



## Subject card

|   |   |  |                     |                                     |   |            |     |
|---|---|--|---------------------|-------------------------------------|---|------------|-----|
| Subject name and code                       | FORECASTING - QUANTITATIVE METHODS, PG_00044960   |  |                     |                                     |   |            |     |
| Field of study                              | Economic Analytics  |  |                     |                                     |   |            |     |
| Date of commencement of studies             | October 2022  | Academic year of realisation of subject  |                     |                                     | 2023/2024   |            |     |
| Education level                             | second-cycle studies  | Subject group  |                     |                                     | Optional subject group<br>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  |                     |                                     | English   |            |     |
| Semester of study                           | 3   | ECTS credits   |                     |                                     | 2.0   |            |     |
| Learning profile                            | general academic profile  | Assessment form  |                     |                                     | assessment  |            |     |
| Conducting unit                             | Katedra Statystyki i Ekonometrii -> Faculty of Management and Economics   |  |                     |                                     |   |            |     |
| Name and surname of lecturer (lecturers)    | Subject supervisor  |  | dr Piotr Paradowski |                                     |   |            |     |
|   | Teachers  |  | dr Piotr Paradowski |                                     |   |            |     |
| Lesson types and methods of instruction     | Lesson type   | Lecture  | Tutorial            | Laboratory                          | Project   | Seminar    | SUM |
|   | Number of study hours   | 0.0  | 0.0                 | 30.0                                | 0.0   | 0.0        | 30  |
|   | 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   | 30   |                     | 4.0                                 |   | 16.0       | 50  |
| Subject objectives                          | The objective of the course is to introduce students to forecasting. The orientation of the course is theoretical and applied. Empirical applications will illustrate forecasting techniques and familiarize students with applied time series analysis and various forecasting techniques. Since the econometric methods that relate to forecasting are rather extensive, this course mainly focuses on regression-based forecasts and a GARCH volatility models. We will also cover econometrics topics such as autoregressive and moving average models and other topics related to forecasting. |  |                     |                                     |   |            |     |
| Learning outcomes                           | Course outcome  | Subject outcome  |                     |                                     | Method of verification  |            |     |
|   | [K7_W10] has an in-depth knowledge of quantitative methods to describe and analyse socio-economic processes using information technology  | The student is able to use Stata statistical software for advanced estimation of socio-economic processes.                           |                     |                                     | [SW1] Assessment of factual knowledge<br>[SW3] Assessment of knowledge contained in written work and projects |            |     |
|   | [K7_U02] can use theoretical knowledge in the field of economics and finance to obtain, analyse and interpret data on economic processes and phenomena and on their basis formulate own opinions  | The student collects appropriate information, constructs forecasts and verifies them.  |                     |                                     | [SU1] Assessment of task fulfilment   |            |     |
|   | [K7_W07] has an in-depth knowledge on methods of social and economic phenomena description, including market information acquisition techniques and methods of analysis and modelling of economic processes   | The student obtains data on market information from various sources and uses methods of analysis and modeling of economic processes. |                     |                                     | [SW1] Assessment of factual knowledge<br>[SW3] Assessment of knowledge contained in written work and projects |            |     |
|   | [K7_K05] can think and act in an entrepreneurial way, understanding the consequences of actions taken   | The student thinks in an entrepreneurial way.  |                     |                                     | [SK1] Assessment of group work skills   |            |     |
|   | [K7_U04] can forecast complex socio-economic processes and phenomena using advanced methods and tools for the analysis of quantitative and qualitative data   | The student selects appropriate methods and calculates forecasts of complex socio-economic phenomena.                                |                     |                                     | [SU4] Assessment of ability to use methods and tools  |            |     |

|                                 |  |   |                               |
|---------------------------------|--|---|-------------------------------|
| Subject contents                | <ol style="list-style-type: none"> <li>1. Review of Basic Linear Regression Analysis</li> <li>2. Regression from a Forecasting Perspective</li> <li>3. Cross Sections: Forecast Model Building and Use</li> <li>4. Forecasting Trends and Seasonal</li> <li>5. Time-Series Models: Autoregressive Models</li> <li>6. Forecasting Cycles with Autoregressions</li> <li>7. Forecasting Cycles from a Moving-Average Perspective</li> <li>8. Forecasting Cycles from an Autoregressive Perspective</li> <li>9. Estimating, Forecasting and Diagnosing GARCH Models</li> <li>10. Forecasting: Advanced Topics</li> </ol> |   |                               |
| Prerequisites and co-requisites | Methods of Quantitative Analysis. In particular it is assumed the student is familiar with regression model estimation and related hypothesis testing techniques.  |   |                               |
| Assessment methods and criteria | Subject passing criteria   | Passing threshold   | Percentage of the final grade |
|                                 | Case study   | 60.0%   | 100.0%                        |
| Recommended reading             | Basic literature   | Diebold, Francis X. (2017), Forecasting in Economics, Business, Finance and Beyond, Department of Economics, University of Pennsylvania, <a href="http://www.ssc.upenn.edu/~fdiebold/Textbooks.html">http://www.ssc.upenn.edu/~fdiebold/Textbooks.html</a> . [Freely available under the Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License at <a href="https://www.sas.upenn.edu/~fdiebold/Teaching221/Forecasting.pdf">https://www.sas.upenn.edu/~fdiebold/Teaching221/Forecasting.pdf</a> ]. |                               |
|                                 | Supplementary literature   | <p>Stock, James H &amp; Watson, Mark W. (2020). Introduction to Econometrics, 4th edition. Pearson.</p> <p>Beckett, Sean (2020). Introduction to Time Series Using Stata, Revised Edition, Stata Press.</p> <p>Diebold, Francis X. (2006). Elements of Forecasting, 4th edition. South-Western Pub.</p> <p>Granger, C.W.J. (2014). Forecasting in Business and Economics, 2nd edition. Academic Press.</p>  |                               |
|                                 | eResources addresses   | Adresy na platformie eNauczanie:<br>FORECASTING - QUANTITATIVE METHODS - Moodle ID: 34141<br><a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=34141">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=34141</a>  |                               |

|   |  |
|---|--|
| <p>Example issues/<br/>example questions/<br/>tasks being completed</p> | <p>Ex 6. GARCH volatility forecasting (from the required textbook, Diebold, Francis X. (2017), p. 305)</p> <p>You work for Xanadu, a luxury resort in the tropics. The daily temperature in the region is beautiful year-round, with a mean around 76 (Fahrenheit!) and no conditional mean dynamics. Occasional pressure systems, however, can cause bursts of temperature volatility. Such volatility bursts generally don't last long enough to drive away guests, but the resort still loses revenue from fees on activities that are less popular when the weather isn't perfect. In the middle of such a period of high temperature volatility, your boss gets worried and asks you to make a forecast of volatility over the next ten days. After some experimentation, you find that daily temperature <math>y_t</math> follows</p> <p><math>y_t   O_{t-1} \sim N(m, s_t^2)</math>, where <math>s_t^2</math> follows a GARCH(1,1) process, <math>s_t^2 = w + a \cdot e_{t-1}^2 + b \cdot s_{t-1}^2</math></p> <p>a. Estimation of your model using historical daily temperature data yields <math>m=76</math>, <math>w=3</math>, <math>a=.6</math>, and <math>b=0</math>. If yesterday's temperature was 92 degrees, generate point forecasts for each of the next ten days conditional variance.</p> <p>b. According to your volatility forecasts, how many days will it take until volatility drops enough such that there is at least a 90% probability that the temperature will be within 4 degrees of 76?</p> <p>c. Your boss is impressed by your knowledge of forecasting, and asks you if your model can predict the next spell of bad weather. How would you answer him?</p> |
| <p>Work placement</p>   | <p>Not applicable</p>  |