GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Volatility Modelling and Market Risk Analysis, PG_00073998		
Field of study	Economic Analytics		
Date of commencement of studies	October 2025	Academic year of realisation of subject	2026/2027
Education level	second-cycle studies	Subject group	Optional subject group
Mode of study	Part-time studies	Mode of delivery	at the university
Year of study	2	Language of instruction	Polish
Semester of study	4	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Statistics and Econometrics -> Faculty of Management and Economics -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr Błażej Kochański	
	Teachers		

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	0.0	0.0	0.0	24.0	0.0	24

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	24	3.0	48.0	75

Subject objectives

Preparing students for the practical application of financial data analysis and modeling methods, particularly in the areas of forecasting rates of return, volatility modeling, and measuring and assessing market risk using statistical and econometric methods. The course also aims to develop skills in interpreting analytical results, modeling investment risk,and utilizing quantitative methods in investment decision-making.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_W05] has in-depth knowledge of integrating economic, legal, and ethical aspects in analyses and their application in entrepreneurial activities.	Knows and understands the methods of financial data analysis and modeling, the principles of modeling rates of return, volatility, and interdependence of financial instruments, as well as methods for measuring and assessing market risk and their application in investment portfolio analysis and investment decision-making.	[SW1] Assessment of factual knowledge
[K7_U04] is able to prepare and convincingly present the results of specialized analyses, providing in-depth interpretation during debates and meetings with various audiences.	Is able to develop and professionally present the results of financial data analysis and volatility models, using appropriate methods of visualization and interpretation, as well as convincingly explain the results of market risk measurement and modeling and their significance in investment decision-making to various audiences.	[SU1] Assessment of task fulfilment [SU5] Assessment of ability to present the results of task

<table>
<tr><td>Subject contents</td><td>Course content – project

1. Financial data visualization
2. Empirical properties of financial data
3. Modeling rates of return and their interdependence
4. Risk in equity investments – measurement and modeling, Value at Risk (VaR)
5. Price random walk models, option pricing, and implied volatility
6. Univariate and multivariate ARIMA-GARCH models
7. Long memory and persistence in financial markets
8. Investment portfolio analysis, multivariate VaR modeling for investment portfolios
9. Log-optimal strategy</td></tr>
<tr><td>Prerequisites and co-requisites</td><td></td></tr>
<tr><td>Assessment methods and criteria</td><td>
<table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Project report and presentation</td><td>60.0%</td><td>60.0%</td></tr>
<tr><td>Test tasks</td><td>60.0%</td><td>40.0%</td></tr>
</table>
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<tr><td>Recommended reading</td><td>
<table>
<tr><td>Basic literature</td><td>Linton, O. (2019). Financial econometrics: Models and methods. Cambridge University Press.

Ruppert, D., & Matteson, D. S. (2015). Statistics and data analysis for financial engineering: With R examples (Second edition). Springer.</td></tr>
<tr><td>Supplementary literature</td><td>Luenberger, D. G. (2014). Investment Science. Oxford University Press.</td></tr>
<tr><td>eResources addresses</td><td>Basic
https://geobosh.github.io/cvar/ - cvar (R package)</td></tr>
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<tr><td>Example issues/ example questions/ tasks being completed</td><td>• Calculate basic descriptive statistics for rates of return and assess their distribution.
• Fit normal, Student's t, and GED distributions to empirical rates of return.
• Estimate the parameters of the ARIMA-GARCH model for a selected financial time series.
• Calculate the standardized residuals of the model and fit a theoretical distribution to them.
• Estimate VaR and ES using historical, parametric, and Monte Carlo simulation methods.</td></tr>
<tr><td>Practical activites within the subject</td><td>Not applicable</td></tr>
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