

Module Outline

Virtual Exchange Spring Semester 2024

Business Mathematics and Statistics 2

5 ECTS-Credits

Format of the course: Synchronous online course

Total Number of Students accepted: 35

Responsible lecturers

The module consists of two parts: Business mathematics and business statistics. The parts are taught by two lecturers at the School of Business, University of Applied Sciences Northwestern Switzerland FHNW (Riggenbachstrasse 16, 4600 Olten, Switzerland):

- Dr. Tobias Schoch, professor of applied statistics (tobias.schoch@fhnw.ch)
- Dr. Thomas Heimsch, lecturer of mathematics (thomas.heimsch@fhnw.ch)

Tobias Schoch is the head of the module and will serve as single point of contact for this module.

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1. Course content

The module introduces students to advanced mathematical and statistical methods. Managers need to be confident when working with quantitative data and appreciate the importance of data and information quality. A solid foundation in quantitative methods, the ability to work with empirical data, carry out analysis, present results in a systematic and clear way are essential for business decision makers. Managers need to understand the importance of data and information quality for decision-making. At the end of the module, students should be able to find solutions for complex business problems.

2. Learning objectives

The module Business Mathematics and Statistics 2 consists of the two parts Business Mathematics and Business Statistics, which are taught in *alternating* manner (i.e., mathematics in week x , followed by statistics in week $x + 1$).

Part: Business Mathematics

- Differentiation: Difference quotient, differentiation, differentiation rules, curve sketching, maximization. Economic applications of differentiation: e.g., marginal costs, optimizing business operations, maximizing revenue, elasticity, marginal utility, marginal rate of tax.
- Integration: Indefinite and definite integral, integration rules, area calculations.
- Economic applications of integration: e.g., producer and consumer surplus, continuous random variables, present value of continuous payments, Lorenz curve and Gini coefficient, reconstructing a function given the derivative.

Part: Business Statistics

- Analytical statistics: Sample distribution (sample mean and standard error of the mean).
- Statistical estimation techniques (point estimates and confidence limits) with the R statistical software.
- Hypothesis tests for means (t-test, U-test) and proportions with the R statistical software. Chi-square-test for cross-classified data.

3. Prior knowledge and entry requirements

- *Basic knowledge of the R statistical software (see www.r-project.org) is absolutely required for statistics. We do not teach the basics in this class.*
- Mathematics: solving linear equations (supply and demand systems), arithmetic and geometric series, economic applications (interest, present and future value calculations, annuities, amortization)
- Statistics: descriptive statistics (mean, quantiles, measure of dispersion), contingency tables, simple linear regression, basics in probability theory (conditional probability, Bayes theorem, binomial and Bernoulli distribution)

4. Course structure and dates

Wednesdays, 17.15 – 21.00 (course dates to follow)

5. Assessment

For virtual exchange students, grading is based on an assignment in business statistics. Each student will be given an individual data set. For this data set, students must do statistical analysis (estimation and hypothesis testing) using the R statistical software and document their findings in a report. Grading will be based on the submitted report.

Students who are enrolled as regular students at the School of Business FHNW take an in-person written exam on campus (120 minutes, part 1: business mathematics, part 2: business statistics).

6. Literature

Sharpe / de Veaux / Velleman (2019). Business Statistics, 4th global edition, Pearson (ISBN 978-0-321-92583-1)

7. Grading

Pass-fail (for virtual exchange students)