Derivatives and Risk Management

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

Course Description

The course focuses on the area of financial risk management with special emphasis on financial derivatives. This type of assets represents one of the key components of modern financial markets. The mere size of derivatives markets (futures, options, swaps, etc.) dwarfs that of any other type of markets in existence and is measured in thousands of trillions of U.S. dollars. The key reason for that is that financial assets allow astute investors to easily change risk exposure of their investment portfolios and, thus, tailor them to their particular needs and desires.

In this course, we depart from the design and pricing of financial derivatives and we aim to understand how such contracts are used in the management practice around the world. While pricing of derivatives can be rather technical and complex, the fundamental economic reasoning behind derivatives pricing methods is quite simple. In our approach, we aim to give always first the “big picture” and motivation and only then dwell into technical details as it will be necessary from the practical point of view. At the end of the course you should be able to understand the structure of the main types of derivative contracts and, even more important, thoroughly understand how these assets can be used to manage the exposure to a certain risk. Jointly with that, you should also be able to obtain prices for these assets in different situations.

This part will involve the understanding of international financial markets for equity and derivatives. We will review the workings of swaps, futures, options, and other more customized derivatives. The emphasis here will be in the applications of these instruments for risk management by corporations. Finally, we will review examples throughout the course in which financial engineering of corporate risks was crucial for the success (and failure) of a company strategy.

Objectives

The goal of this course is to study the fundamentals of financial risk management using in most of the cases derivatives assets. The course has three main objectives:

a) To understand the role of financial risk management as well as the techniques available for its measurement in financial and non-financial corporations.
b) To review the set of financial instruments available in modern financial markets as well as the strategies that a firm can use to optimise the management of the risks this company is faced to, and
c) To build a framework that will help integrate financial risk management into the overall corporate strategy of the firm.

In summary, the main objective of this course is to present an overview of the different potential applications for risk management of derivative assets. Other potential applications of derivatives that can also be covered are, for instance, a) speculation in markets (how to get money departing from a certain guess on future movements in markets) and b) design of (arbitrage) strategies to make riskless profits from observed arbitrage opportunities.

Methodology

Every lecture will typically contain some of the following 3 elements:

a) Presentation and discussion of a **reading set**.
b) **Case** presentation and discussion, and
c) **Lecturing** (theory concepts).

The recommended dynamics for the student are **to work on the readings set or case before the corresponding session**, *attend the session* and participate actively in the readings or case discussion. Then read the corresponding chapters / readings (if additional details are needed) and work on the corresponding issue *after the session*.

The Section “Calendar and Contents” below includes a detailed list of all the readings that will be covered through the course. In what follows you will find a description of each of these elements, the class dynamics, and the grading criterion.

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 an hybrid model (combination of face-to-face and on-line sessions) or to a complete on-line model.

Prerequisites

The course will cover some financial instruments and strategies which could be quite complex. The course assumes that students have no prior knowledge about how derivative instruments work and one of the main objectives of the course is to guarantee that students finish with a good handle on the mechanics of these instruments. As most

of these instruments are quantitative in essence, familiarity with quantitative and analytical techniques is strongly recommended.

Cases

Several of the lectures include a "Case Discussion". The cases are meant to summarize and exercise the concepts studied in the lecture/s. As a way to introduce the case and structure its analysis a set of questions will precede the case. **All the students** are expected to read the cases with the questions in mind to contribute to the class discussion. This will be graded through **case discussion**.

Every case will be assigned to **a particular student or group** who will be in charge of

1. Introducing the topic during approximately the first part of the class
2. Leading the discussion (extra material, complementary questions, …)

These tasks will be graded. The average will constitute the **case discussion** grade for the students (in case of group work, all the students will obtain the same grade except the group *unanimously* decides otherwise)

Lecturing

As a general rule, most of the lectures will introduce new concepts and theory. The objective is to make it as participative and dynamic as possible. Therefore, students are encouraged to intervene with clarifying and constructive questions or remarks anytime during the lecture.

The material covered in every lecture is contained in the recommended readings. The specific material is mentioned opportunely in the course schedule. Due to the obvious time constraint, class slides will only cover the main aspects of every topic. A successful preparation for the exam requires reading the corresponding material and working on the suggested problems (if any) after every session.

Suggested problems

Some lectures may include a *suggested* set of problems from the recommended readings. These problems are designed to help you understand and digest the course material and serve as a self-guide of your progress and as preparation for the final exam. Students are encouraged to work regularly on the suggested problems and check personally with the instructor any question/doubt. Some sessions can focus on discussing / solving some of these problems, especially those that elicit questions/doubts from a sufficiently large number of students.

Evaluation criteria

To pass the course, you must earn at least 50 points out of 100, according to the following distribution:

1. **Problem resolution** (20 points). Students (by groups) will be required to solve two problem sets.
2. **Case discussion** (30 points). Students (by groups) will be required to present and discuss the cases involved in the course. Each group of students will be assigned a certain case. The presentations / discussions should help you to form an opinion about certain firm's strategies. In general terms, the grade will depend on how you arrived at your conclusions regardless your opinion agrees with mine.
3. **Final exam** (50 points). Exam minimum grade to pass the subject is 4 over 10. You are allowed to bring in one page (written on both sides) including the material (mathematical expressions, graphs,...) you feel convenient.

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."

Calendar and Contents

INTRODUCTION: IDENTIFYING, MEASURING, AND HEDGING THE EXPOSURE TO FINANCIAL RISKS	1. Introduction: Course overview, description, and work plan. Reasons and Incentives for Financial Risk Management (FRM) Reading: Introduction to derivatives Hull, Chapter 1	6 hours
THE BUILDING BLOCKS OF RISK MANAGEMENT SYSTEMS	2. Derivatives: forwards and futures Readings: Mechanics of forward and futures markets Determination of forward and futures prices Hedging strategies using futures Hull, Chapters 2, 3, and 5	6 hours
	3. Derivatives: options and option-like instruments Readings: Mechanics of options markets Properties of stock options Hull, Chapters 9 and 10	9 hours
OPTION PRICING	4. Binomial pricing and replicating portfolio. Black-Scholes option pricing and practical applications Reading: Option pricing Hull, Chapters 12, 14, and 18	4 hours

	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 3	1 hour
	6. Cross-Hedging Basis Risk and application of basis risk Case: Metallgesellschaft AG (IMD 3-0613)	1 hour
	7. Derivatives: Potential applications for speculation / hedging. 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 11	1 hour
	8. Using options to limit your risk Case: Pine Street Capital (HBS 9-201-071)	1 hour
	9. An application of FRM Case: American Barrick Resource Corporation: Managing Gold Price Risk (HBS 9-293-128)	1 hour
	10. Final exam: 12, December, 2024.	

Reading Materials/ Bibliography/Resources

The course will use class materials including handouts, cases, and some other readings. There exist many very good books that review the basic financial instruments and tools commonly used in derivatives pricing and financial risk management.

In short, the course will use material extracted from the following books:

1. Hull, J. (2017) “Options, Futures and other Derivatives” Prentice Hall, 10th edition.

   This book is a classical reference in this area. It was chosen in 2003 as the “most influential book” on the financial area as a result of a worldwide survey among practitioners and academics.

This book is the extended version of the following one:

2. Hull, J. (2016) “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 de Madrid and a B. Sc. in Mathematics by Universidad Complutense de Madrid. He is currently affiliated to Universidad Castilla-La Mancha where he is Associate Professor of Finance, Vicedean of Quality, and coordinator of the Official Master in Banking and Quantitative Finance and of the Ph. D. Program in Quantitative Finance and Economics. He is also affiliated professor to Universitat Pompeu Fabra (Barcelona), Adjunct Professor at the Instituto de Empresa (IE) Business School, external professor at Universidad Carlos III (Madrid), and Associate Editor of the scientific journal *Studies in Economics and Finance*

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, Lisbon), 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 Universidad Pompeu Fabra (Barcelona), Associate Editor of *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 special 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 prizes for his research activity as, for instance, the *Barclays Global Investors Australia Research Award* or the prize *Mutua Pelayo* in the *IX Italian-Spanish Congress on Financial and Actuarial Mathematics*.

He has also published extensively in leading scientific journals as, for example, *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, Physica A: Statistical Mechanics and its Applications, Quantitative Finance, or *Review of Derivatives Research,* as well as in several professional volumes. He has presented his work at different international conferences and has given invited talks in many academic and non-academic institutions.

He has been awarded different prizes to his teaching skills including the distinction “Jaume Vicens Vives” to the University teaching quality, awarded by the Government of Generalitat de Cataluña, “Distinguished Teaching” (2021) at Católica Lisbon School of Business & Economics, and 5 “Acknowledgement of excellent student teaching evaluations” (2019-24) at Universidad Carlos III (Madrid). At IE Business School, he has been nominated for "Best Professor of the Year IE Business School Prize 2011" in full-time Masters, was included in the Top 3 of the professors in the course 2010-11, has received 17 Prizes of Teaching Excellence in full-time masters, and 3 Prizes of Teaching Excellence in Executive Education courses.