

5.00 credits



30.0 h

Q1


This learning unit is not open to incoming exchange students!

Teacher(s)	Hainaut Donatien ;
Language :	French
Place of the course	Louvain-la-Neuve
Prerequisites	LACTU2030 Actuariat de l'assurance-vie LACTU2170 Valorisation financière des engagements actuariels.
Main themes	Jump-diffusion and Lévy or stochastic volatility processes, valuation of participating contracts with stochastic interest and mortality rates and hedging.
Learning outcomes	
Evaluation methods	The assessment consists of a project and of a written exam for which the student has a form. The instructor reserves the right to orally question the student both on the exam answers and on the project content.
Teaching methods	The course consists of 13 theoretical lessons which the student is required to attend.
Content	<p>The course contains two parts, respectively dedicated to Lévy processes and to the valuation of life-insurance contracts in hybrid rate-stock models.</p> <p>Part 1 : Lévy process</p> <ul style="list-style-type: none"> • Introduction & review of probability concepts • Lévy processes : first contact • Valuation by simulations with jump-diffusions (Ratchet GMAB) • Estimation of a jump-diffusion under the real measure • Lévy process & infinite divisible distributions • Subordination • Valuation by simulations with VG and NIG (unit-linked contract with lookback guarantee) • Estimation of VG and NIG under P • Jump measures & Lévy-Itô decompositions • Stochastic calculus for Lévy processes <p>Part 2 : Life insurance engineering & hybrid models</p> <ul style="list-style-type: none"> • Short reminder about IR, change of numeraire and B&S • GMAB valuation in a hybrid Hull & White model • Estimation of the HW hybrid model & numerical GMAB valuation • The HJM framework for interest rates • Valuation of hybrid products in a HJM G2++ framework • Estimation of the G2++ hybrid model & GMAB valuation • Forward rates • Libor forward model (LFM) • LFM estimation under P • Participating contracts with caps, floors in the LFM (Cash-Max insurance) • GMAB in a hybrid LFM. • Hybrid LFM estimation under under P & GMAB valuation • Introduction to stochastic volatility: Heston model
Inline resources	Moodle website

Bibliography	Les diapositives disponibles sur moodle peuvent être complétées si besoin par <ul style="list-style-type: none">• Lévy processes in Finance : Pricing Financial Derivatives. Schoutens W. 2003, Wiley Series in Probability and Statistics.• Interest rate models : Theory and Practice (with Smile, Inflation and Credit). Brigo D., Mercurio F. 2016. Springe Finance.• Actuarial Mathematics for Life Contingent Risks. Dickson, D.C.M., Hardy, M.R., Waters, H.R. 2009, Cambridge University Press.
Faculty or entity in charge	LSBA

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Learning outcomes
Master [120] in Mathematics	MATH2M	5		
Master [120] in Actuarial Science	ACTU2M	5		
Master [120] in Mathematical Engineering	MAP2M	5		