

Subject card

Subject name and code	Probability Concepts, PG_00156973						
Field of study	Finance and Accounting						
Date of commencement of studies	October 2024		Academic year of realisation of subject		2024/2025		
Education level	undergraduate studies		Subject group		Obligatory subject group in the field of study 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	1		Language of instruction		English		
Semester of study	2		ECTS credits		5.0		
Learning profile	academic		Assessment form				
Conducting unit	Katedra Statystyki -> Faculty of Management						
Name and surname of lecturer (lecturers)	Subject supervisor		dr Anna Gierusz-Matkowska				
	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		16.0		74.0	150
Subject objectives	Learn basic concepts of probability, including types of random variables and their distributions, properties and applications.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[FiRL3_K01] Self-development: - understands the need for development and lifelong learning - is able to supplement and improve the acquired knowledge and skills - knows his strengths and weaknesses, sets ambitious goals to the best of his ability - knows how to accept failure and admit mistakes.	Self-improvement: - is able to supplement and improve acquired knowledge and skills in the field of probability concepts - is able to accept defeat and admit a mistake.	[SK1] oral statement/conversation/discussion [SK8] observation of student's independent or team work
	[FiRL3_W06] The student has advanced knowledge of methods and tools, including data acquisition and analysis techniques, appropriate to management science and quality, which allow describing economic structures and institutions and the processes within and between them.	Knows advanced methods and tools, including data acquisition and analysis techniques, in particular those related to the analysis of random variable distributions	[SW4] test/exam - oral or written
	[FiRL3_U07] The student analyses the proposed solutions to problems in the disciplines of management and quality sciences and economics and finance, especially in the field of finance and accounting, and is able to present their advantages and disadvantages and propose appropriate solutions in this regard.	Analyses proposed solutions to probability problems; is able to present their advantages and disadvantages and propose appropriate solutions in this regard.	[SU1] oral statement/conversation/discussion [SU4] test/exam - oral or written
	[FiRL3_K05] Responsibility: - meets deadlines - is able to properly identify priorities for the implementation of the task set by him - consistently strives to achieve the set goal - is able to work systematically and independently - observes the rules and norms of social coexistence.	Responsibility: is able to properly determine priorities for the implementation of probability calculation tasks - is able to work systematically and independently to solve probability calculation tasks	[SK1] oral statement/conversation/discussion [SK4] test/exam - oral or written

Subject contents	• definition of a random variable, an outcome, an event, mutually exclusive events, and exhaustive events; • two defining properties of probability and distinguishing among empirical, subjective, and a priori probabilities; • the probability of an event in terms of odds for and against the event; • distinguishing between unconditional and conditional probabilities; • the multiplication, addition, and total probability rules; • calculation and interpretation of 1) the joint probability of two events, 2) the probability that at least one of two events will occur, given the probability of each and the joint probability of the two events, and 3) a joint probability of any number of independent events; • distinguishing between dependent and independent events; • calculation and interpretation of an unconditional probability using the total probability rule; • the use of conditional expectation in investment applications; • the use of a tree diagram to represent an investment problem; • calculation and interpretation of covariance and correlation; • calculation and interpretation of the expected value, variance, and standard deviation of a random variable and of returns on a portfolio; • calculation and interpretation of covariance given a joint probability function; • calculation and interpretation of an updated probability using Bayes formula; • the most appropriate method to solve a particular counting problem, and solving counting problems using factorial, combination, and permutation concepts, • definition of a probability distribution and distinguishing between discrete and continuous random variables and their probability functions; • the set of possible outcomes of a specified discrete random variable; • interpretation of a cumulative distribution function; • calculation and interpretation of probabilities for a random variable, given its cumulative distribution function; • definition of a discrete uniform random variable, a Bernoulli random variable, and a binomial random variable; • calculation and interpretation of probabilities given the discrete uniform and the binomial distribution functions; • construction of a binomial tree to describe stock price movement; • calculation and interpretation of tracking error; • definition of the continuous uniform distribution and calculation and interpretation of probabilities, given a continuous uniform distribution; • the key properties of the normal distribution; • distinguishing between a univariate and a multivariate distribution, and the role of correlation in the multivariate normal distribution; • the probability that a normally distributed random variable lies inside a given interval; • definition of the standard normal distribution, how to standardize a random variable, and calculation and interpretation of probabilities using the standard normal distribution; • definition of shortfall risk, calculation of the safety- first ratio, and selection of an optimal portfolio using Roy's safety- first criterion; • the relationship between normal and lognormal distributions and why the lognormal distribution is used to model asset prices; • distinguishing between discretely and continuously compounded rates of return, and calculation and interpretation of a continuously compounded rate of return, given a specific holding period return; • Monte Carlo simulation and its major applications and limitations; • Monte Carlo simulation and historical simulation.														
Prerequisites and co-requisites	Knowledge from two subjects: 1. Descriptive Statistics 2. Mathematics for Economics														
Assessment methods and criteria	<table><tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr><tr><td>written exam</td><td>51.0%</td><td>40.0%</td></tr><tr><td>mid term written test</td><td>51.0%</td><td>30.0%</td></tr><tr><td>end term written test</td><td>51.0%</td><td>30.0%</td></tr></table>			Subject passing criteria	Passing threshold	Percentage of the final grade	written exam	51.0%	40.0%	mid term written test	51.0%	30.0%	end term written test	51.0%	30.0%
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Recommended reading	Basic literature	1. Richard A. DeFusco, Dennis W. McLeavey, Jerald E. Pinto, David E. Runkle, Mark J. P. Anson, Quantitative Investment Analysis, 3rd Edition, Wiley and Sons 2016 2. David Ray Anderson, Dennis J. Sweeney, Thomas Arthur Williams, Thomas A. Williams, Statistics for business and economics, Cengage Learning, 2010 3. A. Aczel, J. Sounderpandian Complete Business Statistics with Student CD, The McGraw-Hill/Irwin Series 2009 4. Bruce Hansen, Probability and statistics for economists, Princeton University Press, 2022.													

	Supplementary literature	Ken Black, Applied Business Statistics: Making Better business Decision, John Wiley and Sons 2011 Richard A. Johnson, Gouri K. Bhattacharyya, Statistics: Principles and Methods, John Wiley and Sons, 2011
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed		
Work placement	Not applicable	

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