Zurich University
of Applied Sciences

School of
Management and Law

Valid for 2023.HS

Module Name: Quantitative Methods		
Module Code	w.BA.XX.3QMeth-FLEX.XX	
Module Description	In this module, students learn useful quantitative methods with which to solve key financial-mathematical and statistical problems and recognize their relevance for the banking and finance practice.	
Program and Specialization	Business Administration - Specialization in Banking and Finance (FLEX)	
Legal Framework	Academic Regulations BSc dated 29.01.2009, for the degree programs in Business Administration, International Management, Business Information Technology, Business Law, Business Law and Applied Law, first adopted on 12.05.2009	
Module Category	**Module Type:** Compulsory	**Program Phase:** Main Study Period
ECTS	3	
Organizational Unit	W Institut für Wealth & Asset Management	
Module Coordinator	Norbert Hilber (hino)	
Deputy Module Coordinator	Thomas Gramespacher (grat)	
Prerequisite Knowledge	w.BA.XX.2Mathe1.XX, w.BA.XX.2Mathe2.XX, w.BA.XX.2Stat.XX	
Contribution to Program Learning Goals (Affected by Module)	§ Professional Competence § Methodological Competence § Social Competence § Self-Competence	
Contribution to Program Learning Objectives	Professional Competence § Knowing and Understanding Content of Theoretical and Practical Relevance § Apply, Analyze, and Synthesize Content of Theoretical and Practical Relevance § Evaluate Content of Theoretical and Practical Relevance Methodological Competence § Problem-Solving & Critical Thinking § Scientific Methodology § Work Methods, Techniques, and Procedures § Information Literacy § Creativity & Innovation Social Competence § Oral Communication § Teamwork & Conflict Management § Intercultural Insight & Ability to Change Perspective Self-Competence § Self-Management & Self-Reflection § Ethical & Social Responsibility § Learning & Change	
Module Learning Objectives	Students... § can explain why matrices are useful in constructing portfolios. § can explain the significance of partial derivatives and Taylor approximations. § can understand basics of utility theory. § can characterize distributions using moments. § can explain the problem of skewed and leptokurtic return distributions for portfolio theory and risk management. § can explain how options can be valued using arbitrage considerations. § can determine the expected value and variance (of sums) of random variables and thus determine the expected portfolio return and the portfolio risk. § can annualize mean and standard deviation of returns. § can form partial derivatives and total differentials of functions with several independent variables. § Can use matrix calculus to determine expected portfolio return and variance. § can form 1st and 2nd order Taylor series of functions and use them in practical applications. § can determine the shortfall probability and the value at risk of an investment using a parametric and historical approach. § can calculate or approximate the price of European and American options using the binomial model. § can interpret sensitivity ratios ("Greeks") of options. § can estimate and assess interest rate risks of bonds by Taylor approximations (duration and convexity).	

	§ can critically question quantitative models or assess whether model assumptions have been violated in application. § are able to apply quantitative methods in the context of guided self-study in new problems (behavior of a bond in the case of interest rate changes).
Module Content	§ Introduction to matrix calculus § Mean-variance portfolio theory: location and dispersion measures; linear transformations of random variables; return and risk of a single asset; portfolio return and risk (sums of random variables); portfolios with multiple assets (matrix notation). § Functions of several variables: Partial derivative; total differential; Taylor series § Elements of utility theory: utility function, indifference curves; expected utility, safety equivalent; risk aversion, risk premium; measures of absolute and relative risk aversion; mean-variance utility functions. § Aspects of risk management: skewness and kurtosis of return distributions; time aggregation of returns; shortfall probability; VaR methods. § Option pricing: Binomial model (one- and two-stage model, no-arbitrage argument, risk-neutral valuation); sensitivity ratios: The "Greeks"; hedge ratios, and delta hedging.
Links to other modules	The content of this module is linked to the following modules: w.BA.XX.2Mathe2-flex.XX
	w.BA.XX.2Stat-flex.XX
Methods of Instruction	Exercises **Social Settings Used:** -
Digital Resources	§ Reader § Teaching Videos § Practice and Application Exercises (with Key) § Multiple Choice Tests

Type of Instruction	**Classroom Instruction**	**Guided Self-Study**	**Autonomous Self-Study**
Large Class	-	-	
Small Class	12 h	34 h	
Group Instruction	-	-	
Practical Work	-	-	
Seminar	-	-	
Total	**12 h**	**34 h**	**44 h**

Performance Assessment

End-of-module exam	**Form**	**Length (min.)**	**Weighting**
Written exam	Open book	60	100,00 %
Permitted Resources	Free choice of calculator	With dictionary	

Others	**Assessment**	**Length (min.)**	**Weighting**
-	-	-	-

Classroom Attendance Requirement	Mandatory Attendance: None
Language of Instruction/Examination	German
Compulsory Reading	-
Recommended Reading	Excerpts from textbooks/essays (see semester program and the materials set aside for this module at the library.
Comments	-