

TEACHING GUIDE

Course Information	
Full Name	Quantitative Risk Management
Code	0000012216
Degree	Master in Finance
Taught in	Advantere School of Management
Level	Postgraduate Official Master's Degree
Term	3
Credits	3,0 ECTS
Type	Elective
Person in charge	Nicolas Delettieres
Office hours	Continuous availability via email

Professor Information	
Professor	
Name	Nicolas Delettieres
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Office	Continuous availability via email
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SPECIFIC COURSE INFORMATION

Course contextualization

Contribution to the professional profile of the degree

Quantitative risk management

Risk management considers how an individual or an entity can consciously determine the risk that it can accept to obtain future benefits. The risk management process comprises a series of actions to determine which types are going to be assumed by a firm or an individual. Thus, the risk management process is built on a series of basic pillars:

Identification of Financial and Non-Financial Risks

A fundamental part of this stage is given by the categorization of risks between known and unknown. The former have a certain impact on the firm or individual, while the latter are usually part of the tail risk events. Some quantitative techniques to address the risk identification process include the analysis of time series and losses incurred in the past in order to discern the severity and frequency of each risk.

Risk Measurement

This stage involves the quantification of risks, which is carried out through the analysis of a loss function, using basic statistical measures such as the mean and dispersion of returns until reaching the simulations, calculation of VAR and expected falls. The importance of the Normality hypothesis in a probability function and its implications in finance.

The course introduces the student to the construction of models to understand the risks of financial portfolios, especially focused on the banking, insurance and asset management sectors. The student learns about the model building process, collects data on the underlying risk factors that affect the value of the portfolio, and analyzes its behavior. In this course, the student learns to work with risk factor return series, will study the empirical properties or so-called "stylized facts" of these data, including their typical volatility and non-normality, and will estimate the value at risk for a portfolio using programming in Office and Python.

Risk management.

In this stage, work will be carried out assessing different strategies that a firm can implement to manage its exposure to risk. Using the four-way approach: accept, avoid, mitigate or transfer the risk based on your ability and appetite. A complete mapping of the potential risks of an entity as well as the proper use of risk management tools, such as coverage or exposure limitations, are key factors for good management.

The main contents will cover the construction of models applied to financial portfolio risks, modeling process, identification of underlying risk factors, and analysis of their behavior. Typical risk factor performance series, empirical properties of the data, volatility and non-normality. Estimates of value at risk for a portfolio using data analytics applications.

Competences – Objectives		
Competences		
GENERAL		
CG.1		Learning by projects: Ability to develop and execute collective financial projects in their different phases based on real situations, proposing real solutions and making all interactions with the team, clients and any other participant efficient.
	RA1	Ability to commit to the development of experimental collective projects based on the real world, managing and aligning the client's needs with the available resources, optimally distributing the work, communicating and projecting its different phases, proposing real solutions and making efficient all interactions with the team, customers and other stakeholders.
CG.3		Teamwork: Apply techniques and methodologies that promote teamwork and mutual collaboration in talent management projects to be carried out with companies and organizations.
	RA1	Be committed and cooperate in the defined roles to achieve the goals related to the tasks, activities, projects and responsibilities defined and assigned.
CG.10		Technical Capacity: Capacity for analysis, synthesis, and projection, applied to situations, problems, and models, in the financial field.
	RA1	It is able to deal with the analytical study of cases and scenarios, as well as to carry out information and data synthesis

SPECIFIC		
CE.10		Know how to identify the main financial and non-financial risks that any company faces, and apply advanced models for their control and management.
	RA1	Knows and understands that one of the main objectives of financial entities is financial risk management and the assumption of risks that other market agents do not want and/or cannot assume and is familiar with the new financial and risk management strategies identifying the main parameters necessary for its evaluation.
	RA2	Know how to use derivatives (futures, options, swaps and structured derivatives) to cover different risks in practice and master risk management models such as Value-at-Risk (VaR)/Conditional Value at Risk (CVaR)/Shortfall Risk and its application as a measure of the market risk of an asset, portfolio or entity, as well as the methodological alternatives most used for its calculation in practice.

THEMES AND CONTENT

Contents - Themes
Module 1
Fundamentals of risk management
<ul style="list-style-type: none"> • Expected and unexpected loss. Risk Benefit Relationship. Types of Risks in an organization. Risk management governance. MRE
Risk Identification
<ul style="list-style-type: none"> Time series analysis. Empirical Properties of Financial Data Loss function. • Severity and Frequency Changes in Assessment • Deviation from the Normality hypothesis •
Financial Risk Quantification
Parametric approaches
<ul style="list-style-type: none"> Value at Risk (VAR) Normal Approach and Log Normal Expected shortfall
Nonparametric approaches
<ul style="list-style-type: none"> Bootstrapping Simulations Montecarlo VAR and Montecarlo
Volatility
<ul style="list-style-type: none"> Conditional Volatility Deviation from Normality hypothesis. Current / Historical Volatility Estimation GARCH / EWMA Models
Risk Factor Theory

<p>Factors that impact prices.</p> <p>Value: Investment in value. Macroeconomic factors.</p> <p>Management of dynamic risk factors.</p> <p>Volatility risk management.</p>
Interest rate risk
<p>Rate curves. Structure and Form</p> <p>Duration and Convexity.</p> <p>Key Rate durations and DV01</p> <p>Immunization. Cash-flow matching strategies.</p>
Other Financial and Non-Financial Risks.
Credit and Sovereign Risk
<p>Rating process. Transitions. Credit universe</p> <p>Default and recovery rates</p> <p>Mean and Standard deviation of credit losses.</p> <p>Sovereign Risk Sources</p>
Liquidity risk
<p>Market Liquidity.</p> <p>Sources of Liquidity.</p> <p>Liquidity-adjusted VAR.</p> <p>Regulation.</p>
Operational risk
<p>Definition. Frequency and severity.</p> <p>Standard approach. Loss distribution</p> <p>Extreme events. Operational Risk Management</p>
Financial risk management
Portfolio risk
<p>Analytical methods</p> <p>Portfolio Management with VAR</p> <p>Risk Budget</p> <p>Risk and performance monitoring</p>

VAR Validation: Backtesting
<p>Mapping of the VAR</p> <p>Correlation Risk.</p> <p>Aggregation Methods</p>
Use of derivatives for risk management
<p>Risk neutral approach</p> <p>Interest rate volatility</p> <p>Sensitivity to options. Greek</p>

Risk Management in Financial Institutions and Regulation
Regulation. Stress and scenario testing.
<p>Historical scenarios</p> <p>Reverse Stress Testing.</p> <p>Regulatory test. Basel/Solvency II</p>
Risk management in Banks
<ul style="list-style-type: none"> - Basic principles and regulatory requirements in Banking in order to stabilize results. - Risks and mitigation strategies and asset allocation for banks. - Quantitative models for credit risk management and liquidity in banking.
Risk management in Insurance Companies and Pension Funds
<ul style="list-style-type: none"> - Quantitative principles of risk management in insurance companies and pension funds. Model and optimal allocation of financial and technical risks in the sector. - Design of mitigation and asset allocation strategies for a long-term horizon.

TEACHING METHODOLOGY

General methodological course aspects

Presential Methodology: Activities

Cooperative work of students who, in pairs or small groups, are given a task, case or assumption that requires sharing information and resources among members in order to achieve the common goal. Based on the case method, studied by each student and discussed by each group before the individual interventions of each general session.

The case method stimulates inductive learning. From the analysis of concrete examples, the different tools of analysis are built and general rules of application to all types of companies and sectors are induced. Therefore, prior study of the cases and active participation in the discussions of the general sessions is essential.

Exhibitions about their skills and abilities to get a job.

The presentations must be evaluated and critiqued by the rest of the classmates or by the professor in order to go deeper into the course.

Lessons of an expository and participative nature.

Non-presential Methodology: Activities

Individual study.

Individual reading of different types of texts (cases, books, magazines, articles, press, Internet publications, reports on practical experiences, etc.) related to the study courses.

Cooperative work of students who, in pairs or small groups, undertake a project that requires the sharing of information and resources among members in order to achieve a common goal.

SUMMARY OF STUDENT WORK HOURS

PRESENTIAL HOURS					
Professor Exhibition	Student exhibition. Debates and group dynamics	Exercises and problem solving. Elaboration of applied work	Analysis and documentation	Tutorial sessions	Development of real projects for organizations
7	9	12	0	1	1
NON-PRESENTIAL HOURS					
Professor Exhibition	Student exhibition. Debates and group dynamics	Exercises and problem solving. Elaboration of applied work	Analysis and documentation	Tutorial sessions	Development of real projects for organizations
0	0	35	23	1	1

ECTS CREDITS: 3,0 (90,00 hours)

EVALUATION AND GRADING CRITERIA

Graded Activities	Evaluation Criteria	% of Total Grade
Assessment of individual or group work carried out by students, some of them presented in class	<ul style="list-style-type: none"> • Work adequacy to the objectives set • On-time delivery • Goal adequacy and focus • Results achieved • Compliance with deadlines • The participation of ALL members of each team in the presentations and elaborations is required 	50
Performance of oral and written examinations, public defenses and multiple-choice tests, concept tests and resolution of practical cases as exams	<ul style="list-style-type: none"> • Throughout the program, exams or written tests will be given to test the solidity of the concepts acquired. • In order to pass the course, the final exams and tests of each section of the course must be passed. If there are several exams in the same section or block of a course, the weighted average of them must be higher than 5.0 as a necessary condition to pass the course. 	30
Participation and utilization of the classes	<ul style="list-style-type: none"> • When we talk about participation, it is clear that both the positive and negative ones are counted and that the quality of participation is as important as the quantity. The students' participation in class, the quality and timeliness of their interventions, the quality in the preparation and presentation of their work, predisposition and commitment, initiative, attendance. 	20

Grades

The evaluation criteria for the subject are governed by the following rules:

- 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 sum of the graded activities, the evaluation criteria and the % of the total grade described in the Evaluation and Grading Criteria section.
- 3-Individual and group work must be submitted on time and in the form specified by the subject's teacher.
- 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 at the time of the schedule exams.

The evaluation criteria for enrolling in a second year:

The student enrolled in the second-year course must fulfill 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.

Health alert criteria:

The student must be permanently identified, in class with an identification poster and remotely with their full name. Students should not change the spaces they occupy in the classroom, until indicated by a professor or the direction of the program.

Failure to comply with any of the health recommendations during the teaching sessions may lead to failure in the course

BIBLIOGRAPHIES AND RESOURCES

Basic Bibliographies

1. *Risk Management and Financial Institutions* – John Hull 6th ed Hoboken, NY (Wiley & Sons 2021)
2. *Option Futures and other derivatives* – John Hull 11th ed New York NY Pearson (2020)
3. *Foundations of Risk management*. Global Association of Risk Professionals. New York NY Pearson
(2019)
4. *Quantitative Risk Management: Concepts, Techniques and Tools*. Revised Edition Alexander J. McNeil,
Rudiger Frey and Paul Embrechts. Princeton Series in Finance. Princeton University Press (2015)
5. *Value at Risk - The new benchmark for managing financial risk* - Philippe Jorion
6. *The credit crunch of 2007: what went wrong? Why? What lessons can be learned?*. Hull 2009 - *Journal of
Credit Risk*
7. *Modern Investment Management: An Equilibrium Approach* - Robert Litterman (Wiley & Sons 2003).
8. *Measuring Market Risk*. Kevin Dowd 2nd edition. West Sussex UK (Wiley & Sons 2005)
9. *Value at Risk: The new benchmark for managing financial risk* – Philippe Jorion 3rd edition. New York (Mc Graw Hill 2007)
10. *Asset Management: A Systematic approach to factor investing* - Andrew Ang. New York Oxford University Press (2014)
11. *Correlation Risk Modelling and Management* – Gunter Meissner 2nd edition. New York (Risk Books 2019)

