Module Description, available in: EN

Predictive Modelling

General Information

Number of ECTS Credits

3

Module code

FTP_PredMod

Valid for academic year

2026-27

Last modification

2025-10-20

Coordinator of the module

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Explanations regarding the language definitions for each location:

- Instruction is given in the language specified for each location and module execution.
- Documentation is available in the language(s) listed for each location and module execution. If the documentation is in multiple languages, the percentage distributed is indicated (100% = all documentation provided).
- The examination, including both questions and answers, is provided entirely (100%) in the language(s) specified for each location and module execution. The exams are on-site.

	Lausanne			Lugano	Zurich		
Instruction					**X** E 100%		
Documentation					**X** E 100%		
Examination					**X** E 100%		

Module Category

FTP Fundamental theoretical principles

Lessons

2 lecture periods and 1 tutorial period per week

Entry level competences

Prerequisites, previous knowledge

Basic knowledge of statistics on the level of an introductory stochastics course. Linear algebra: matrix-vector calculations. Basic Calculus. Familiarity and experience with programming, in particular with scripting languages like Matlab, Python or R. We will provide the students with a self-test to assess their prior knowledge in statistics and scripting.

Brief course description of module objectives and content

This course will provide a self-study introductory review of the basic concepts of probability and statistics to understand probability distributions and to produce rigorous statistical analysis including estimation, hypothesis testing, and confidence intervals. Students will be introduced to the basic concepts of predictive modelling which by definition is the analysis of current and historical facts to make predictions about future events. Students will learn several techniques that account for many business and engineering applications of predictive modelling. These include regression techniques,

and time series models. Applicability and limitations of these methods will be illustrated in the light of data sets and analyses using the statistical software R or Python.

Please note: An MSE cursus may not contain both similar statistics modules FTP_AppStat and FTP_PredMod. Students can only choose one of these modules.

Aims, content, methods

Learning objectives and competencies to be acquired

Students are able to analyze data by means of regression and time series analysis. They are familiar with important statistical forecasting methods and are able to calculate, evaluate and interpret predictions. They are able to choose an appropriate statistical method for a regression, or time series problem. They are able to evaluate and compare statistical models.

Module content with weighting of different components

Regression analysis: Simple linear regression with parameter estimation, graphical model validation, transformation of variables, confidence and prediction intervals for parameters. Multiple linear regression with parameter estimation, statistical tests and confidence intervals for parameters, variable selection, feature importance analysis, and regularization methods.

Time series analysis: STL decomposition; ARMA, seasonal and non-seasonal ARIMA, confidence and prediction bands, (partial) autocorrelation, model selection, model validation metrics, and applications across economics, finance, and engineering.

Optional advanced time series analysis topics: Spectral analysis, Bayesian structural time series, Kalman filtering, and anomaly detection.

Teaching and learning methods

Lecture and practical work on computer with the statistics software R or Python.

Literature

Lecture notes will be available in addition to recommended book chapters.

Assessment

Additional performance assessment during the semester

The module does not contain an additional performance assessment during the semester

Basic principle for exams

As a rule, all standard final exams are conducted in written form. For resit exams, lecturers will communicate the exam format (written/oral) together with the exam schedule.

Standard final exam for a module and written resit exam

Kind of exam

Written exam

Duration of exam

120 minutes

Permissible aids

Aids permitted as specified below:

Permissible electronic aids

Statistical software R or Python and calculator.

Other permissible aids

No other aids permitted

Exception: In case of an electronic Moodle exam, adjustments to the permissible aids may occur. Lecturers will announce the final permissible aids prior to the exam session.

Special case: Resit exam as oral exam

Kind of exam

Oral exam

Duration of exam

30 minutes

Permissible aids

No aids permitted