



Course information	
ECTS	4
Degree	Master in Finance / Máster Universitario en Finanzas por la Universidad Pontificia de Comillas
Professor	Guillermo Corredor
Name	Math, Statistics and Business Analytics (Bootcamp)
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Objectives

The course aims to provide the basic tools in financial mathematics, probability, and Python programming that the student will need to understand the mathematical underpinnings of financial modeling. These skills will be invaluable to understand the mathematical underpinnings of more advanced courses in risk management, derivatives valuation, and artificial intelligence covered in the Master in Finance syllabus.

General Competencies

CG02 - Critical thinking: Use critical thinking for decision making and problem solving in financial management processes

CG09 - Digital Competence: Employ, take advantage of and use, efficiently and safely, the technological and digital resources that are applied in the financial management of organizations

CG10 - Technical Capacity: Capacity of analysis, synthesis and projection, applied to situations, problems, and models in the financial field

Specific Competences

CE12 - Know and apply the programming and modeling necessary to create defined functions, statistical, econometric and mathematical analysis through computer programs

Contents

1. Foundations of Financial Mathematics

- 1.1. Time value of money. Simple and continuous compounding
- 1.2. Annuities: constant and variable. Perpetuities
- 1.3. Net Present Value and Internal Rate of Return
- 1.4. Asset valuation

2. Probability and Statistics for Finance

- 2.1. Probability. Bayes' theorem
- 2.2. Random variables. PMF and CDF. Expectation and variance.
- 2.3. Discrete random variables: Bernoulli, Binomial, Geometric, Poisson, Uniform
- 2.4. Continuous random variables: Normal, Lognormal, Chi-Square, Student's t, Uniform
- 2.5. Conditional expectation.
- 2.6. Covariance and Correlation
- 2.7. Central Limit Theorem
- 2.8. Sampling. Law of Large Numbers. Introduction to Monte Carlo simulation
- 2.9. Statistical Inference: Estimators, Confidence Intervals



3. Python for Data Science and Business Analytics

- 3.1. Jupyter notebooks and Google Colab
- 3.2. Base Python: Data types and data structures. Control statements. Functions
- 3.3. NumPy
- 3.4. SciPy
- 3.5. Matplotlib
- 3.6. Pandas

Teaching methodology

The course covers several disciplines, and the teaching methodology will be adapted to each one of them. For the financial mathematics and probability topics, the lectures will focus on the exposition of the main theoretical results that will then be applied to practical exercises. The coding and business analytics topics will be taught using a hands-on approach, through interactive Jupyter notebooks. Students are expected to take their own class notes and review thoroughly the concepts and exercises discussed during the lessons. The active participation of students is essential for the successful development of the sessions.

EVALUATION AND GRADING CRITERIA

Evaluation items / Graded activities	Weight (%)
Individual final assessment (Final Exam)	50%
Group final assessment (Python exercises)	30%
Class participation	20%

Grading criteria

1. All students must comply with 100% attendance on the days established for this course. Any absence must be justified.
2. The final grade corresponds to the weighted sum of the graded activities. Students must successfully pass each evaluation item.
3. Individual and group work must be submitted on time and in the form specified by the professor.
4. A final grade lower than 5 implies the need to take an extraordinary exam. The final grade for this exam may not exceed the median of the passing grades in the ordinary evaluation period.

The student enrolled in the second-year course must complete the individual and group tasks established by the course professor. The same evaluation criteria described in the Evaluation and Grading Criteria section will be maintained.

In circumstances not covered by this Teaching Guide, the Advantere School of Management Regulation and the General Regulation of Comillas will apply



Bibliography

- Chan, W., Tse, Y. (2017). *Financial Mathematics for Actuaries*. World Scientific
- Vanderplas, J. T. (2016). *Python Data Science Handbook: Essential Tools for Working with Data*. O'Reilly
- Pishro-Nik, H. (2016). *Introduction to probability, statistics, and random processes*. Kappa Research