

**AGH**AGH UNIVERSITY OF SCIENCE
AND TECHNOLOGY

Module name: Quantitative analysis for managerial decisions (prof. PHILIPPE DE BROUWER)

Academic year: 2019/2020 Code: AMAT-2-306-MF-s ECTS credits: 2

Faculty of: Applied Mathematics

Field of study: Mathematics Specialty: Financial Mathematics

Study level: Second-cycle studies Form and type of study: Full-time studies

Lecture language: English Profile of education: Academic (A) Semester: 3

Course homepage: —

Responsible teacher: dr inż. Dzieża Jerzy (dzieza@agh.edu.pl)

Module summary

Quantitative analysis for managerial decisions

Description of learning outcomes for module

MLO code	Student after module completion has the knowledge/ knows how to/is able to	Connections with FLO	Method of learning outcomes verification (form of completion)
Skills: he can			
M_U001	•make a project: identify the issue, get data, select a method, do the maths and finally present the result.	MAT2A_U22, MAT2A_K07, MAT2A_K02, MAT2A_U13, MAT2A_K06, MAT2A_U15, MAT2A_K05	Presentation, Project
M_U002	•apply this knowledge to •mine data•make informed decisions based on data and facts•identify opportunities of improvement	MAT2A_U20, MAT2A_U18, MAT2A_U16	Test, Oral answer
M_U003	•understand the importance data in decision-making•understand when what method can be used and what their limitations are•understand the limitations of methods and models	MAT2A_W11, MAT2A_U20, MAT2A_U12, MAT2A_W12, MAT2A_W09, MAT2A_U21, MAT2A_U11, MAT2A_W10, MAT2A_U16	Test, Oral answer
Knowledge: he knows and understands			

M_W001	<ul style="list-style-type: none"> •know the basics of statistics and data manipulations •know at least one analytical tool (R) •know the limitations and possibilities of models, tools and visualizations 	MAT2A_W12, MAT2A_W10, MAT2A_W08	Test, Oral answer
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Number of hours for each form of classes

Suma	Form of classes										
	Lectures	Auditorium classes	Laboratory classes	Project classes	Conversation seminar	Seminar classes	Practical classes	Fieldwork classes	Workshops	Prace kontrolne i przejściowe	Lektorat
30	0	0	0	0	30	0	0	0	0	0	0

FLO matrix in relation to forms of classes

MLO code	Student after module completion has the knowledge/ knows how to/is able to	Form of classes										
		Lectures	Auditorium classes	Laboratory classes	Project classes	Conversation seminar	Seminar classes	Practical classes	Fieldwork classes	Workshops	Prace kontrolne i przejściowe	Lektorat
Skills: he can												
M_U001	<ul style="list-style-type: none"> •make a project: identify the issue, get data, select a method, do the maths and finally present the result. 	-	-	-	-	+	-	-	-	-	-	-
M_U002	<ul style="list-style-type: none"> •apply this knowledge to •mine data •make informed decisions based on data and facts •identify opportunities of improvement 	-	-	-	-	+	-	-	-	-	-	-
M_U003	<ul style="list-style-type: none"> •understand the importance data in decision-making •understand when what method can be used and what their limitations are •understand the limitations of methods and models 	-	-	-	-	+	-	-	-	-	-	-
Knowledge: he knows and understands												
M_W001	<ul style="list-style-type: none"> •know the basics of statistics and data manipulations •know at least one analytical tool (R) •know the limitations and possibilities of models, tools and visualizations 	-	-	-	-	+	-	-	-	-	-	-

Student workload (ECTS credits balance)

Student activity form	Student workload
Udział w zajęciach dydaktycznych/praktyka	30 h
przygotowanie projektu, prezentacji, pracy pisemnej, sprawozdania	10 h
Realization of independently performed tasks	10 h
Summary student workload	50 h
Module ECTS credits	2 ECTS

Additional information

Module content

Conversation seminar

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Description

We are at the eve of a new industrial revolution that will be based on information and new technology. Key in this revolution will be the use of data, analytics, machine learning and mathematical modeling. This course aims to provide insight in these developments but it also aims to provide students tools that will help them to be more successful in a corporate environment.

Specific objectives are:

- know the basics of statistics and data manipulations
- know at least one analytical tool®
- know the limitations and possibilities of models, tools and visualizations
- understand the importance data in decision-making
- understand when what method can be used and what their limitations are
- understand the limitations of methods and models
- apply this knowledge to
- mine data
- make informed decisions based on data and facts
- identify opportunities of improvement
- make a project: identify the issue, get data, select a method, do the maths and finally present the result.

Design

PART I: Theory

1. Introduction: economic cycles and the technology of the future
2. Introduction to modelling with R
 - a) the basics of programming in R

- b)levels of measurement
- c)selected notions of statistics
- a)levels of measurement
- b)measures of central tendency
- c)measures of variation and spread
- d)measures of covariation
- e)regression models
- f)model performance
- g)distributions
- h)anova
- i)time series analysis
- j)decision trees
- k)random forest
- l)chi square tests
- m)bootstrapping

3.Valuation of financial assets and companies

4.Multi Criteria Decision Analysis

PART II: Practice

1. Guided modeling exercises (preparation for the final presentation)
2. Guest speakers from different companies that bring each a specific topic, models and eventually data so students can try the methods learned)
3. project (" selected assignment")
 - 1.preparation of a " board paper" (showing that the student is able to work with data and communicate about it)
 - 2.presentation of the results

Teaching methods and techniques:

Conversation seminar: Nie określono

Warunki i sposób zaliczenia poszczególnych form zajęć, w tym zasady zaliczeń poprawkowych, a także warunki dopuszczenia do egzaminu:

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Zasady udziału w poszczególnych zajęciach, ze wskazaniem, czy obecność studenta na zajęciach jest obowiązkowa:

Conversation seminar:

- Attendance is mandatory: Yes
- Participation rules in classes: Nie określono

Method of calculating the final grade

Grading

- 10% presence in classroom
- 40%collaboration in classroom
- 50%selected assignment

Sposób i tryb wyrównywania zaległości powstałych wskutek nieobecności studenta na zajęciach:

The student should report to the teacher in order to determine the individual way of catching up.

Prerequisites and additional requirements

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Recommended literature and teaching resources

Materials

- 1.the book "Introduction to statistics and data mining with R"
- 2.the book "Valuation of Financial Assets and companies"
- 3.the book "Multiple Criteria Decision Analysis"
- 4.code snippets
- 5.links to papers and articles

Scientific publications of module course instructors related to the topic of the module

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Additional information

The Selected Assignment ("project")

A project can be an individual work or a group work (a "group" is one to 4 persons), that uses at least one of the methods learned. The project aims to practice the methods learned, formulate hypotheses, test them and present the results in a convincing way.

During the last lesson each project can be presented in a "15 minutes elevator pitch". Elevator pitch presentations are assessed as follows

40%for the idea and its viability

30% for the logical structure of the presentation

30%for the presentation itself (quality of slides if used + oratorical qualities)

(start in winter semester 2018/19)