Zurich University
of Applied Sciences

School of
Management and Law

2019.HS

Module Name: Quantitative Methods		
Module Code	w.BA.XX.2QMeth.XX	
Module Description	Students acquire important quantitative methods for overcoming key financial-mathematical and statistical problems and recognize their practical relevance in banking and finance.	
Program and Specialization	Business Administration - Banking and Finance	
Legal Framework	Academic Regulations BSc dated 29.01.2009, Appendix to the Academic Regulations for the degree programs in Business Administration, Business Information Technology, and Business 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... § are able to explain why matrices are useful in the construction of portfolios. § are able to elaborate on the significance of partial derivatives and Taylor approximations. § are able to understand the basic principles of utility theory. § are able to characterize distributions based on moments. § are able to elaborate on the problems of skew and leptokurtic return distributions for portfolio theory and risk management. § are able to explain how options can be evaluated using arbitrage arguments. § are able to calculate expectation and variance (of sums) of random variables and use these to determine return and risk of portfolios. § are able to annualize mean and standard deviation of returns. § are able to form partial derivatives and total differentials of functions of several variables. § are able to utilize matrix calculus for determining risk and return of portfolios. § are able to form Taylor series of 1st and 2nd order and apply these in a practical context. § are able to determine the shortfall probability and value at risk of an investment by means of a parametric and historical approach. § are able to calculate/approximate the price of European and American options using a binomial model. § are able to interpret sensitivities (the "Greeks") of options. § are able to appraise and evaluate interest risks of bonds using Taylor approximations (duration and convexity).	

	§ are able to scrutinize/evaluate quantitative models critically to assess whether the model assumptions were infringed in use. § are able to apply quantitative methods to new problem areas as part of guided self-study (behavior of a bond when the 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 individual investments; return and risk of portfolios (sums of random variables; portfolios with multiple assets (matrix notation) § Functions of several variables: partial derivatives; total differentials; Taylor series § Elements of utility theory: utility functions, indifference curves, expected utility, certainty equivalent; risk aversion, risk premiums; size of absolute and relative risk aversion; mean-variance utility functions § Aspects of risk management: skewness and kurtosis of return distributions, time aggregation of risk and return; shortfall probability; VaR methods § Option pricing: binomial tree model (one and two-step model, no arbitrage argument, risk-neutral valuation); sensitivities (the "Greeks"); hedge ratios, delta hedging
Links to other modules	The content of this module is linked to the following modules: w.BA.XX.2Mathe1.XX
	w.BA.XX.2Mathe2.XX
	w.BA.XX.2Stat.XX
Methods of Instruction	§ Lecture § Interactive Instruction § Exercises **Social Settings Used:** Individual Work
Digital Resources	§ Reader § Practice and Application Exercises (with Key) § Multiple Choice Tests

Type of Instruction	**Classroom Instruction**	**Guided Self-Study**	**Autonomous Self-Study**
Large Class	-	-	
Small Class	28 h	34 h	
Group Instruction	-	-	
Practical Work	-	-	
Seminar	-	-	
Total	**28 h**	**34 h**	**28 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	-
Language of Instruction/Examination	German
Compulsory Reading	-
Recommended Reading	Journal articles and book sections (see semester weekly plan and course reserves in library)
Comments	-