University of Gdańsk

Subject card

Subject name and code	Options Theory, PG_00206877		
Field of study	Mathematics		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2027/2028
Education level	Master's studies	Subject group	Obligatory subject group in the field of study Optional subject group Subject group related to scientific research in the field of study
Mode of study	full-time studies	Mode of delivery	at the university
Year of study	2	Language of instruction	Polish
Semester of study	4	ECTS credits	5.0
Learning profile	academic	Assessment form	exam
Conducting unit			
Name and surname of lecturer (lecturers)	Subject supervisor	dr Monika Wrzosek	
	Teachers		

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	30.0	0.0	0.0	0.0	60

E-learning hours included: 0.0

Learning activity and number of study hours

Learning activity	Participation in didactic classes included in study plan	Participation in consultation hours	Self-study	SUM
Number of study hours	60	3.0	62.0	125

Subject objectives

To familiarize students with classical option pricing models and directions of their generalizations.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[MATMU2_U04] is able to apply the scientific method in solving advanced problems in a selected branch of mathematics or its applications, and appropriately selects methods and tools - mathematical or computer - needed to solve such problems	The student is able to apply probabilistic and mathematical methods to the pricing of derivative instruments and the analysis of problems in option theory.	[SU4] test/exam - oral or written
[MATMU2_W03] knows and understands to a deep degree a selected field of theoretical or applied mathematics and is able to understand the formulations of issues in this field that are still at the research stage and knows the connections between issues in this field and other areas of mathematics	The student knows and understands options theory and the role that probabilistic methods play in it.	[SW4] test/exam - oral or written

Subject contents

1. Discrete-time financial market model. - portfolio, portfolio value, self-financing strategies, - arbitrage and martingale measure, - European payoff, replicating strategies, complete market, - martingale method of derivatives valuation, - Cox-Ross-Rubinstein binomial model. 2. Continuous-time financial market model. - Black-Scholes model, martingale valuation of derivatives, - valuation of European options in the Black-Scholes model, 3. Option sensitivity coefficients. 4. American, exotic options. 5. Historical method and implied volatility method of determining the volatility coefficient σ (volatility), 6. Review of models that are generalizations of the B-S model, in particular the Hull and White, Heston, or Dupire models.

Prerequisites and co-requisites

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	exam	51.0%	50.0%
	tests	51.0%	50.0%
	observation of the student's attitude	51.0%	0.0%
Recommended reading	Basic literature	1. J. Jakubowski, Modelowanie rynków finansowych, Script, 2006. 2. S. R. Pliska, Inroduction to Mathematical Finance, Discret Time Models, Blackwell Publishers, 1997.	
	Supplementary literature	1. J. Jakubowski, A. Palczewski, M. Rutkowski, Ł. Stettner, Matematyka finansowa. Instrumenty pochodne, WNT, 2003. 2. J. Hull, Kontrakty terminowe i opcje. Wprowadzenie. WIG - Press, Warszawa 1997. 3. D. Lamberton, B. Lapeyre, Introduction to Stochastic calculus applied to finance, Chapman and Hall, 1996. 4. M. Musiela, M. Rutkowski, Martingale Methods in Financial Modelling, Springer, 1997. 5. A. Weron, R. Weron, Inżynieria Finansowa, WNT, 1999.	
	eResources addresses		
Example issues/ example questions/ tasks being completed	not included		
Work placement	Not applicable		

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