COURSE DATA

DATA SUBJECT

Code: 43787
Name: Pricing and multivariate analysis
Cycle: Master's Degree
ECTS Credits: 3
Academic year: 2026-27

STUDY (S)

Degree	Center	Acad. year	Period
2171 - Master's Degree in Actuarial and Financial Sciences	Facultat d'Economia	1	Second quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
2171 - Master's Degree in Actuarial and Financial Sciences	Non-life insurance	COMPULSORY

COORDINATION

BAEZA SAMPERE ISMAEL

SUMMARY

The course "Pricing and Multivariate Analysis" is located in the second semester of the first year and is taken after Advanced Mathematics for Actuaries and Advanced Statistics for Actuaries, both of which are required prior to addressing multivariate methods.

In pricing or premium calculation, one of the most important phases is the selection of risk factors, that is, the characteristics of the insured that are correlated with the claims rate and that together explain a large percentage of its variability (variance).

Multivariate statistical techniques will allow the selection of these factors.

Measures of association allow us to understand the variable-by-variable relationship with the claims rate, but the objective is to obtain a "balanced" set of rate variables. If we separately select the variables that are most closely associated with risk, we may have redundant information in the selected set of variables or not include variables that, when combined with others, are significant. Therefore, it is necessary to conduct the study taking into account all potential risk factors simultaneously and, ideally, all their interactions.

For all of the above reasons, multivariate techniques will allow for the appropriate selection of factors.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

There are no specified enrollment restrictions with other subjects of the curriculum.

OTHER REQUIREMENTS

Before taking the courses taught in this module, students must have completed and successfully completed the typical content taught in introductory mathematics and statistics courses in social science studies. For example, students should have basic prior knowledge of differential and integral calculus, function representation, descriptive statistics, probability models, and inference.

COMPETENCES / LEARNING OUTCOMES

2171 - Master's Degree in Actuarial and Financial Sciences

Comprender y ser capaces de desarrollar las técnicas matemáticas y estadísticas que resultan relevantes para el trabajo actuarial: modelos de supervivencia, siniestralidad, tarificación, previsión y solvencia.

Poseer un amplio conocimiento de los procesos estocásticos y ser capaces de utilizarlos en modelos financieros y actuariales.

Ser capaces de aplicar los criterios y principios de planificación y control actuarial, necesarios para el correcto funcionamiento de las operaciones que, en cada momento, ofrezcan las entidades de seguros, financieras o cualesquiera otras que impliquen transferencia y cobertura de riesgos.

Ser capaces de construir modelos adecuados al entorno económico empresarial a partir de las posibilidades que ofrecen las modernas tecnologías de la información y de la computación.

Students should apply acquired knowledge to solve problems in unfamiliar contexts within their field of study, including multidisciplinary scenarios.

Students should demonstrate self-directed learning skills for continued academic growth.

DESCRIPTION OF CONTENTS

1. Introduction: information management in pricing.

1.1. Information in the pricing process.

1.2. Multivariate information traditional statistical treatment and the data mining approach. Multivariate Analysis, Datamining and Machine Learning.

1.3. Main problems/tasks and methods/techniques.

1.4. Pattern extraction, clustering, classification, prediction, association and factor analysis in the context of pricing.

2. Association and dependency.

2.1. Dependence between qualitative variables.

2.2. Dependence between a qualitative variable and one or more quantitative variables.

2.3. Analysis of variance.

2.4. Dependency between quantitative variables.

3. Dimension reduction and factor analysis.

3.1. Problem approach: factorial model. Fundamental concepts: Pattern, structure. Explanation, interpretation, communality, rotation, scores.

3.2. Principal Components. Principal Components Model and Principal Components as a factorial model.

3.3. Other methods: Principal axes. Maximum likelihood.

3.4. SPSS and R computer applications.

4. Clustering

4.1. Statement of the problem: Grouping, Clustering, similarities and distances.

4.2. Direct methods. K-means Clustering.

4.3. Hierarchical methods. 4.4. Neural and mesh methods (SOM).

5. Discrimination and classification.

5.1. Discrimination as a decision. Classification. Discrimination as analytical description. Discriminant analysis.

5.2. Linear discriminant analysis. Quadratic discriminant analysis.

5.3. Other classifiers: trees, rules, Bayesian methods.

5.4. Neural classifiers: MLP.

6. Other techniques and methods of multivariate analysis.

6.1.AID and CHAID segmentation.

6.2. Correspondence analysis.

6.3. Prediction and multivariate regression. Generalized linear model.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Theory	15,00
Classroom practices	15,00
Total hours	**30,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	15,00
Independent study and work	15,00
Preparation of lessons	0,00
Preparation for assessment activities	0,00
Resolution of case studies	15,00
Total hours	**45,00**

TEACHING METHODOLOGY

During the course, the program's contents will be covered, combining theoretical content with practical cases. Various assignments will be proposed, which the student must submit in the manner and on the date specified throughout the course. To this end, all available resources (whiteboard, transparencies, computer, etc.) will be used, as needed, and are considered most appropriate to successfully achieve the proposed objectives.

Generally, the theoretical classes will be taught using a lecture methodology, in which the professor will highlight the fundamental aspects of each topic and guide the study through the relevant bibliography,

which must be consulted to complete and deepen the subject matter.

The practical classes will consist of questions and exercises applied to the financial and actuarial fields, which the student must solve, proceeding, where appropriate, to the relevant modeling and discussion of the solution.

Practical classes will be conducted using computer support, using the SPSS statistical package.

The available teaching materials can be accessed from the virtual classroom, http://aulavirtual.uv.es.

EVALUATION

Evaluation will be based on:

-A written exam consisting of conceptual questions in which the student demonstrates overall knowledge of the multivariate methods studied.

-Continuous assessment based on:

- Class attendance and participation in in-person training activities.

- Periodic follow-up tests, consisting of practical applications in class and individual and/or team work.

The written exam will account for 30% of the final grade, and the continuous assessment will account for 70%.

In any case, to pass the course, a minimum grade of 5 out of 10 is required, and a minimum grade of 5 out of 10 is also required in the practical section.

For the proposed activities and tasks to be assessed, they must be submitted on the date and in the manner stipulated for each one.

The same assessment criteria will be used in the second session as in the first.

REFERENCES

Basic

- Escobar, Modesto (1998). Las Aplicaciones del Análisis de Segmentación: el Procedimiento Chaid. Empiria, Revista de Metodología de Ciencias Sociales, nº 1.

- Pérez López, César (2005). Métodos Estadísticos Avanzados con SPSS. Thomson, Madrid.

- Uriel, Ezequiel and Joaquín Aldás (2005). Análisis Multivariante Aplicado. Thomson, Madrid.

Additional

- Boj, Eva; M. Mercè Claramunt and Josep Fortiana (2004). Análisis Multivariante aplicado a la selección de factores de riesgo en la tarificación. Cuadernos de la Fundación Mapfre nª 88.

- Ohlsson, Esbjörn (2010). Non-Life Insurance Pricing with Generalized Linear Models. Springer Heidelberg Dordrecht, London, New York.

- Piet de Jong and Willian Z. Heller (2008). Generalized Linear Models for Insurance Data. Cambridge University Press.