MA6632: STATISTICAL ANALYSIS OF FINANCIAL BIG DATA

Effective Term

Semester B 2024/25

Part I Course Overview

Course Title

Statistical Analysis of Financial Big Data

Subject Code

MA - Mathematics

Course Number

6632

Academic Unit

Mathematics (MA)

College/School

College of Science (SI)

Course Duration

One Semester

Credit Units

3

Level

P5, P6 - Postgraduate Degree

Medium of Instruction

English

Medium of Assessment

English

Prerequisites

MA2172 Applied Statistics for Sciences and Engineering OR
MA2506 Probability and Statistics OR equivalent course of elementary statistics

Precursors

Nil

Equivalent Courses

Nil

Exclusive Courses

Nil

Part II Course Details

Abstract

This course aims to
· introduce students statistical concepts and techniques of data analysis; and
· demonstrate applications of statistical methods and modeling techniques to scientific and engineering problems; and
· develop the use of computer software in statistical calculations.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	perform hypothesis testing on data sets and draw appropriate inferences about the underlying populations.	30	x	x	
2	construct statistical models and experimental designs from regression and analysis of variance.	20	x	x	
3	implement multivariate methods of analysis to data sets with inherent interdependence among variables.	20	x	x	
4	present a range of statistical methods for evaluating product quality and forecasting time series processes.	20	x	x	x
5	carry out statistical calculations and analyses with software packages.	10		x	x

A1: Attitude
Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability
Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.

A3: Accomplishments
Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

Learning and Teaching Activities (LTAs)

	LTAs	Brief Description	CILO No.	Hours/week (if applicable)
1	teaching	Learning through teaching is primarily based on lectures.	1, 2, 3, 4, 5	3 hours/week
2	take-home assignments	Learning through take-home assignments helps students implement advanced theory for better understanding	1, 2, 3, 4, 5	After-class

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Test	1, 2	20	
2	Hand-in assignments	1, 2, 3, 4, 5	10	

Continuous Assessment (%)

30

Examination (%)

70

Examination Duration (Hours)

3

Additional Information for ATs

30% Coursework

70% Examination (Duration: 3 hours, at the end of the semester)

For a student to pass the course, at least 30% of the maximum mark for the examination must be obtained.

Assessment Rubrics (AR)

Assessment Task

1. Test (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

Problem solving ability on statistical models and experimental designs

Excellent

(A+, A, A-) Consistently demonstrates a thorough understanding of statistical models and designs experiments for complex problems

Good

(B+, B, B-) Adequately demonstrates an understanding of statistical models and designs experiments for moderately complex problems

Fair

(C+, C, C-) Demonstrates some understanding of statistical models and designs experiments for simple problems

Marginal

(D) Demonstrates limited understanding of statistical models and has limited ability to design experiments for complex problems

Failure

(F) Demonstrates little understanding of statistical models and is unable to design experiments for complex problems

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Assessment Task

2. Hand-in assignments (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

Comprehensive understanding of statistical methods and software usage

Excellent

(A+, A, A-) Consistently demonstrates a thorough understanding of statistical models and designs experiments for complex problems on software

Good

(B+, B, B-) Adequately demonstrates an understanding of statistical models and designs experiments for moderately complex problems on software

Fair

(C+, C, C-) Demonstrates some understanding of statistical models and designs experiments for simple problems on software

Marginal

(D) Demonstrates limited understanding of statistical models and has limited ability to design experiments for complex problems on software

Failure

(F) Demonstrates little understanding of statistical models and is unable to design experiments for complex problems on software

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Assessment Task

3. Examinations (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

Creativity and problem solving ability based on comprehensive understanding

Excellent

(A+, A, A-) Consistently demonstrates a thorough understanding of statistical models and designs experiments for complex problems

Good

(B+, B, B-) Adequately demonstrates an understanding of statistical models and designs experiments for moderately complex problems

Fair

(C+, C, C-) Demonstrates some understanding of statistical models and designs experiments for simple problems

Marginal

(D) Demonstrates limited understanding of statistical models and has limited ability to design experiments for complex problems

Failure

(F) Demonstrates little understanding of statistical models and is unable to design experiments for complex problems

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Assessment Task

1. Test (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

Problem solving ability on statistical models and experimental designs

Excellent

(A+, A, A-) Consistently demonstrates a thorough understanding of statistical models and designs experiments for complex problems

Good

(B+, B) Adequately demonstrates an understanding of statistical models and designs experiments for moderately complex problems

Marginal

(B-, C+, C) Demonstrates some understanding of statistical models and designs experiments for simple problems

Failure

(F) Demonstrates little understanding of statistical models and is unable to design experiments for complex problems

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Assessment Task

2. Hand-in assignments (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

Comprehensive understanding of statistical methods and software usage

Excellent

(A+, A, A-) Consistently demonstrates a thorough understanding of statistical models and designs experiments for complex problems on software

Good

(B+, B) Adequately demonstrates an understanding of statistical models and designs experiments for moderately complex problems on software

Marginal

(B-, C+, C) Demonstrates some understanding of statistical models and designs experiments for simple problems on software

Failure

(F) Demonstrates little understanding of statistical models and is unable to design experiments for complex problems on software

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Assessment Task

3. Examinations (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

Creativity and problem solving ability based on comprehensive understanding

Excellent

(A+, A, A-) Consistently demonstrates a thorough understanding of statistical models and designs experiments for complex problems

Good

(B+, B) Adequately demonstrates an understanding of statistical models and designs experiments for moderately complex problems

Marginal

(B-, C+, C) Demonstrates some understanding of statistical models and designs experiments for simple problems

Failure

(F) Demonstrates little understanding of statistical models and is unable to design experiments for complex problems

Part III Other Information

Keyword Syllabus

Arbitrage theory, Hedging, Binomial model, Ito's formula, Black-Scholes equation, Option Greeks

Reading List

Compulsory Readings

	Title
1	Course materials provided

Additional Readings

	Title
1	Derivatives Markets, by R. McDonald, Pearson; 3rd edition
2	Options, Futures and Other Derivatives, by J. Hull, Pearson; 9th edition