

## Module Layout

### ERM512 / Advanced Quantitative Methods for Risk Management

|                                                         |                      |                                                   |                   |
|---------------------------------------------------------|----------------------|---------------------------------------------------|-------------------|
| <b>Faculty</b>                                          | FEM                  | Faculty of Economics and Management               |                   |
| <b>Programme of Study</b>                               | ERMII                | Enterprise Risk Management                        |                   |
| <b>Module</b>                                           | ERM512               | Advanced Quantitative Methods for Risk Management |                   |
| <b>Level of Study</b>                                   | <b>Undergraduate</b> | <b>Graduate</b>                                   |                   |
|                                                         |                      | <b>Master</b>                                     | <b>Doctoral</b>   |
|                                                         |                      | X<br>Joint Program<br>OUC & HOU                   |                   |
| <b>Language of Instruction</b>                          | English              |                                                   |                   |
| <b>Mode of Delivery</b>                                 | Distance             |                                                   |                   |
| <b>Module Type</b>                                      | <b>Required</b>      | <b>Electives</b>                                  |                   |
|                                                         | X                    |                                                   |                   |
| <b>Number of Group Consulting Meetings</b>              | <b>Total</b>         | <b>Physical Presence</b>                          | <b>Online</b>     |
|                                                         | 5                    | -                                                 | 5                 |
| <b>Number of Assignments</b>                            | 2                    |                                                   |                   |
| <b>Final Grade Calculation</b>                          | <b>Assignments</b>   | <b>Weekly Activities</b>                          | <b>Final Exam</b> |
|                                                         | 30%                  | 10%                                               | 60%               |
| <b>Number of European Credit Transfer System (ECTS)</b> | 10                   |                                                   |                   |

#### **Module Description**

This Thematic Unit / Module is designed to introduce students to econometric techniques and their applications in economic analysis and decision-making. The main objective of the module is to train students in (i) handling economic data; (ii) quantitative analysis of economic models with probabilistic tools; (iii) econometric techniques, their application as well as their statistical and practical interpretation; (iv) implementing these techniques on any given econometric software.

The module focuses on practical and conceptual issues involved in substantive applications of econometric techniques. Estimation and inference procedures are formally analysed for simple econometric models and illustrated by empirical case studies using real-life data. The module covers sampling, estimation and statistical inference techniques, linear and non-linear regression models.

#### **Submodules**

1. Probabilities, Estimation, Sampling, Data analysis (3 weeks)
2. Statistical Inference: Confidence Intervals Hypothesis Testing (4 weeks)
3. Linear and Non-Linear Regression, Estimation, Prediction (6 weeks)

#### **Expected Learning Outcomes**

Upon completion of this module, the students will be able to:

Knowledge

- Exhibit a deep and thorough understanding of statistical concepts underlying sampling and sample statistics, the applications of inferential statistics and the processes of hypothesis testing, and the underlying mechanisms of regression including the assumptions and the estimation process.

Comprehension

- Distinguish among various statistical measures and modelling techniques and classify them with respect to their suitability in analysing empirical data and meeting the objectives of the study.
- Explain the underpinnings of the Hypotheses Testing process, the significance level and the importance of considering the Type

I and II errors in testing hypotheses by providing demonstrative examples

- Explain the construct of regression models and it is affected in practice by violation of assumptions and “non-cleaned” data in empirical observations.

#### Application

- Apply various sampling techniques, describe the processes for defining and selecting sample data, calculate sample statistics and derive confidence intervals for the sample statistics.
- Perform test of hypothesis by properly selecting statistical methodologies defining null and alternative hypotheses determining critical values and interpret the results in context.
- Setup multiple linear regression models and derive and analyse regression results and residuals
- Handle the effect of qualitative indicators in regression, and apply proper transformations in the data to build suitable non-linear regression models
- Use statistical software to handle empirical data, perform statistical analysis listed above, accordingly.

#### Analysis

- Analyse statistical data properly, in order to identify distribution patterns, possible relationships among data attributes, contingencies, and interaction among various factors.
- Estimate relationships between explanatory and response variables, explain how estimators behave in terms of their probability distributions, test hypotheses on the relation between variables using F-values, t-values and p-values, and measure goodness of fit in a regression
- Analyse the statistical significance of a regression model, the contribution of the explanatory variables and the significance of categorical explanatory variables.
- Consider practical problems that arise in the estimation and analysis of the regression model, including multicollinearity, heteroscedasticity, presence of extreme or missing observations and take proper action to rectify the situation.

#### Synthesis

- Consolidate and interpret results of statistical analysis of empirical data in context in order to communicate relative information for supporting business decision making.
- Use the results of a regression model to identify and measure the single or interaction effects of independent variables on a dependent variable and interpret the effects in context.
- Select the most appropriate regression model after a comparison among alternatives, and interpret the regression results in context providing insight of potential limitations.

#### Evaluation

- Appraise the appropriateness of various sampling methods in collecting empirical data for specific purpose and evaluate the adequacy of a sample size, vis-à-vis acceptable sampling error, and desired confidence of the results.
- Describe the basic statistical characteristics of a population, based on evaluation of sample statistics.
- Evaluate relationships and patterns among the data using statistical techniques.
- Evaluate the “fitness” and the predictive power of regression model in making extrapolations
- Evaluate a regression model in terms of statistical significance and conformance with assumptions and detect potential problems with respect to violation of assumptions

**Pre-requisite Modules**

**Co-requisite Modules**

**Co-requisite Modules**

**Grading Scheme**

| Assessment Method                                                                        | Percentage on Final Grade | Workload           |           |
|------------------------------------------------------------------------------------------|---------------------------|--------------------|-----------|
|                                                                                          |                           | Hours              | ECTS      |
| <b>Weekly Study</b><br>(13 weeks * ~12 hours of study)<br>(2 weeks * ~18 hours of study) | 0 %                       | ~180 - ~210        | 7         |
| <b>Weekly Interactive Activities</b>                                                     | 10 %                      | ~25 - ~30          | 1         |
| <b>Assignment 1</b>                                                                      | 15 %                      | ~25 - ~30          | 1         |
| <b>Assignment 2</b>                                                                      | 15 %                      | ~25 - ~30          | 1         |
| <b>Final/Repeat Examination</b>                                                          | 60 %                      | 0                  | -         |
| <b>Total</b>                                                                             | <b>100 %</b>              | <b>~250 - ~300</b> | <b>10</b> |

**Grading Rules and Assessment methods**

- Students are evaluated with 9, if they earn 90% of the possible grade, i.e.  $90\% \times 10 = 9$ , etc.
- Passing rate
  - 50% of the Assignments
  - 50% of the Interactive Activities
  - Students are allowed to participate in the final exam of a Module if they have overall earned the minimum grade ( $\geq 50\%$ ) in both their Assignments and Interactive Activities
  - 50% of the Final exam

If a student earns a grade with decimal points, then it is rounded to the nearest half unit.