Syllabus
2023 - 2024

TECHNICAL SHEET OF THE SUBJECT

Data of the subject	
Subject name	Quantitative Models for Business and Economics
Subject code	E000005834
Mainprogram	Bachelor's Degree in Business Administration and Management
Involved programs	Grado en Administración y Dirección de Empresas y Grado en Derecho (E-3 16) [Third year] Grado en Administración y Dirección de Empresas (E-2) - Bilingüe en inglés [Second year]
Level	Reglada Grado Europeo
Quarter	Semestral
Credits	6,0 ECTS
Type	Obligatoria (Grado)
Department	Departamento de Métodos Cuantitativos
Coordinator	Francisco Borrás Palá
Office hours	Request an appointment. The tutoring schedules will be available to each teacher when the schedules are final

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SPECIFIC DATA OF THE SUBJECT

Contextualization of the subject

Contribution to the professional profile of the degree

Within the area of economics and business, in the empirical research; conclusions about the effect of a variable in other one can be obtained throughout the realization of experiment, if data allows the experimental control, or throughout econometrics model if we have observational data and are given to the researcher.

For the first case, the subject studies the basis of the design and analysis of experiments, and also the basic associated statistical techniques (hypothesis tests in order to compare means or proportions among groups)

For the observational data, the subject carries out an introduction to econometric techniques. Econometrics, understood as the art of building models, allows the exploration, the quantification and the empirically contrast, using real data of micro and macro type, of the existing relationship between economic and business variables and of the theories established about them.

Results gotten out of the models allow the estimations of the effect that a change in a variable would have in the other one, and also the realization of predictions.

The practical character of the subject allows to put in practice many concepts and theories that have already been introduced in other subjects, being of economic type (production or demand models, gravitational models of international commerce), of marketing, or finance (CAPM models).

The obligation of having to carry out a project of empirical application allows the student to introduce his or her-self in the steps to applied scientific research, emphasizing the transcendental fact of following a clear and objective methodology.

Prerequisites

- **Basis of economic analysis (micro and macro)**
- **Basis of matrix algebra**
- **Basis of inference and descriptive statistics**
- **Intermediate management of spreadsheet**

Competencies - Objectives

Competences

GENERALES

CG01	Capacidad de análisis y síntesis	
	RA1	Analiza la información identificando sus elementos más significativos
	RA2	Realiza la abstracción y simplificación necesaria para modelizar estadísticamente el problema real planteado
	RA3	Integra el análisis gráfico, verbal y los datos cuantitativos y cualitativos para definir el modelo estadístico apropiado al problema
CG02	Resolución de problemas y toma de decisiones	
	RA1	Conoce las metodologías aplicables para resolver el problema real
	RA2	Sabe aplicar dichas metodologías
	RA3	Reconoce el alcance de las conclusiones y los supuestos necesarios para la validez de las mismas
CG04	Capacidad de gestionar información proveniente de fuentes diversas	

	RA1	Conoce fuentes y bases de datos profesionales macro y microeconómicas
	RA2	Sabe tratar y juzgar críticamente las fuentes utilizadas para que sean válidas en el análisis
CG05	Conocimientos generales básicos sobre el área de estudio	
	RA1	Desarrolla habilidades necesarias para el estudio e investigación independiente
	RA2	Encuentra por sí mismo aplicaciones y extensiones de los conceptos y metodologías estudiadas
CG06	Comunicación oral y escrita en la propia lengua	
	RA1	Expresa correctamente la metodología empleada y los resultados y conclusiones obtenidas del análisis efectuado
	RA2	Comunica de forma efectiva, a público no especialista, los informes y análisis efectuados
CG08	Conocimientos de informática relativos al ámbito de estudio	
	RA1	Conoce y emplea de forma suficiente herramientas informáticas de uso común para el análisis estadístico
ESPECÍFICAS		
CE10	Capacidad para tratar, sintetizar y analizar la información. Conociendo los fenómenos aleatorios y los procesos de inferencia estadística	
	RA1	Conoce, diferencia y emplea los conceptos estadísticos para el análisis de la información- Identificación de variables, codificación y presentación sistemática de los datos
	RA2	Deduce información estadística relevante de un conjunto de datos
	RA3	Analiza e interpreta correctamente las relaciones entre distintas variables
	RA4	Comprende y aplica correctamente los conceptos fundamentales de la teoría de la probabilidad
	RA5	Comprende el concepto de variable aleatoria, discreta o continua, y elabora correctamente su distribución de probabilidad.
	RA6	Conoce la distribución de probabilidad conjunta de dos variables, analizando correctamente las relaciones de asociación y/o dependencia entre ellas
	RA7	Conoce distintos tipos de muestreo. Determina correctamente probabilidades en el caso de Muestro Aleatorio Simple
	RA8	Reconoce y diferencia la aplicación de distintos métodos de estimación y contrastación, adecuados al tipo de información disponible y a los objetivos pretendidos.
	RA9	Aplica correctamente los métodos de inferencia a situaciones reales sencillas, tomando decisiones oportunas e interpretándolas correctamente

CE11	Conocimiento y comprensión de los Modelos Econométricos	
	RA1	Conoce las principales técnicas y métodos de construcción de modelos de regresión lineal y las aplica correctamente a datos reales
	RA2	Sabe interpretar críticamente los resultados obtenidos en la estimación de un modelo econométrico.
	RA3	Reconoce las posibilidades y utilidades del empleo de métodos econométricos en las diferentes áreas de la administración de empresas y de la economía
CEOPT	Conocimiento y comprensión de las principales Técnicas de Predicción y el Análisis Multivariante	
	RA1	Conocer los principales modelos econométricos empleados en el ámbito de las finanzas especialmente los relativos a la modelización de la volatilidad
	RA2	Conocer los principales modelos econométricos empleados en el ámbito de la economía aplicada tanto en el campo microeconómico como macroeconómico
	RA3	Conocer las principales técnicas clásicas de dependencias e interdependencias, sabiendo seleccionar la más adecuada según el tipo de problemas y el conjunto de datos disponible
	RA4	Adquirir una perspectiva general de las nuevas técnicas de análisis de datos aplicables al nuevo paradigma del análisis masivo de datos (Big Data)
	RA5	Conocer los conceptos básicos de los procesos de predicción económica y empresarial
	RA6	Saber realizar predicciones , seleccionando y aplicando la técnica más adecuada en cada caso

THEMATIC BLOCKS AND CONTENTS

Contents - Thematic Blocks

Topic 1. Design of experiments

Objectives and analysis of experimental analysis

The experimental control

Applications in Economics and Business area

Topic 2. Hypothesis testing

Hypothesis testing. Fundamentals and elements

Hypothesis testing on a parameter

Hypothesis testing for 2-groups experiments: average and proportion comparisons

Applications in Economics and Business area

BLOCK 2. CAUSAL MODELS

Topic 3. The multiple linear regression model

Economic and econometric models: elements and work stages

The model's basic hypotheses

Topic 4. Estimation

Estimation of ordinary minimum squares

Results interpretation

Goodness of fit

Applications in Economics and Business area

Topic 5.

Modelling of qualitative characteristics and non-linearities

Topic 6. Validation. Hypothesis testing

Statistical and economical validity

Constraints and Individual and joint tests of significance

Applications in the Economics and Business area

Topic 7: Logit models

Limitations of the linear probability model

Main characteristics and interpretation of Logit and Probit results

Other models

Topic 8. Prediction

Utilization of a professional data set

Interpretation of regression results and definition of the reference person

Sensitivity of estimators to changes in specification

Topic 9: Multicollinearity, Heteroscedasticity and Autocorrelation

Perfect multicollinearity

Near multicollinearity: consequences, detection and correction

Heteroscedasticity and Autocorrelation: Concept, causes and consequences

Heteroscedasticity and Autocorrelation detection: residual graphs and hypothesis test

Heteroscedasticity and Autocorrelation: Correction and prevention. Generalized minimum squares. Robust estimation

TEACHING METHODOLOGY

General methodological aspects of the subject

In-class Methodology: Activities

Presentation about the general context of every topic Realization and discussion of examples of practical application Correction of fundamental issues in weekly workshops General tutoring of practical application of tasks Basic introduction to the use of econometrical technological applications and obtainment and treatment of economic data gotten out of web sources Realization of a learning game each week Realization of intermediate tests Realization of final exam of the subject	CG01, CG02, CG04, CG05, CG06, CG08, CE11

Non-Presential Methodology: Activities

Realization of the final project of empirical application (proposal + final handing). It will include the presentation, in an informative outline, of the main research results (poster, graphical abstract or video)	CG01, CG02, CG04, CG05, CG06, CG08, CE11

SUMMARY STUDENT WORKING HOURS

CLASSROOM HOURS		
Lecciones de carácter expositivo	Ejercicios y resolución de casos y de problemas	
30.00	30.00	
NON-PRESENTIAL HOURS		
Trabajos monográficos y de investigación, individuales o colectivos	Estudio individual y/o en grupo y lectura organizada	Ejercicios y resolución de casos y de problemas

20.00	35.00	35.00
		ECTS CREDITS: 6,0 (150,00 hours)

EVALUATION AND CRITERIA

Evaluation activities	Evaluation criteria	Weight
FINAL EXAM	Numerical grading 0-10. **It will be necessary to obtain at least 4.5 in the exam to pass the subject**. Most multiple choice questions and some short open-ended questions.	50
FINAL PROJECT OF EMPIRICAL APLICATION, with the structure and format of an academic paper.	**It will be necessary to obtain at least 5 in the project to pass the subject.** In the event that the project is failed, the Ordinary Call will be failed. In this case, the delivery may be made again on the day of the final exam of the Extraordinary Call, without the need to take such exam again, unless exam results in a grade lower than 4.5 in the Ordinary Call. Rating from 0 to 10 (according to rubric): • Originality of the topic • Theoretical context • Depth • Structure and format of the academic paper • Quality Analysis • Divulgation section Proposal (30% of the grade) + final delivery (70% of the grade). Teachers who wish may request an intermediate delivery. Students who complete it may be given a bonus of 0.5 points in the final delivery. The oral defense of the different deliveries of the project may be requested to some students, at the discretion of the corresponding teacher. Students who do not make an adequate oral defense may see their grade for this project reduced to 0 points.	20
	Numeric rating 0-10. Short tests of about 15-25 minutes (100% test type, approximately 5-6 tests) will always be done in person, unless there is some circumstance that requires a return to online or bimodal teaching at the university. Oral defense of the same may be requested (to verify that their real knowledge	

CONTINUOUS EVALUATION IN CLASS: short tests at the end of each topic (in some cases several topics can be put together in one test)	corresponds to that demonstrated in the test). The teacher could replace the first test ("design of experiments") by a short practical assignment with the same weight of such test in the final grade. The oral defense of this work may be requested, The tests not carried out will have a 0, unless the absence is for a justified reason by the tutor of the group. In this case, the test will be annulled and its percentage in the average of the tests will increase that of the final exam. For the average of these tests, the worst grade will be eliminated.	20
ACTIVE PARTICIPATION OF THE STUDENT INSIDE THE CLASSROOM:	Numeric rating 0-10. To evaluate this item, kahoots made during class time, "one minute paper" collected in class, etc. will be used. The grade will not be taken into account, but only its completion. Eventually it will also be possible to do a roll call in some classes.	10

Ratings

Students in ORDINARY CALL (1st call) **and EXTRAORDINARY** (2nd call): the same grading system will be followed: all the components of continuous evaluation carried out during the course are weighted.

- It is an essential requirement to pass the subject in any of the calls that the exam obtains a grade of at least 4.5 points (on a scale of 0 to 10 points). In any case, the average grade considering all the evaluation items must be greater than 5.
- It is an essential requirement to pass the subject in any of the first 2 calls that the empirical project obtains a grade of at least 5 points (on a scale of 0 to 10 points). In any case, the average grade considering all the evaluation items must be greater than 5.

In the first and second calls, if the final exam has a grade lower than 4.5 and/or in the empirical project the grade is lower than 5, the student's final grade will be the lowest of these three: a) grade of the exam; b) grade of the practical work; c) the one that results from calculating the average with all the evaluation items.

The student who has not done or who has failed the practical project in the Ordinary Call (1st call) must do it again for the Extraordinary (2nd call). The underlying philosophy is that the extraordinary call cannot be a way to avoid the completion of the empirical final project.

It will be possible to obtain up to 0.5 extra points for participation in various voluntary activities proposed by the teacher.

At the discretion of each teacher, there may be an additional test to determine the students who are awarded the Honors.

EXCHANGE STUDENTS (OUT) AND REST OF CALLS (3rd and following): It is strongly recommended to carry out and deliver the empirical application work as a way to better understand the subject and know how to apply it to the economic and business reality. In the case of students in the 3rd and subsequent calls, it must be a new project, with a different topic than the one delivered in the 1st/2nd call. It is also recommended to take the tests and, in such a case, they must notify the corresponding teacher in advance (they will only be done in person and their qualification will follow the criteria indicated in the description of the tests). The final grade for these students will be the best of the following four options: a) 100% exam; b) 75% exam and 25% work; c) 75% exam and 25% tests; d) 50% exam, 25% tests,

25% work.

Students with **SCHOOL WAIVERS** and exceptional situations: this will be dealt with on a case-by-case basis, seeking a balance between equity and learning objectives.

WORK PLAN AND SCHEDULE

Activities	Date of realization	Delivery date
Proposal of empirical project	Middle of the course	Middle of the course
Empirical project	From the teacher's OK to the proposal	last day of the course

BIBLIOGRAPHY AND RESOURCES

Basic Bibliography

TEXT BOOKS:

- Martínez de Ibarreta, Álvarez, Borrás, Budría, Curto, Escobar, Portela (2018) 101 PREGUNTAS DE MODELOS CUANTITATIVOS (Y SUS RESPUESTAS), EV Services (disponible en la librería de la Universidad)
- Martínez de Ibarreta, Álvarez, Borrás, Escobar, Curto, Budría (2017) MODELOS CUANTITATIVOS PARA LA ECONOMIA Y LA EMPRESA EN 101 EJEMPLOS, EV Services (disponible en la librería de la Universidad)
- Hill, Griffiths, Lim (2018) PRINCIPLES OF ECONOMETRICS, 5ª edición (International Student Version), Wiley

PAPERS:

Reading of some articles of scientific magazines for the realization of some of the workshops to be handed periodically:

- Fair, Ray C, 1978. A theory of extramarital affairs. Journal of political economy, University of Chicago Press, vol. 86(1), pages 45-61, February.
- Hamermesh, Daniel S & Biddle, Jeff E, 1994. Beauty and the labor market. American economic review. American Economic Association, vol. 84(5), pages 1174-94, December.
- Bernard, Ab. & Busse, Mr (2004). Who wins the Olympic Games: Economic resources and medal totals. Review Of Economics And Statistics vol. 86 (1), pages 413-417

WEB PAGES:

http://www.learneconometrics.com/gretl.html for the manual of application of software Gretl :Adkins, L.C. Using Gretl for Principles of Econometrics

NOTES:

In Moodle Rooms about some topics and sections

SOFTWARE:

GRETL (free software) available in http://gretl.sourceforge.net/

Complementary Bibliography

TEXT BOOKS:

Gujarati, D.M (2009) Econometría (5ª edición), Mc Graw Hill

Stock, J. y Watson, M. (2012) Introducción a la Econometría (3ª ed),Ed. Pearson

Wooldridge, J.M. (2010) Introducción a la Econometría, un Enfoque Moderno (4ª edición), Cengage Learning

WEB PAGES:

References in Moodle to some interesting directions to compliment and apply some concepts