SUBJECT DATASHEET

Introduction to financial mathematics

BMEGT35M100

I. SUBJECT DESCRIPTION

1. SUBJECT DATA

Subject name
Introduction to financial mathematics

ID (subject code)	BMEGT35M100

Type of subject
contact lessons

Course types and lessons

Type	*Lessons*
Lecture	4
Practice	0
Laboratory	0

Type of assessment
mid-term grade

Number of credits
5

Subject Coordinator

Name	*Position*	*Contact details*
Dr. Bethlendi András	associate professor	bethlendi.andras@gtk.bme.hu

Educational organisational unit for the subject
Department of Finance

Subject website
https://edu.gtk.bme.hu/

Language of the subject
angol – ENG

Curricular role of the subject, recommended number of terms

Direct prerequisites

Strong	None
Weak	None
Parallel	None
Exclusion	None

Validity of the Subject Description

2. OBJECTIVES AND LEARNING OUTCOMES

Objectives

Students will learn the basics of financial time series analysis. The broad areas of knowledge covered in this course: The focus is on the practical applications of them. The primary goal is to familiarize students with the most im-portant tools and to enable them to apply them individually both in their studies and during their later work. The agenda covers the first and fourth topics (Quantitative Analysis) of the international FRM (Financial Risk Man-ager) exam to give immensely useful and practical knowledge to the audience in real life.

Academic results

Knowledge

1. • time series analysis,
2. • basic methods of risk management,
3. • risk mitigation techniques.

Skills

1. • plan and organize independent learning,
2. • comprehend and use the professional literature of the topic,
3. • using methods learn they could perform calculations to support decision-making.

Attitude

1. • is open to getting to know and adapting innovations in the financial field,
2. • collaborates with their instructors and others during the learning process,
3. • gains knowledge and information,
4. • uses the possibilities offered by IT tools

Independence and responsibility

1. -

Teaching methodology

Lectures, written and oral communication, use of IT tools and techniques, optional tasks alone and in groups.

Materials supporting learning

- 1. Az előadások prezentációinak anyaga, ami a félév során folyamatosan fog feltöltésre kerülni. / Slideshows of the lectures which will be uploaded continuously during the semester.
- 2. Chris Brooks (2014): Introductory Econometrics for Finance. 3rd Edtion, Cambridge University Press
- 3. Ruey S. Tsay (2010): Analysis of Financial Time Series 3rd Edition

II. SUBJECT REQUIREMENTS

TESTING AND ASSESSMENT OF LEARNING PERFORMANCE

General Rules

Assessment of the learning outcomes described under 2.2. is based on two written end-term tests.

Performance assessment methods

Based on written end-term tests and homework.

Percentage of performance assessments, conducted during the study period, within the rating

Percentage of exam elements within the rating

Conditions for obtaining a signature, validity of the signature

The written tests can be retaken in the exam period.

Issuing grades

Excellent	91
Very good	86-90 %
Good	71-85 %
Satisfactory	61-70 %
Pass	50-60 %
Fail	50 %

Retake and late completion

The written tests can be retaken in the exam period.

Coursework required for the completion of the subject

participation on contact lessons	56
optional home work	40
preparing for the exam	54

Approval and validity of subject requirements

III. COURSE CURRICULUM

THEMATIC UNITS AND FURTHER DETAILS

Topics covered during the term

Bayesian Analysis: Bayes' theorem and apply this theorem in the calculation of conditional probabilities. Apply Bayes' theorem to scenarios with more than two possible outcomes. Time series Analysis: Introducing AR, MA, ARMA, ARIMA, ARCH and GARCH models. Highlighting the connection between AR and MA models. Emphasizing the concept of mean and variance equations. Modelling volatility I: non-linearity, volatility, variance rate, and implied volatility, the power law, the exponentially weighted moving average (EWMA) model to estimate volatility. Modelling volatility II: describe the generalized autoregressive conditional heteroskedasticity (GARCH(p,q)) model for estimating volatility, using the GARCH(1,1) model, mean reversion captured in the GARCH(1,1) model, the volatility term structure and the impact of volatility changes. Modelling correlation II: Gaussian copula, Student's t-copula, multivariate copula, and one-factor copula. Simulation methods: Random number generation, Monte Carlo simulation methodes, focusing on variance reduction techniques and highlighting the problem of quasi random Real-world and risk neutral simulations, Girsanov's theorem.

Additional lecturers

Dr. László Nagy - nagy.laszlo@gtk.bme.hu

Approval and validity of subject requirements