student organizations/groups to uphold and abide by standards included in the Code of Student Conduct. These standards are embodied within a set of core values that include personal and academic integrity, fairness, respect, community, and responsibility.

14 University Policy: Honor Pledge

By attending Old Dominion University, you have accepted the responsibility to abide by the Honor Pledge:

I pledge to support the Honor System of Old Dominion University. I will refrain from any form of academic dishonesty or deception, such as cheating or plagiarism. I am aware that as a member of the academic community it is my responsibility to turn in all suspected violations of the Honor Code. I will report to a hearing if summoned.

15 University Policy: Discrimination Policy

The purpose of this policy is to establish uniform guidelines in order to promote a work and education environment that is free from harassment and discrimination, as defined below, and to affirm the University's commitment to foster an environment that emphasizes the dignity and worth of every member of the Old Dominion University community. The [Discrimination Policy](#) details the process to address complaints or reports of retaliation, as defined by this policy.

16 Diversity and Inclusion

The [Division of Student Engagement & Enrollment Services](#) values the uniqueness of our Monarch community. The word "engagement" reflects our commitment to embrace the differences in our cultural backgrounds, perceptions, beliefs, traditions, world views, socio-economic status, cognitive and physical abilities.

We will strive to serve as the pre-eminent model for engaging every student to achieve their own success. Our core values are fueled by our responsibility and actions toward community development and engagement, cultural competence and understanding, physical and mental wellness and inclusion for every member of ODU. We will embrace our greatest strength - the diverse composition of our student body and workforce. For more information regarding diversity and inclusion, please visit the [Office of Intercultural Relations](#).

17 University Policy: Educational Accessibility and Accommodations

Old Dominion University is committed to ensuring equal access to all qualified students with disabilities in accordance with the Americans with Disabilities Act. The [Office of Educational Accessibility](#) (OEA) is the campus office that works with students who have disabilities to provide and/or arrange reasonable accommodations. The [Accommodations for Students with Disabilities](#) define the procedures used to accommodate student with disabilities. Students are encouraged to self-disclose disabilities that the Office of Educational

Accessibility has verified by providing Accommodation Letters to their instructors early in the semester in order to start receiving accommodations. Accommodations will not be made until the Accommodation Letters are provided to instructors each semester.

18 University Policy: University Email Policy

With the increasing reliance and acceptance of electronic communication, email is considered an official means for University communication. Old Dominion University provides each student an email account for the purposes of teaching and learning, research, administration, and service. It is the responsibility of every eligible student to activate MIDAS, the Monarch Identification and Authorization System, in order to obtain email access. It is important that all students are aware of the expectations associated with email use as outlined in the [Student Email Standard](#). The email account provided by the University is considered to be an official point of contact for correspondence. Students are expected to check their official e-mail account on a frequent and consistent basis in order to stay current with University communications. Mail sent to the ODU email address may include notification of University-related actions, including academic, financial, and disciplinary actions. For more information about student email, please visit [Student Computing](#).

19 University Policy: Withdrawal

A syllabus constitutes an agreement between the student and the course instructor about course requirements. Participation in this course indicates your acceptance of its teaching focus, requirements, and policies. Please review the syllabus and the course requirements as soon as possible. If you believe that the nature of this course does not meet your interests, needs or expectations, if you are not prepared for the amount of work involved – or if you anticipate assignment deadlines or abiding by the course policies will constitute an unacceptable hardship for you – you should drop the course by the drop/add deadline, which is listed in the [ODU Schedule of Classes](#). For more information, please visit the [Office of the University Registrar](#).

20 University Policy: Privacy of Student Information

Old Dominion University recognizes its duty to uphold the public's trust and confidence, not only in following laws and regulations, but in following high standards of ethical behavior. Members of the Old Dominion University community are responsible for maintaining the highest ethical standards and principles of integrity. The [Code of Ethics](#) is a set of values-based statements that demonstrate the University's commitment to this goal. The [Privacy of Student Information](#) details Family Educational Rights & Privacy Act (FERPA), along with other information regarding privacy.

21 Course Modules and Examinations

The course outline is subject to change. Changes will be posted to Canvas. We will cover topics from the textbook, assignments, and short video presentations. Topics will be covered in the order shown in this syllabus, but we may spend more (or less) time on a topic depending on whether students have mastered the material. Students may find it useful to form study groups for the assignments, however, each student is responsible for mastering the material that is covered during the class.

22 Generative AI

This course encourages students to use Generative AI tools such as ChatGPT for assistance in completing assignments. Generative AI can assist you with learning how to code in R and to write using Latex. However, the use of generative AI is no substitute for coding on your own and learning how code works. Some assignments and exams may take place without access to Generative AI and search tools. You will find it difficult to complete these assignments and/or exams if you rely on AI tools to complete your work.

When you use AI tools, you should acknowledge the use in your responses. It is the student's responsibility to assess the validity and applicability of Generative AI output and the student bears complete responsibility for all submitted work. If you do not cite your use of AI tools or attempt to substitute AI output for your work, I will consider this a violation of ODU's academic conduct policy and take appropriate action.

23 Asynchronous-Accelerated Instruction

All materials are available at the start of class. You must complete each module in its entirety before you can complete the next module. Students are expected to complete assignments on time and moving ahead of the due dates is recommended to provide sufficient time to master more complex material.

The final examination will open 2 weeks before the end of class. Students must submit all assignments and materials prior to taking the final examination.

Course Modules and Examinations

The course outline is subject to change. Changes will be posted to Canvas. We will use topics from the textbook, case studies, and short video presentations. Topics will be covered in the order shown in the outline, but we may spend more (or less) time on a topic depending on whether students have mastered the material. Students may find it useful to form study groups for the homework assignments and quizzes, however, each student is responsible for mastering the material that is covered during the class.

Module.1 Week 1

Topics: Introduction to R and Descriptive Statistics

Readings: Chapters 1-3 (Anderson), Sections 1-4 (Irizarry), Suggested: Chapter 1-3 (Hanck)

Performance: Problem Set 1

Performance: Quiz 1

At the completion of this module, students will have installed R and RStudio. Students will under the basic foundations of working in R and the basic data types in R. Students will construct row and column vectors and perform mathematical transformations of the data. Students will learn how to combine vectors and how to form matrices in R. Students will gain an understanding of data frames and estimate basic descriptive statistics using real world data. Students will construct basic plots of data. Students will learn how to use R Markdown to answer homework assignments with code chunks and in-line code.

Module.2 Week 2

Topics: Covariance and Correlation

Topics: Introduction to R and Descriptive Statistics

Readings: Chapters 2-3 (Anderson), Sections 1-4 (Irizarry), Suggested: Chapter 1-3 (Hanck)

Performance: Problem Set 2

Performance: Quiz 2

At the completion of this module, students will estimate covariance between two series and correlation between two series. students will manipulate row and column vectors of data in R. Students will combine two or data frames into a single data frame. Students will work with the concept of ‘piping’ (through an introduction to the tidyverse) data in R and how to create new data frames by manipulating existing data frames. Students will understand the differences among common types of data and how to convert one type to another. Students will estimate descriptive statistics using example and publicly available data, including replicating obtaining data using an API. Students will continue to expand their use of R Markdown to communicate the results of their work.

Module.3 Week 3

Topic: Introduction to Probability

Readings: Chapters 4-6 (Anderson), Sections 14 and 15 (Irizarry) (Probability)

Performance: Problem Set 3

Performance: Quiz 3

Students will examine the concept of probability and use discrete and continuous data to explore probability concepts. We will start with discrete probability distributions and how to develop histograms of

discrete data. We will discuss the difference between discrete and continuous probability distributions and explore probability rules. Students will simulate probability distributions and examine the properties of these distributions. Students will continue to develop skills importing and visualizing data in R.

Module.4 Week 4

Topic: Discrete Probability Distributions

Readings: Chapters 4-6 (Anderson), Sections 14 and 15 (Irizarry) (Probability)

Performance: Problem Set 4

Performance: Quiz 4

Students will focus on discrete probability distributions in this module. We will continue to work on histograms of discrete data. We will also simulate discrete data in R. We will extend our discussion to include the calculation of probabilities and expected values using discrete distributions.

Module.5 Week 5

Topic: Continuous Probability Distributions

Readings: Chapters 4-6 (Anderson), Sections 14 and 15 (Irizarry) (Probability)

Performance: Problem Set 5

Performance: Quiz 5

Student will examine the properties of common continuous probability distributions in this module. Students will work on computing probabilities for continuous distributions and creating visualizations using R of these distributions. Students will examine how to apply continuous distributions to economic data.

Module.6 Week 6

Topic: Sampling Distributions

Readings: Chapters 7 and 8 (Anderson), Sections 14 and 15 (Irizarry)

Performance: Problem Set 6

Performance: Quiz 6

Students will discuss the concept of sampling and how sampling distributions can affect descriptive statistics. Students will work with microdata to construct samples and will examine how sampling distributions differ from the population in question. Time permitting, students will examine the concept of interval estimation.

Module.7 Weeks 7 and 8

Topic: Interval Estimation and Hypothesis Testing

Readings: Chapters 8-11 (Anderson), Section 15 (Irizarry)

Performance: Problem Sets 7 and 8

Performance: Quiz 7 and 8

In this module, students will estimate intervals and develop an understanding of hypothesis testing. Students will explore the concepts of the null and alternative hypotheses, the power of a test, and statistical significance. Students will examine the properties of population and sample data and construct tests of means,

proportions, and variances of populations and samples. Students will make inferences about the population. Students will conduct statistical inference, develop confidence intervals, and conduct statistical tests using R.

Module.8 Final Examination

Students may take the examination at any time during the examination window. Timed, online examination available through Canvas.

Examinations typically consist of derivations, problems, and application in R. Open book and open note examination.

Examination window closes at 11:59 on the due date. ODU policy states that final grades must be submitted within 48 hours of the final examination.