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UNIVERSITAT POLITÈCNICA
DE CATALUNYA
BARCELONATECH

TEACHING GUIDE RISK ANALYSIS AND CONTROL 2025-26

GENERAL DATA

Name:	Risk analysis and control
Code:	801886
Course:	2025-26
Titration:	Master's Degree in Financial Innovation and Fintech
Number of credits (ECTS):	5
Location in the curriculum:	1st Course, 1st Semester
Department:	
Head of department:	
Date of last revision:	March 2025
Teaching staff:	Jordi Planagumà, Bru Martinell,

1 OVERVIEW

The subject "Risk Analysis and Control" focuses on the study of financial risks in the context of markets that are increasingly interconnected, volatile and subject to constant regulatory changes. The main types of risk affecting financial institutions, asset managers and institutional investors are analysed, with special emphasis on the measurement and management of market, credit, liquidity and operational risk.

The course addresses advanced risk modelling tools (such as Value at Risk, scenario analysis or stress tests), as well as new technologies applied to its control. It also examines the international regulatory frameworks that condition the functioning of markets (Basel III, Solvency II, MiFID II) and discusses the role of sustainability and ESG criteria in risk management.

This course provides students with a solid foundation to rigorously perform in the analysis and control of risks in the financial sector, preparing them for roles in banking, risk consulting, financial auditing, and investment management.

2 OBJECTIVES

- Understand the concept of risk from a comprehensive perspective: financial, operational, strategic.
- Know the main international risk management models and frameworks.
- Identify, evaluate and classify different types of risks.
- Design risk control and mitigation strategies aligned with corporate objectives.
- Assess the role of technology in risk management (Big Data, AI, RegTech).
- Promote an organizational culture oriented to the control and anticipation of risk.

- Understand risk management using financial instruments.
- Integrate ESG (environmental, social and governance) criteria into risk analysis.

3 LEARNING OUTCOMES

At the end of the course, the student will be able to:

K3.1: Recognize the different methods of valuing projects and companies.

K3.2: Recognize the different financing structures and their implications for the company's profitability and risk.

S1.1: Communicate effectively orally, in writing and graphically with other people about learning, thinking and decision-making, and participate in debates, making use of interpersonal skills, such as active listening and empathy, which favour teamwork.

S2.1: Develop the capacity to contribute to innovation in new or existing business institutions and organizations, through participation in creative projects and have the ability to apply skills and knowledge on technology-based business sales, organization and development.

S3.1: Understand advanced digital technologies, so that they can be applied with a critical perspective, in diverse contexts, in academic, professional, social or personal situations.

S6.1: Analyze investment projects, acquisitions and other corporate operations from a financial point of view, considering the risks of the transaction, profitability and sustainability.

S6.2: Determine the cost of capital of the company, analyse long-term and short-term financing alternatives, both in established companies and in new entrepreneurs.

C1.1: Integrate the values of sustainability, understanding the complexity of systems, in order to undertake or promote actions that restore and maintain the health of ecosystems and improve justice, generating diverse visions for sustainable futures.

C2.1: Identify and analyse problems that require autonomous, informed and reasoned decision-making, in order to act with social responsibility, in accordance with ethical values and principles.

C3.1: Develop the capacity to assess gender and gender inequalities and to design solutions.

C6.2: Implement financial strategies that support business objectives and take into account the advances in digitalisation and new technologies that are breaking into the financial sector.

C7.1: Apply data analysis and visualization tools to obtain relevant information for business control or the identification of trends.

C7.2: Apply data analysis techniques, artificial intelligence, and machine learning fundamentals to analyze and predict trends in financial markets and make informed decisions in the management of technology investments and business finance.

We can highlight:

- Understand the fundamental concepts of risk and uncertainty in the financial field.
- Identify and classify the main types of financial risks: market, credit, liquidity, and operational.
- Analyze the impact of financial risks on investment decisions and portfolio management.
- Apply quantitative models for the measurement of market risk, such as Value at Risk (VaR) and Expected Shortfall (ES).
- Differentiate between market risk calculation approaches: parametric, historical simulation and Monte Carlo simulation.
- Assess credit risk using key indicators such as probability of default, expected loss, and exposure to default.
- Use structural and reduced models to estimate credit risk.
- Simulate adverse scenarios and perform sensitivity analyses for credit and market risk.
- Measure liquidity risk through indicators such as LCR, NSFR, and maturity flow analysis.
- Interpret the role of internal committees such as ALCO in liquidity risk management.
- To assess the international regulatory framework applicable to financial risk management (Basel III/IV, Solvency II, MiFID II, CRD/CRR).
- Analyze historical cases of liquidity crises and their impact on financial institutions.
- Identify operational risk events in financial and fintech contexts (fraud, technological failures, human errors, etc.).
- Apply operational risk identification and assessment tools such as risk maps and criticality matrices.
- Interpret key operational risk indicators (KRIs) and track loss events.
- Use technological tools (spreadsheets, dashboards, specialized software) to measure and control the different risks.
- Assess the contribution of new technologies (Big Data, AI, RegTech) in advanced risk management.

- Integrate ESG (environmental, social and governance) criteria into the analysis and control of financial risks.

4 CONTENTS

TOPIC 1. Introduction to Financial Risk Analysis

- 1.1. Concept of risk and uncertainty in the financial field. Definition of financial risk.
- 1.2. Practical examples of financial risks: fluctuation in asset prices, interest rate variability, credit risk, among others.
- 1.3. The role of uncertainty in investment decisions and portfolio management.

TOPIC 2. Financial Risk Classification

2.1. Classification of financial risks.

- 2.1.1. Market risk.
- 2.1.2. Credit risk.
- 2.1.3. Liquidity risk.

TOPIC 3. Market Risk and Credit Risk: Measurement and Control

- 3.1. Market and credit risk as pillars of global risk.
- 3.2. Market risk: definition, factors (interest rate risk, exchange rate, equities, commodities), and exposure.
- 3.3. Measuring Market Risk:
 - a. Value at Risk (VaR): concept, assumptions, advantages and limitations.
 - b. Expected Shortfall (ES): definition and comparison with VaR.
 - c. Calculation approaches: parametric, historical simulation and Monte Carlo simulation.
 - d. Practical applications and use in regulatory environments (Basel IV).
- 3.4. Credit Risk:
 - a. Definition, key components and metrics (probability of default, exposure in case of default, expected loss).
 - b. Credit risk measurement models: structural, reduced and internal models.
 - c. Simulation of adverse scenarios: use of stress testing techniques and sensitivity analysis.
- 3.5. Practical tools: advanced spreadsheets, statistical software.
- 3.6. Interaction between market risk and credit: cross-correlations and contagion risk.

TOPIC 4. Liquidity risk

4.1. Introduction:

1. Introduction to liquidity risk.
2. Definition and types of liquidity risk.
3. Impact on financial institutions.
4. Relevant historical cases (e.g., Northern Rock, Lehman Brothers).
5. Liquidity risk measurement.

4.2. Analysis and measurement:

1. Quantitative indicators: LCR, NSFR, liquidity gap.
2. Analysis of cash flows and maturities.
3. Static and dynamic simulation tools.
4. . Liquidity risk management.
5. Internal policies and boundaries.
6. Rol del ALCO (Asset and Liability Committee).

4.3. Regulation and supervision:

1. Basel III requirements.
2. European regulatory framework (CRD/CRR).
3. Liquidity risk supervision by the ECB.
4. Stress testing regulatorio.

TOPIC 5. Operational Risk

5.1. Introduction to Operational Risk:

1. Definition and characteristics of operational risk.
2. Types of events (internal/external fraud, technological failures, human errors, disasters).

5.2. Normative and regulatory framework:

1. Basel II and III: treatment of operational risk.
2. Approaches to the calculation of regulatory capital (BIA, TSA, AMA).
3. European regulations and ECB and EBA guidelines.
4. Relationship with business continuity management (BCP/DRP).

5.3. Identification and assessment of operational risk:

1. Common sources of operational risk in financial and Fintech environments.
2. Identification tools: risk maps, criticality matrices.
3. Operational risk scenarios.
4. Internal and external data collection (ORX-type databases).

5.4. Measurement and monitoring of operational risk:

1. Key Risk Indicators (KRIs) and associated metrics.
2. Quantitative evaluation models: expected loss and severity.
3. Tracking incidents and loss events.

5 METHODOLOGY

The methodology is based on participatory lectures complemented by the reading in advance of the different topics of the material previously published on the virtual campus. With the practices in class and the work at home, it is expected to reaffirm the concepts and procedures that have been presented in class.

The subject combines:

- Theoretical sessions with analysis of current case studies.
- Practical workshops on market analysis and financial products.

6 EVALUATION

In accordance with the Bologna Plan, the model rewards the constant and continuous effort of students.

40% of the grade is obtained from the continuous evaluation of the directed activities and the remaining 60% from the final face-to-face exam. The final exam has two sittings.

Distribution of continuous assessment (60%):

- Individual practical work: 40%
- Specific analysis group project: 40%
- Participation in discussions and case studies: 20%

Final exam (40%):

The exam will evaluate all units with the following approximate weighting:

- Topic 1: 20%
- Topic 2: 20%
- Item 3: 20%
- Item 4: 20%
- Item 5: 20%

7 BIBLIOGRAPHY

Basic:

- Dowd, Kevin (2005). *Measuring Market Risk*. 2nd ed. Wiley.
- Hull, John C. (2023). *Risk Management and Financial Institutions*. Wiley.

- Jorion, Philippe (2007). Value at Risk: The New Benchmark for Managing Financial Risk. 3rd ed. McGraw-Hill.
- McNeil, Alexander J.; Frey, Rüdiger; Embrechts, Paul (2015). Quantitative Risk Management: Concepts, Techniques and Tools. Revised ed. Princeton University Press
- Wilmott, Paul (2006). Paul Wilmott on Quantitative Finance. 2nd ed. Wiley.

Complementary:

- Bessis, Joël (2015). Risk Management in Banking. 4th ed. Wiley
- Christoffersen, Peter F. (2011). Elements of Financial Risk Management. 2nd ed
- Crouhy, Michel; Galai, Dan; Mark, Robert (2000). Risk Management. McGraw-Hill.
- Glasserman, Paul (2004). Monte Carlo Methods in Financial Engineering. Springer.
- Taleb, Nassim Nicholas (2018). The Statistical Consequences of Fat Tails

Digital Resources:

- Bank for International Settlements (www.bis.org)
- Bloomberg Terminal (institutional access)
- ECB Statistical Data Warehouse (sdw.ecb.europa.eu)
- FRED Economic Data (fred.stlouisfed.org)
- International Monetary Fund (www.imf.org)
- The Financial Times (www.ft.com)
- World Economic Forum - Financial and Monetary Systems (www.weforum.org)