upf. BARCELONA SCHOOL OF MANAGEMENT

Derivative Markets

Professor: Manuel Moreno Fuentes
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Office hours: by appointment
Course Type: Compulsory
Credits: 4
Term: First

Course Description

This is an introductory course on derivatives that covers the topics included in the CFA derivatives curriculum. The course begins with fundamental concepts and definitions regarding how derivatives work, with the primary objective of ensuring that students gain a solid grasp of the mechanics of these instruments. To achieve this, a significant portion of the sessions will consist of lectures designed to establish a consistent baseline of knowledge regarding these types of products.

It is worth noting that the course's conceptual approach enables all students to learn and understand, to a certain extent, the theoretical concepts underlying derivatives markets. In subsequent elective courses within this master's program, students will have the opportunity to delve deeper into the analysis of more complex strategies and applications involving derivatives.

In short, this course focuses on financial risk management, with particular emphasis on derivatives. These assets represent a key component of modern financial markets. The size of derivatives markets (forwards, futures, swaps, and options) dwarfs that of any other type of market and is measured in thousands of trillions of U.S. dollars. The main reason for this is that these financial assets allow astute investors to easily alter the risk exposure of their investment portfolios, thereby tailoring them to their specific needs and preferences.

We begin with the design of derivative products and seek to understand how these contracts are used in practical management around the world. While derivative pricing can be quite technical and complex, the fundamental economic reasoning behind pricing methods is relatively simple. Our approach is to always present the "big picture" and the underlying rationale first, delving into technical details only when they are necessary from a practical standpoint. At the end of the course, you should be able to understand the structure of the main derivatives and, even more importantly, gain a thorough understanding of how these assets can be used to manage exposure to specific risks. You should also be able to determine the prices of these assets in various scenarios.

We will explore the understanding of international equity and derivatives markets. We will analyze the mechanics of forwards, futures, swaps, options, and other more customized derivatives. Emphasis will be placed on the application of these instruments to corporate risk management. Finally, throughout the course, we will examine examples where financial engineering applied to corporate risks proved decisive for the success (or failure) of a company's strategy.

Objectives

The objective of this course is to study the fundamentals of financial risk management, primarily using derivative instruments. **The course has three main objectives:**

a) To understand the role of financial risk management, as well as the techniques available for measuring it in financial and non-financial firms.
b) To analyse the financial instruments available in modern financial markets and the strategies a firm can employ to optimise the management of the risks it faces; and
c) To establish a framework for integrating financial risk management into the firm's overall corporate strategy.

In summary, the primary objective of this course is to provide an overview of the various potential applications of derivative assets in risk management. Other possible applications of derivatives that may also be addressed include, for example: a) market speculation (how to profit from a specific forecast regarding future market movements) and b) the design of (arbitrage) strategies to generate risk-free profits from observed arbitrage opportunities.

Prerequisites

The course will cover certain financial instruments and strategies that can be quite complex. It assumes that students have no prior knowledge of how derivative instruments work, and – as indicated before – the primary objective of the course is to ensure they gain a solid grasp of the mechanics of these instruments. **Given the quantitative nature of most of these instruments, familiarity with quantitative and analytical techniques is strongly recommended.**

Learning outcomes

As stated before, at the end of the course, the student should be able to understand the structure of the main types of derivative contracts, how to price these derivatives and, even more important, thoroughly understand how these assets can be used to manage the exposure to a certain risk. In this way, the review of the pricing methods and the techniques for measuring and managing risk will help us to understand the use of

financial instruments to manage risk. This knowledge will be especially useful in applying derivatives for pricing and risk management by corporations.

Methodology

The teaching methodology for this course combines theoretical sessions with practical examples. Students are required to analyse these situations and understand the rationale behind the risk management activities implemented by various individual investors or companies. Most of the examples used in the course are (simplified) versions of real-world applications of hedging strategies executed using derivatives.

The instructor's primary role is to direct and guide students in achieving the course's objectives. This is accomplished through a variety of teaching techniques and different types of learning activities, such as the following. Every lecture will typically include some of the following three elements:

a) Presentation and discussion of a **reading set**, typically a chapter in the reference book.
b) **Case** presentation and discussion, and
c) **Lecturing** (theory concepts).

The recommended approach for students is to **work on the readings or the case prior to the session**, *attend the session*, and actively participate in the readings or case discussions. I hope you participate actively in class. You can ask questions, raise issues, share your knowledge, and challenge the opinions of others (including mine, of course). Subsequently, it is suggested that students read the relevant chapters or texts (if further detail is required) and review the topic covered *after the session*.

Generally, understanding and reflecting on the slides covered in class is sufficient to pass successfully this course. If you have questions about the topics addressed, you can consult the corresponding chapter of the textbook and, of course, you are more than welcome to discuss those questions with the professor.

The "Schedule and Content" section below includes a detailed list of all the readings to be covered throughout the course. In what follows, you will find a description of each of these elements, the class dynamics, and the grading criteria.

The competences, the learning outcomes, the assessment elements and the quality of the learning process included in this Teaching Plan will not be affected if during the academic trimester the teaching model has to switch either to a hybrid model (combination of face-to-face and on-line sessions) or to a complete on-line model.

Cases

Several sessions include a "Case Discussion." The aim of these cases is to summarize and apply the concepts studied in the corresponding session(s). **All the students** are expected to read the cases with the questions raised in mind to contribute to the class discussion. The presentation and defense of each case will be assigned to **a specific group of students**. A set of preliminary questions will be provided to introduce the case and structure its analysis. This activity will be assessed **based on the case presentation and discussion**. All students in the same group will receive the same grade unless the group unanimously decides otherwise.

Lecturing

Most class sessions will introduce new concepts and theory. The aim is to make them as participatory and dynamic as possible. Therefore, students are encouraged to intervene with questions or constructive, clarifying comments at any point during the class.

The content for each session is covered in the recommended readings. Specific materials are indicated in the course schedule. Due to inevitable time constraints, **the lecture slides will cover only the key aspects of each topic**. To prepare adequately for the exam, it is necessary to read the relevant material and complete the suggested problems (if any) after each session.

Readings set

All classes include a slide presentation, and the assigned readings are based on chapters from the reference book. The aim of these readings, as well as the in-class questions and comments, is to encourage engagement with the session's key topics. Students are expected to read the material with these questions in mind to contribute to the class discussion.

Suggested problems

Some classes may include a set of *suggested problems* based on the recommended readings. These problems are designed to help you understand and assimilate the course material, as well as to serve as a guide for self-assessment of your progress and preparation for the final exam. Students are encouraged to work regularly on the suggested problems and to consult the instructor regarding any doubts or questions. Some sessions may focus on analyzing or solving some of these problems, particularly those that raise questions for a significant number of students.

Evaluation criteria

To pass the course, it is necessary to obtain at least 50 out of a total of 100 points, based on the following breakdown:

1. **Problem resolution** (20 points). Students (in groups) must solve two problem sets, each worth 10 points.
2. **Case discussion** (30 points). Students (in groups) must present and discuss the cases included in the course. Each group will be assigned a specific case. The presentations and discussions should help students form an opinion on the strategies of specific companies. In general terms, the grade will depend on how they reached their conclusions regardless of whether their opinion aligns with mine.
3. **Final exam** (50 points). **The minimum exam score to pass the course is 4 out of 10.** Students are allowed to bring one sheet of paper (written on both sides) containing any material (mathematical expressions, graphs, etc.) they deem appropriate.

Students who do not meet this minimum passing grade should retake the final exam but not the case discussion nor the problems resolution. After this retake, the above grade criteria also apply.

Students are required to attend 80% of classes. Failing to do so without justified reason will imply a Zero grade in the participation/attendance evaluation item and may lead to suspension from the program

Students who fail the course during the regular evaluation are allowed ONE re-take of the evaluation, in the conditions specified above. If the course is again failed after the retake, the student will have to register again for the course the following year.

In case of a justified no-show to an exam, the student must inform the corresponding faculty member and the director(s) of the program so that they study the possibility of rescheduling the exam (one possibility being during the “Retake” period). In the meantime, the student will get an “incomplete”, which will be replaced by the actual grade after the final exam is taken. The “incomplete” will not be reflected on the student’s Academic Transcript.

Plagiarism is to use another’s work and to present it as one’s own without acknowledging the sources in the correct way. All essays, reports or projects handed in by a student must be original work completed by the student. By enrolling at any UPF BSM Master of Science and signing the “Honor Code,” students acknowledge that they understand the schools’ policy on plagiarism and certify that all course assignments will be their own work, except where indicated by correct referencing. Failing to do so may result in automatic expulsion from the program.”

Schedule and Contents

INTRODUCTION: IDENTIFICATION, MEASUREMENT, AND HEDGING OF FINANCIAL RISK EXPOSURE

1. Introduction: Course overview, description, and work plan. Reasons and Incentives for Financial Risk Management (FRM)

   Reading: Introduction to derivatives

   Hull, Chapter 1

THE FUNDAMENTAL COMPONENTS OF RISK MANAGEMENT SYSTEMS

2. Derivatives: forwards and futures

   Readings:

   Mechanics of forward and futures markets

   Hedging strategies using futures

   Determination of forward and futures prices

   Hull, Chapters 2, 3, and 5

3. Derivatives: options and option-like instruments

   Readings:

   Mechanics of options markets

   Properties of stock options

   Hull, Chapters 10 and 11

OPTION PRICING

4. Binomial pricing and replicating portfolio. Black-Scholes option pricing and practical applications

   Reading: Option pricing

   Hull, Chapters 13, 15, and 19

BUSINESS CASES

5. Derivatives: forward and futures for speculation

   Case: Speculation in the Financial Futures Market: A Local Tries to Break the Bund

   (London Metropolitan University 299-009-1)

   Reading: Determination of forward and futures prices

   Hull, Chapter 5

6. Cross-Hedging Basis Risk and application of basis risk

   Case: Metallgesellschaft AG (IMD 3-0613)

7. Derivatives: Combining options to achieve optimal risk / payoff strategies

   Cases: The Collapse of Barings (London Business School 401-020-1 & 401-021-1)

   Reading: Trading strategies involving options

   Hull, Chapter 12

8. Using options to limit your risk

   Case: Pine Street Capital (HBS 9-201-071)

9. An application of FRM

   Case: American Barrick Resource Corporation: Managing Gold Price Risk (HBS 9-293-128)

10. Final exam: 11, December 2026.

Reading Materials/ Bibliography/Resources

There exist many very good books that review the basic financial instruments and tools commonly used in derivatives pricing and financial risk management.

The course will use material drawn from the following books:

1. Hull, J. (2022) “Options, Futures and other Derivatives” Prentice Hall, 11th edition.

   This book will be referred to as "Hull" and is a classic reference in the field. In 2003, it was named the “most influential book” in the financial world, the result of a worldwide survey of professionals and academics.

2. Hull, J. (2022) “Fundamentals of Futures and Options Markets” Prentice Hall, 9th edition.

Bio of Professor

Manuel Moreno holds a Ph. D. in Economics by University Carlos III (Madrid) and a B. Sc. in Mathematics by Universidad Complutense (Madrid). He is currently Full Professor of Finance at Universidad Castilla-La Mancha, where he coordinates the Official Master in Banking and Quantitative Finance and the Ph. D. Program in Quantitative Finance and Economics. He is also affiliated professor to Universitat Pompeu Fabra (Barcelona) in both Barcelona School of Management (BSM) and Barcelona School of Economics (BSE), external professor at Universidad Carlos III (Madrid), and Adjunct Professor at the Instituto de Empresa (IE) Business School.

He has previously held teaching and research positions at the Financial Option Research Centre (Warwick Business School), Católica Lisbon School of Business & Economics (Universidade Católica Portuguesa), IESE Business School, Universidad Carlos III (Madrid), and Universitat Pompeu Fabra (Barcelona). In the past, he was the Founder and Co-Director of the Master Sc. in Finance at BSE in Universidad Pompeu Fabra (Barcelona), Associate Editor of the scientific journals *Studies in Economics and Finance* and *Revista de Economía Financiera* and Co-President of the Scientific Committee at the XIV Meeting of the Spanish Finance Association. Instructor in several "in company" courses in institutions, as for instance, Banco Popular, Endesa, Caixa Catalunya, or the International Olympic Committee.

His research interests focus on finance in continuous time, with particular emphasis on derivatives markets, financial engineering, derivatives pricing, portfolio management, term structure models, climate risk management, and machine learning applied to credit risk. He has received several awards for his research such as, for instance, the *Barclays Global Investors Australia Research Award* and the *Mutua Pelayo* award at the *IX Italian-Spanish Congress on Financial and Actuarial Mathematics*.

He has published extensively in prestigious academic journals such as *Annals of Operations Research*, *Australian Journal of Management, Economic Modelling, Energy Economics, European Journal of Finance, European Journal of Operational Research, Finance Research Letters, Journal of Banking and Finance, Journal of Computational Finance, Journal of Futures Markets, Journal of the Operational Research Society, Journal of Risk Model Validation, Physica A: Statistical Mechanics and its Applications, Quantitative Finance, Quantitative Finance and Economics*, or *Review of Derivatives Research,* as well as in various professional volumes. He has presented his work at diverse international conferences and has delivered invited lectures at numerous academic and non-academic institutions.

He has received various awards for his teaching skills, including the "*Jaume Vicens Vives*" distinction for university teaching quality, awarded by the Government of Generalitat de Cataluña in 2004; the "*Distinguished Teaching*" award (2020–21) at the

Católica Lisbon School of Business & Economics (Lisbon); and 7 "*Teaching Excellence Acknowledgement"* awards (2019–26) at Universidad Carlos III (Madrid). At IE Business School, he was nominated for the "*Best Professor of the Year IE Business School Prize 2011*" award for full-time master programs, ranked among the top three professors for the 2010–11 academic year, and has received 18 "*Prizes of Teaching Excellence"* for full-time master programs as well as 5 "*Prizes of Teaching Excellence"* for *Lifelong Learning* (executive education) courses.