llsms2226

2023

Credit and interest rate risk

| 5.00 credits | 30.0 h | Q2 |

Teacher(s)	Vrins Frédéric ;
Language :	English
Place of the course	Louvain-la-Neuve
Prerequisites	Advanced courses in probability theory and finance course covering financial markets and products. Corresponding UCl course: • LLSMS2225 (Elements of Stochastic calculus) • LLSMS2100 (Advanced Finance) In addition, this course is reserved for students with a bachelor's degree in business engineering or students with equivalent quantitative method skills.
Main themes	1. Part I : Black-Scholes Model (discrete time Cox-Ross-Rubinstein, continuous time model Black-Scholes-Merton, greeks) 2. Part II: arbitrage-free pricing (fundamental theorem of asset pricing). 3. Part III : Interest rates products (FRAs, Swaps, caps, floors) and pricing (affine short rate model, arbres binomiaux). 4. Part IV : Limits of the model and advanced methods.
Learning outcomes	**At the end of this learning unit, the student is able to :** 1 ***During their programme, students of the LSM Master's in management or Master's in Business engineering will have developed the following capabilities*** 2.2 Master highly specific knowledge in one or two areas of management : advanced and current research-based knowledge and methods. 2.3 Articulate the acquired knowledge from different areas of management. 2.4 Activate and apply the acquired knowledge accordingly to solve a problem. 3.1 Conduct a clear, structured, analytical reasoning by applying, and eventually adapting, scientifically based conceptual frameworks and models,to define and analyze a problem. 6.1 Work in a team :Join in and collaborate with team members. Be open and take into consideration the different points of view and ways of thinking, manage differences and conflicts constructively, accept diversity. 8.1 Express a clear and structured message, both orally and in writing in their mother tongue, in English and ideally, in a third language, adapted to the audience and using context specific communication standards. 8.3 Persuade and negotiate :understand the needs and viewpoints of others, put forward their reasoning in an appropriate, relevant and persuasive manner, able to bring out points of agreement, even in antagonistic situations.

Evaluation methods	**Continuous evaluation (projects with implementation in R)**
	
	 • Date: *Will be specified at the beginning of the course*
	 • Type of evaluation: *Report (teamwork, 20% of final grade) and Individual assessment (following the oral exam, during the examination session; 10% of final grade)*
	
	 Evaluation week
	
	 • Oral: *No*
	 • Written: *No*
	
	 Examination session
	
	 • Oral: *Yes*
	 • Written: *No*
	 • Comments: The final examination is made of two parts :
	
	     • *1h preparation of questions (exercises + theory) followed by a 10 to 15 min discussion with the professor (60% of final grade)*
	     • *10 min discussion with the teaching assistant to assess the individual contribution of the student in the group project (10% of final grade).*
	
	 Complementary information about the project
	
	 • *The grade of the project (both the group and individual parts) will be set to 0 for the students who would not present the individual examination scheduled the day of the exam. It is however possible to skip the oral exam, and to defend the individual part of the project only.*
	 • <u>*In case of failure in first session:*</u> *the grade of the report of the project will be automatically transferred. The same holds for the individual part of the project, provided that it was successful in the first session. Otherwise, the student must retake the individual part in second session.*
	 • <u>*In case of failure in second session:*</u> *If both parts of the project were successful, the student gets a dispense for the project of the next academic year. Otherwise, the student must enroll in the project of the new academic year. It is the responsibility of the student to make sure (s)he joins a group !* <u>*Pay attention to the announcement on Moodle !*</u>
	
	 Important note about plagiarism and the use of generative AI
	 By submitting an assignment for evaluation, you assert that:
	
	 • *it accurately reflects the facts and to do so you need to have verified the facts, especially if they originate from generative AI resources;*
	 • *all your sources that go beyond common knowledge are suitably attributed. Common knowledge is what a knowledgeable reader can assess without requiring confirmation from a separate source;*
	 • *you have respected all specific requirements of your assigned work, in particular requirements for transparency and documentation of process, or have explained yourself where this was not possible.*
	
	 If any of these assertions are not true, whether by intent or negligence, you have violated your commitment to truth, and possibly other aspects of academic integrity. This constitutes academic misconduct.

Teaching methods	Ex-cathedra courses enriched with exercises on R and group and/or individual projects. The main objective of the project is to make the concepts more concrete and to facilitate the learining process.
Content	The course starts with a brief review of the key concepts and results introduced in LLSMS2225. In the later, a key assumption was that stakeholders are default free. We first explain how a default event can default risk can be accounted for using stochastic models (structural form, reduced form and rating transitions). This is used to determine the credit spread associated with defaultable Bonds, as well as to explain how interest rates derivatives such as FRAs, Swaps but also caps and floors can be priced.
Bibliography	• Slides, Excel workbook and R code - Hull, J. Options, Futures and Other derivatives. - Portrait & Poncet, Finance de marché, Dalloz, 2009. - Joshi, M. : Concepts and Practice of Mathematical Finance, Cambridge University Press, 2003. - Shreve, S. : Stochastic calculus for Finance I & II, Springer 2004.
Faculty or entity in charge	CLSM

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Learning outcomes
Master [120] in Actuarial Science	ACTU2M	5		🔍
Master [120] : Business Engineering	INGE2M	5		🔍
Master [120] in Economics: General	ECON2M	5		🔍