Kuwait University
College of Business Administration
Economics Department

Course Syllabus
ECON 350 – Econometrics[1]
(ECON 405 – Econometrics)[2]
Spring 2022/2023
Dr. Ebrahim Alebrahim

Lecture Time and Location

Sundays, Tuesdays, and Thursdays from 12:00 PM to 12:50 PM in Room C3 1005. Please make sure to attend all lectures and arrive on time.

Contact Information

Location: Economics Department – 3rd Floor – Zone A – Office No. 1074

Email: ebrahim.alebrahim@ku.edu.kw

Office Hours: Sundays, Tuesdays, and Thursdays from 11:00 PM to 11:45 PM, as well as available by appointment or walk-in.

Teaching Assistant

Name: Mahmoud Arab

Location: Economics Department – 3rd Floor – Zone A – Office No. 1067

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Office Hours: TBD

Tutorial: Tuesday 4:00 PM – 4:50 PM, Room TBD

Course Description

Introduction to econometrics by merging mathematics, probability, and statistics to answer economic questions using data. The course covers model specification, estimation, and inference, using multiple linear regression and ordinary least squares estimation while also incorporating nonlinear relationships and discrete variables. Violations of the classical linear model assumptions are examined, including endogeneity, heteroskedasticity, correlated data, non- normality, and nonlinearity. Emphasis is placed on practical applications of econometric methods to answer questions of cause and effect and forecast macroeconomic variables.

[1] For students admitted starting from the 2021/2022 academic year
[2] For students admitted before the 2021/2022 academic year

Prerequisites

For students admitted starting from the 2021/2022 academic year:

ECON 230 (Mathematics for Economists) & ISOM 220 (Business Statistics II)

For students admitted before the 2021/2022 academic year:

ECON 210 (Microeconomic Theory), ECON 211 (Macroeconomic Theory), & ISOM 220 (Business Statistics II)

Corequisites

For students admitted starting from the 2021/2022 academic year:

ELU 126 (English for Academic Purposes I) & ECON 320 (Intermediate Microeconomics)

For students admitted before the 2021/2022 academic year:

No corequisites

Course Learning Objectives (CLOs)

Upon successful completion of the course, students will be able to:

CLO1. Establish the theoretical foundations of key models and estimators.

CLO2. Identify data structures, specify appropriate econometric models, and develop estimation and forecasting strategies.

CLO3. Differentiate critically between spurious correlations and causal relationships.

CLO4. Use statistical software to organize data, estimate model parameters, draw inferential conclusions, and communicate findings in written form.

CLO Mapping to CBA Skill Based Competency Goals[3]

CLO	Competency Goal			
	Analytical	Communication	Information Technology	Business Ethics
1	R			
2	I	I		I
3	I	I		
4	A	A	I	R

Type of Emphases:

- **(I)ntroduce:** Students will be introduced to the skill and their grasp of it assessed in the course.
- **(A)pply:** The course will not cover the skill. Students should have a high-level grasp of the skill and are required to apply it in the course.
- **(R)einforce:** Students should have an introductory-level grasp of the skill and the course will improve their mastery to a higher level.

Required Material

Textbook: Carter-Hill, Griffiths, and Lim, *Principles of Econometrics,* 4th edition or later, Wiley.

Alternative: Wooldridge, *Introductory Econometrics: A Modern Approach*, 5th edition or later, Cengage.

[3] CBA Competency Goals can be found at the end of this document

Software: R language, and R-Studio.

https://posit.co/download/rstudio-desktop/

Additional Material: Lecture slides are available on MS Teams.

E-Learning System: MS Teams, and Moodle

Course Website: http://moodle.ku.edu.kw

Lab

There will be mandatory weekly lab attendance and exercises. In each lab, you will complete and submit a coding exercise that is essential for learning the commands and techniques used in the homework.

Course Requirements

- **Exams:** The exams will mainly include questions that ask for written answers, which can be conceptual, analytical, or quantitative in nature. There will be a total of three exams, and the lowest-scoring exam will be disregarded. In addition, there will also be a final exam.
- **Projects:** In this course, there will be a single project that will provide students with an opportunity to apply the skills they have learned. The project may encompass both written and oral components.

Course Policies

- **Attendance and Participation:** Every student in this course must abide by the Kuwait University Policy on Attendance (published in the Curriculum System Bylaws, Chapter 3, Section 13). A proper copy of the student guide can be accessed online on:
  http://kuweb.ku.edu.kw/DO/ar/Students/StudentGuide/index.htm
  Attendance will be recorded in Moodle. You can check your attendance on Moodle. You should report any discrepancies within three business days for corrections. Absences notices and warnings will be sent through formal university channels and platforms, such as the email, Moodle, and MS Teams.
- **Cheating and Plagiarism:** Every student in this course must abide by the Kuwait University Policy on Cheating and Plagiarism (published in the student guide).
- Please carefully note all sources and assistance when you turn in your work. Under no circumstances should you take credit for work that is not yours. You should neither receive nor give any unauthorized assistance on any deliverable. If you have any questions about what constitutes "unauthorized assistance" please contact me through email or MS Teams me before the deliverable is submitted.
- Students may review their exams during the course and report any potential grading errors in a timely manner. Upon completion of the final exam, students will have a two-business-day opportunity to review their grades and exams for accuracy, beginning from the initial posting of all grades on Moodle. At the end of this period, grades will be considered final and will be made available on the portal.

Grading

The scores in this course will be the weighted average of the following items:

Weight	Description
20%	Assignments
30%	Exams
10%	Project/Presentation
40%	Final Exam
100%	TOTAL

Grade Distribution

Grade	Range
A	≥ 95
A-	≥ 90 and < 95
B+	≥ 87 and < 90
B	≥ 83 and < 87
B-	≥ 80 and < 83
C+	≥ 77 and < 80
C	≥ 73 and < 77
C-	≥ 70 and < 73
D+	≥ 65 and < 70
D	≥ 60 and < 65
F	< 60

Course Outline

Title	Topics	Readings on Textbook	Week (Tentative)
	I. Preliminaries		
Math, Probability, & Statistics Review	1. Math, probability, and statistics review 1.1. Math review: 1.1.1. Summation 1.1.2. Proportions and percentages 1.1.3. Changes and percentage changes 1.1.4. Linear functions 1.1.4.1. Univariate linear functions 1.1.4.1.1. Slopes and derivatives 1.1.4.1.2. Integration 1.1.4.2. Multivariate linear functions 1.1.4.2.1. Partial derivatives 1.1.4.3. Nonlinear functions 1.1.4.3.1. Quadratic functions 1.1.4.3.2. Exponential function 1.1.4.3.3. Logarithmic function 1.2. Probability review 1.2.1. Random variables 1.2.2. Probability distribution 1.2.3. Measures of centrality, variability, and shape 1.2.4. Two random variables 1.2.4.1. Joint, marginal, and conditional distributions 1.2.4.2. Covariance and correlation 1.2.4.3. Conditional expectation and variance 1.2.4.4. Conditional mean function 1.2.4.5. Statistical independence 1.2.5. Normal distribution 1.3. Statistic review 1.3.1. Random sampling 1.3.2. Estimating the population mean and variance	Probability Primer, Appendix A, B, C	1-2

	1.3.3. Properties of estimators: unbiasedness, consistency, efficiency, and normality 1.3.4. Steps of hypothesis testing 1.3.5. Confidence intervals		
Introduction	2. Introduction 2.1. What is econometrics, and why study it? 2.2. Steps of econometric analysis 2.3. Data sources and data structures 2.4. Correlation vs. causation	1	
Causal Inference	3. Causal Inference 3.1. The problem: unobserved counterfactuals 3.2. Confounding 3.3. Randomized control trials	Lecture Notes	
II. Linear Regression			
Linear Regression Model	4. Linear Regression Model 4.1. Multiple linear regression model 4.2. Ordinary least squares (OLS) estimation 4.3. Interpretation of estimates 4.4. Goodness of fit	2.1-2.3, 5.1-5.2	3-5
OLS Properties	5. OLS Properties 5.1. Classical linear model assumptions 5.2. Finite sample properties of OLS 5.3. Asymptotic properties of OLS	2.4-2.6, 5.3, App. 5B	
Statistical Inference	6. Statistical Inference 6.1. t test for a single parameter 6.2. Communicating statistical inference results 6.3. F test for multiple parameters	3.1-3.5, 5.4, 5.5, 6.1	
Functional Form	7. Function Form 7.1. Log models: log-linear, linear-log, log-log 7.2. Quadratic model 7.3. Binary independent variable 7.4. Categorical independent variable 7.5. Interaction terms: 7.5.1. Dummy by dummy. 7.5.2. Dummy by continuous. 7.5.3. Continuous by continuous	2.8, 2.9, 5.6, 7.1-7.3	
III. Estimation & Inference Problems			
Heteroskedasticity	8. Heteroskedasticity 8.1. Consequences of heteroskedasticity 8.2. Detecting and testing for heteroskedasticity 8.3. Heteroskedasticity-robust standard errors	8, 15.2.1, App. 15A	6-8
Correlated Data and Cluster Sampling	9. Correlated data and Cluster Sampling 9.1. Consequences of cluster sampling 9.2. Cluster-robust standard errors		
Endogeneity and Instrumental Variables	10. Endogeneity and Instrumental Variables 10.1. Sources of endogeneity 10.2. Identification problem 10.3. Instrumental variables 10.3.1. IV Estimator 10.3.2. Conditions for a valid instrument 10.4. Two-stage least-squares estimator	10.2-10.4, App. 10B, 10C	

	10.5. Specification tests 10.5.1. First-stage F-test 10.5.2. Overidentifying restrictions test 10.5.3. Hausman test		
	IV. Panel Data		
Panel Data	11. Panel Data 11.1. Unobserved heterogeneity 11.2. Pooled regression 11.3. Fixed effects regression	15.1-15.3	9
	V. Time Series		
Stationary Time Series	12. Stationary Time Series 12.1. Autoregressive distributed lag (ARDL) model 12.2. Time series assumptions 12.3. Forecasting with ARDL 12.3.1. Granger causality 12.3.2. Lag structure selection 12.3.3. Forecast uncertainty. 12.4. Serially correlated errors in forecasting 12.4.1. Estimating autocorrelations 12.4.2. Correlogram of the autocorrelation function 12.4.3. Testing for serially correlated errors 12.4.4. Consequences of serially correlated errors 12.5. Dynamic causal effects estimation with the finite distributed lag (FDL) model 12.5.1. s-period delay multipliers 12.5.2. Cumulative multipliers 12.5.3. Serial correlation in FDL model 12.5.3.1. Consequences 12.5.3.2. Newey-West HAC standard errors 12.5.3.3. Nonlinear least squares (NLS) estimation 12.5.3.4. Generalized least squares (GLS) estimation	9	10-12
Non-Stationary Time Series	13. Non-Stationary Time Series 13.1. Stationary conditions 13.2. Stochastic processes 13.2.1. Stationary AR(1) with zero mean 13.2.2. Stationary AR(1) with non-zero mean 13.2.3. AR(1) with linear trend 13.2.4. Random walk 13.2.5. Random walk with drift 13.2.6. Random walk with drift and trend 13.3. Spurious regression 13.4. Unit-root test for non-stationary 13.4.1. Standard Dickey-Fuller test 13.4.2. Augmented Dickey-Fuller test 13.5. Trend stationarity 13.5.1. Detrending 13.6. Cointegration 13.6.1. Engel-Granger test for cointegration	12.1-12.5	

	13.7. Error correction model 13.8. Models in first-differences 13.9. Seasonality		
VI. Binary Choice Models			
Maximum Likelihood Estimation	14. Maximum Likelihood Estimation 14.1. Likelihood function 14.2. Maximum likelihood principle 14.3. Likelihood function maximization 14.4. MLE properties 14.5. MLE in regression vs. OLS	App. C8	13
Binary Choice Models	15. Binary choice models 15.1. Choice probability 15.2. Link function 15.3. Linear probability model 15.3.1. Advantages and disadvantages 15.4. Probit model 15.4.1. Standard normal CDF as link function 15.4.2. Maximum likelihood estimation 15.4.3. Partial effects 15.5. Logit model 15.5.1. Logistic CDF as link function 15.5.2. Maximum likelihood estimation 15.5.3. Partial effects	16.1-16.2	

Important Dates[4]

Tentative Date	Event
02/03/2023	Exam 1
30/03/2023	Exam 2
30/04/2023	Exam 3
04/05/2023	Last day of classes
09/05/2023	Final Exam

[4] Exams dates are tentative and the instructor reserve the right to change them if necessary, except for the final exam.

CBA Competency Goals

1. Analytical Competency: A CBA graduate will be able to use analytical skills to solve business problems and make a well-supported business decision.

Student Learning Objectives:

1.1. Use appropriate analytical techniques to solve a given business problem.
1.2. Critically evaluate multiple solutions to a business problem.
1.3. Make well-supported business decisions.

2. Communication Competency: A CBA graduate will be able to communicate effectively in a wide variety of business settings.

Student Learning Objectives:

2.1. Deliver clear, concise, and audience-centered presentations.
2.2. Write clear, concise, and audience-centered business documents.

3. Information Technology Competency: A CBA graduate will be able to utilize Information Technology for the completion of business tasks.

Student Learning Objectives:

3.1. Use data-processing tools to analyze or solve business problems.

4. Ethical Competency: A CBA graduate will be able to recognize ethical issues present in business environment, analyze the tradeoffs between different ethical perspectives, and make a well-supported ethical decision.

Student Learning Objectives:

4.1. Identify the ethical dimensions of a business decision.
4.2. Recognize and analyze the tradeoffs created by application of competing ethical perspectives.
4.3. Formulate and defend a well-supported recommendation for the resolution of an ethical issue.

5. General Business Knowledge: A CBA graduate will be able to demonstrate a basic understanding of the main business disciplines' concepts and theories.

Student Learning Objectives:

5.1. Acquire a fundamental understanding of knowledge from the main business disciplines (e.g. finance, accounting, marketing, and management information systems, among others).