

**Course title: Quantitative Finance**

Studies: Economics

**Course description form (syllabus form)**

General data						
Cycle of studies	2024-2027					
Organizational unit	Faculty of Economic Sciences					
Studies	Economics, first-cycle studies					
The profile of education	general academic					
Semester	04					
Mode of studies	full-time					
Type of course	Lecture	Practical session	Laboratory	Conversatorium	Seminar	Project
Number of hours	15	30				
Number of ECTS	3					
Examination	Graded credit					
Language	English					
Content author	PhD Anna Szczepańska-Przekota					
Course objectives						
The objective of the course is to master the basic quantitative techniques used in finance. These techniques include statistical analysis, mathematical modelling and numerical methods. The course develops skills in constructing financial models for valuation, forecasting and decision making, with particular emphasis on real-world applications.						
Prerequisites						
Basic understanding of mathematics and statistics, basic knowledge of financial markets and financial products, understanding of basic economic principles and how they relate to financial markets, ability to perform quantitative analysis and solve problems, basic understanding of computing, knowledge of spreadsheets and basic financial modelling in Excel and Statistica.						
Student workload						
1. Class sessions (including assessment) - 45 hours 2. Reading literature for classes - 5 hours 3. Preparing assignments - 10 hours 4. Assessment and project preparation -15 hours  TOTAL: 75 hours (3 ECTS)						
Short description						
1. Financial market quantitative analysis. 2. Fundamental concepts of time series. 3. Modelling the volatility of asset returns. 4. Evaluation of risk forecasts and return rates. 5. Risk management and Value-at-Risk (VaR): models. 6. Fundamentals of financial engineering.						
Learning outcomes						
KNOWLEDGE: 1. Know and understand financial phenomena in quantitative terms. Be able to analyse and forecast them rigorously (IB1_W01) 2. Know and understand the mathematical principles of analytical models used in finance (IB1_W04)						

**SKILLS:**

1. Participants are able to create statistical, econometric and mathematical models describing problems in the field of finance (IB1\_U02)
2. Participants are able to optimise the performance of statistical, econometric and mathematical models, select their appropriate parameters and use these models to solve a problem and/or make a forecast (IB1\_U03)

**COMPETENCIES:**

1. Participants are prepared to critically evaluate developments, theories and recent concepts of quantitative finance (IB1\_K01)
2. Participants are prepared to carry out independent and team research and analytical projects (IB1\_K03)

**Form of verification**

Credit project: performing a quantitative assessment and modelling and forecasting of a selected time series of financial data.

**Detailed data****Type of course: Lecture/ Practical session****Bibliography****Bibliography:**

1. P. Kliber, *Financial engineering: Methods and cases*, Uniwersytet Ekonomiczny w Poznaniu, Poznań 2019.
2. M. Panfil, *Project finance with Excel : a basic approach*, Oficyna Wydawnicza SGH, Warszawa 2015.

**Supplementary:**

1. A. Szczepańska-Przekota, Grzegorz Przekota, *Statystyka opisowa w teorii i zadaniach*, Wydawnictwo Politechnika Koszalińska, 2020 r.
2. A. Szczepańska-Przekota, „Condition of Agriculture Compared to Economic Growth in Selected Countries” – European Research Studies Journal Volume XXIII, Special Issue 1, 2020, p. 693-707;
3. A. Szczepańska-Przekota, „Transmission of volatility from the capital market to commodity futures markets”, w: „Pieniądz, instrumenty i instytucje finansowe – problemy, diagnoza, perspektywy” redakcja naukowa S. Franek, A. Adamczyk, Szczecin 2020, str. 103-118;

**Range of content**

1. Quantitative analysis of financial markets: classical and positional level and variance statistics, measures of asymmetry and concentration on financial markets.
2. Basic time series: linear and nonlinear trend models. The phenomenon of cyclicity and seasonality in financial markets. Error correction models, Granger causality tests, autoregressive models.
3. Modelling the volatility of asset returns: univariate and multivariate regression and autoregressive models.
4. Evaluation of risk and return forecasts. Testing statistical properties of models, evaluating models based on past forecasts.
5. Risk management and value-at-risk (VaR): models.
6. Fundamentals of financial engineering: non-classical methods for evaluating financial time series.

**Didactic methods**

1. Lecture using a PowerPoint multimedia presentation
2. Instructions for project implementation
3. Work sheets - individual and team work using computer software: MS Excel, Statistica
4. Internet databases of financial and statistical data, [www.unstats.un.org](http://www.unstats.un.org); [www.stooq.pl](http://www.stooq.pl); [www.oecd.org](http://www.oecd.org);
5. Creating reports using Statistica and MS Excel

**Assessment methods and assessment criteria**

Project with no technical or factual errors, correctly interpreted results (above 90% of points grade bdb)  
Project with minor technical or content-related errors, correctly interpreted results (from 80-90% of the

points evaluation db+)

Project containing technical or content-related errors, the results partially interpreted correctly (from 70-80% of the points evaluation db)

Project containing technical and content-related errors, results interpreted correctly (60-80% of the points grade dst+)

Project containing technical and content-related errors, results interpreted incorrectly (from 50-60% of the points evaluation dst)

Project with unacceptable technical and content-related errors, wrongly interpreted results (below 50% of the points, mark ndst)