Programme Specification (PG)

Awarding body / institution:	Queen Mary University of London
Teaching institution:	Queen Mary University of London
Name of final award and title:	Risk Analytics MSc
Name of interim award(s):	PG Cert and PG Dip
Duration of study / period of registration:	1 year full time, 2 years part time
Queen Mary programme code(s):	PFQM-G13A-09, PPQM-G13D-09
QAA Benchmark Group:	Mathematics, Statistics and Operational Research; Finance; Business
FHEQ Level of Award:	Level 7
Programme accredited by:	N/A
Date Programme Specification approved:	04 October 2023
Responsible School / Institute:	School of Mathematical Sciences

Schools / Institutes which will also be involved in teaching part of the programme:

Collaborative institution(s) / organisation(s) involved in delivering the programme:

Programme outline

This Risk Analytics MSc includes modules on statistics, probability and mathematical tools for risk management, financial instruments and markets, data analytics, actuarial risk management, regulatory risk analytics, sustainability and climate risk analytics, digital and real asset analytics, SAS for business intelligence, and optimisation for business processes.

Students are also trained using statistical software such as Excel/VBA, SAS, R and Python to analyse and visualise data. In addition, the programme offers options for specialisation both in taught modules as in the Summer Dissertation module in areas such as climate and sustainability, regulatory risk management, or financial risk management, depending on the students' interests.

The programme is delivered across three semesters.

In the first semester, students take four compulsory modules. After an introduction on basic statistics and probability used in physical and life sciences and economics, students learn various loss distribution models, which are applied to liability valuations. We discuss compound distributions and their applications in risk modelling. To manage dependent and extreme risks, we discuss copulas and extreme value theory. Students learn stochastic modelling and stochastic processes, discrete time processes, including Markov chains and random walks, and continuous time processes such as Poisson processes. In addition to

the statistical and mathematical fundamentals, students learn risk analytics tools, and data analysis, and receive a comprehensive introduction to risk management theories in Enterprise Risk Management and Finance. The students work with real-world data applications using Excel/VBA, R and Python.

In the second semester, based on what they have learned in the first semester, students may choose to further study financial risk analytics (with Digital and Real Asset Analytics) or enterprise risk analytics (with Actuarial Risk Management 2), SAS for Business Intelligence and Optimisation for Business Processes. Students can also extend their knowledge to specific risk areas, such as sustainability and climate risk analytics, where we discuss contemporary climate risks and sustainability issues, and measure them using various risk analytical models. We introduce analytical tools for climate risk management, including scenario analysis, simulation, extreme value theory, etc. Then they are guided to develop appropriate strategies to manage the climate risks and evaluate responses. Students can also choose to learn regulatory risk analytics, which provides students with the practical knowledge that is essential for a career not only in risk management functions, but also in regulatory institutions, e.g., central banks. We discuss different types of systemic risks and corresponding strategies to manage them from the lens of regulators specifically. Then we study models on systemic risk and financial crises, e.g., extreme value theory, network analysis, and learn their recent development and application. Real data on past crises is analysed using the models. To equip students as future regulators, we introduce the most current risk regulation and risk management cultures across different countries and regions.

In the third semester, students will be involved in projects directly related to the field. This hands-on experience equips students with the skills they need to work in various industries, government agencies, or academic institutions, or to pursue further study in a PhD programme in Risk Analytics or a related field.

Aims of the programme

The Risk Analytics MSc aims to equip students with advanced knowledge and practical skills in the field of risk analytics, which is the application of statistical methods, computer programming tools, and financial or business insight to risk management. The program is designed to give students the knowledge and skills necessary to obtain employment in a wide variety of roles in the field of risk analytics, in financial institutions, regulatory bodies, or corporations.

The primary aim of this programme is to provide students with a solid foundation in mathematical principles, methodologies, and techniques, key to risk management and data analysis, and to enable them to apply this knowledge to real-world situations. Students will develop a deep understanding of risk management techniques, data analysis, and interpretation, allowing them to extract meaningful insights from complex datasets and manage risk.

The programme also focuses on enhancing students' proficiency in various technologies, such as Excel/VBA, R, Python and SAS Viya. Students will gain hands-on experience with cutting-edge software and programming languages, enabling them to effectively manipulate, analyse, and visualize data using real world scenarios in case studies.

Additionally, the programme aims to promote a discussion on the cutting edge topics on risk management, e.g., climate risk analytics, regulatory risk analytics, and digital and real asset analytics.

Furthermore, the programme aims to foster critical thinking and problem-solving abilities in students. They will learn to design and execute research projects, formulate research questions, and select appropriate methodologies. Through practical exercises and projects, students will develop the ability to apply techniques to solve real-world challenges.

In addition to academic content, the programme places emphasis on developing essential disciplinary skills and abilities. Students will learn to collaborate effectively in interdisciplinary teams. They will also cultivate strong communication skills, enabling them to present complex concepts and findings to both technical and non-technical audiences in a clear and concise manner.

Students will also be educated on the responsible and ethical use of data, emphasizing principles such as data privacy, confidentiality, and unbiased analysis. They will gain an understanding of the ethical challenges that may arise in data science and risk management and learn how to navigate and mitigate potential risks.

What will you be expected to achieve?

Students who successfully complete the programme will be able to apply a wide range of mathematical and statistical techniques to model risk.

They will be able to understand the various types of risks in addition to financial risk. They will understand challenges in the field, such as climate risk and digital assets risk analytics and understand strategies for crises (such as those presented during the COVID pandemic).

They will be able to conduct rigorous analysis using sound methodologies and software, draw meaningful insights and be able to communicate those insights to a wide audience with different levels of technical expertise.

Academic Content:	
A 1	Demonstrate a comprehensive understanding of advanced statistical and mathematical concepts, methodologies, and techniques commonly employed in enterprise risk analytics and financial risk management.
A 2	Systematically understand the structure of various financial instruments, including derivatives, and develop the ability to analyze and calculate their prices using advanced mathematical and financial modeling techniques.
A 3	Analyse statistical tools and methods to interpret historical time series data relevant to actuarial risk management, enabling the identification of patterns, trends, and potential risks.

Disciplinary Skills - able to:	
B 1	Systematically appreciate the practical applications of a wide range of financial instruments, including their risk/return characteristics, and demonstrate the ability to evaluate and manage risks associated with these instruments
B 2	Demonstrate proficiency in utilizing multiple programming languages for data analysis, visualization, and modeling purposes, and effectively apply computational techniques to analyze large datasets relevant to actuarial risk management.
B 3	Develop the skills necessary to design and execute research projects in actuarial risk management, including the formulation of appropriate research questions, the selection and application of suitable methodologies, and the proficient execution of data-driven investigations.
B 4	Critically review key concepts from published academic research papers in the field of actuarial risk management, and integrate this knowledge into the development of innovative research and practice in the discipline.

Attributes:	
C 1	Effectively communicate complex risk concepts and findings to diverse audiences, demonstrating strong oral and written communication skills suitable for technical and non-technical stakeholders in the field of actuarial risk management.
C 2	Develop a comprehensive and in-depth understanding of the significance of risk analytics and management within the broader economic context, including the impact on financial institutions, regulatory frameworks, and societal well-being.
C 3	Display a strong commitment to ethical practices in risk management and data science, encompassing principles of data privacy, confidentiality, and responsible application of statistical techniques to ensure the integrity and ethical conduct of risk-related activities.

C 4	Stay abreast of the latest advancements in risk analytics, including emerging technologies, methodologies, and industry practices, and demonstrate an ability to adapt and incorporate these developments into professional practice within the field of actuarial risk management.
C 5	Appreciate how erroneous assumptions in mathematical modelling may have significant negative consequences.

How will you learn?

In the Risk Analytics MSc programme, your learning experience will be comprehensive and supported by various methods. Here's how you will learn:

1. Formal Lessons: You will attend structured formal lessons delivered by experienced lecturers who are experts in their respective fields. These lessons will provide you with the necessary theoretical foundations, concepts, and methodologies in the field. The curriculum is designed to cover a wide range of topics, ensuring a well-rounded understanding of the subject matter.

2. Tutorials: Alongside formal lessons, you will have the opportunity to participate in tutorials. Tutorials offer a smaller group setting where you can engage in interactive discussions, ask questions, and receive further clarification on complex topics. Tutorials provide a supportive environment for deeper exploration of course materials and facilitate peer-to-peer learning. For modules that cover computer programming, we run weekly teaching sessions in our dedicated PC laboratory which you are required to attend.

3. Assignments: Throughout the programme, you will be assigned various coursework and assignments. These assignments will challenge you to apply the knowledge and techniques learned in the classroom to practical scenarios. They will involve hands-on data analysis tasks, problem-solving exercises, and applications to real-world datasets.

4. MSc Dissertation Project: As part of your MSc journey, you will undertake a summer dissertation project. This project will be a culmination of your learning, where you will have the opportunity to demonstrate your ability to conduct independent research, apply state-of-the-art methodologies, and generate valuable insights. You will work closely with a supervisor who will guide and support you throughout the project.

5. Access to State-of-the-Art Software and Hardware: The programme ensures that you have access to cutting-edge software and hardware resources. You will have the opportunity to work with industry-standard statistical software packages, programming languages, and data analysis and visualisation tools. Access to advanced hardware and computing resources will enable you to handle large datasets and perform computationally intensive analyses effectively.

6. Personal Academic Advisor: Each student will be assigned a personal academic advisor who will serve as a mentor and guide throughout your academic journey. Your advisor will provide support and advice on course selection, academic progress, and career development. They will assist you in navigating the programme requirements and help you make informed decisions regarding your academic and professional goals.

7. Office Hours: Lecturers and teaching staff will hold regular office hours, during which you can schedule one-on-one meetings to seek clarification, discuss coursework, receive feedback, and address any questions or concerns. Office hours provide an opportunity for personalized interaction, allowing you to receive individualized attention and guidance from faculty members.

Overall, the learning experience in the Risk Analytics MSc will combine formal lessons, interactive tutorials, practical assignments, independent research, access to advanced technology, and personal support from academic advisors and lecturers. This holistic approach will foster a dynamic and engaging learning environment, enabling you to develop a strong foundation in risk analytics and prepare you for successful careers in this rapidly evolving field.

How will you be assessed?

You will be assessed by a combination of in-term class tests (some of which are computer-based) and written examinations. Some modules may also have in-term assessed coursework assignments or projects.

For the in-term class tests and assignments (but excluding those that are the final element of assessment for a module) we generally aim to release provisional marks, and to give detailed feedback, within two weeks. The assessment dates will be

coordinated by the Director of Education, Programme Director and Module Organisers to ensure no undue pressure is placed on students.

The MSc dissertation project represents a significant component of your assessment. This independent research project allows you to investigate a specific research question or problem in depth. You will design and execute a research study, analyze data, and present your findings in a formal written dissertation. The dissertation will be assessed based on the quality of research design, data analysis, interpretation, and the clarity and coherence of your written work.

The combination of assignments, exams, projects, and the MSc dissertation ensures a comprehensive evaluation of your knowledge and practical skills in applied statistics and data science.

Throughout the programme, you will receive feedback and guidance from faculty members, allowing you to identify areas of improvement and enhance your learning experience. The assessments are designed to not only evaluate your progress but also to promote active engagement with the subject matter and to prepare you for future challenges in the field of risk analytics.

How is the programme structured?

Please specify the structure of the programme diets for all variants of the programme (e.g. full-time, part-time - if applicable). The description should be sufficiently detailed to fully define the structure of the diet.

The programme consists of four compulsory taught modules in Semester A and four elective modules in Semester B, as well as a summer dissertation project. Full-time students are expected to complete eight taught modules and the project dissertation in one academic year. Students choose their elective modules according to their academic background and interests, in consultation with the Programme Director and other staff as needed.

Full Time Diet
Semester A

Four compulsory modules
MTH761P [7] Financial Instruments and Markets
MTH7015P [7] Foundations of Mathematics and Statistics
MTH781P [7] Data Analytics
MTH7013P [7] Actuarial Risk Management 1

Semester B
Choose four from
MTH7016P [7] Regulatory Risk Analytics
MTH7017P [7] Sustainability and Climate Risk Analytics
MTH7014P [7] Actuarial Risk Management 2
MTH741P [7] Digital and Real Asset Analytics
MTH782P [7] SAS for Business Intelligence
MTH784P [7] Optimisation for Business Processes
MTH791P [7] Computational Statistics with R

Semester C
MTH7018P [7] Risk Analytics Dissertation

Part Time Diet
Year 1
Semester A
Two compulsory modules
MTH761P [7] Financial Instruments and Markets
MTH7015P [7] Foundations of Mathematics and Statistics

Semester B

Choose two from
MTH7016P [7] Regulatory Risk Analytics

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MTH7017P [7] Sustainability and Climate Risk Analytics
MTH741P [7] Digital and Real Asset Analytics
MTH782P [7] SAS for Business Intelligence
MTH784P [7] Optimisation for Business Processes
MTH791P [7] Computational Statistics with R

Year 2

Semester A
Two compulsory modules
MTH781P [7] Data Analytics
MTH7013P [7] Actuarial Risk Management 1

Semester B

Choose two from
MTH7016P [7] Regulatory Risk Analytics
MTH7017P [7] Sustainability and Climate Risk Analytics
MTH7014P [7] Actuarial Risk Management 2
MTH741P [7] Digital and Real Asset Analytics
MTH782P [7] SAS for Business Intelligence
MTH784P [7] Optimisation for Business Processes
MTH791P [7] Computational Statistics with R

Semester C
MTH7018P [7] Risk Analytics Dissertation

Academic Year of Study FT - Year 1

Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester
Foundations of Mathematics and Statistics	MTH7015P	15	7	Compulsory	1	Semester 1
Financial Instruments and Markets	MTH761P	15	7	Compulsory	1	Semester 1
Data Analytics	MTH781P	15	7	Compulsory	1	Semester 1
Actuarial Risk Management 1	MTH7013P	15	7	Compulsory	1	Semester 1
Regulatory Risk Analytics	MTH7016P	15	7	Elective	1	Semester 2
Sustainability and Climate Risk Analytics	MTH7017P	15	7	Elective	1	Semester 2

Programme Title: Risk Analytics

Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester
SAS for Business Intelligence	MTH782P	15	7	Elective	1	Semester 2
Computational Statistics with R	MTH791P	15	7	Elective	1	Semester 2
Digital and Real Asset Analytics	MTH741P	15	7	Elective	1	Semester 2
Optimisation for Business Processes	MTH784P	15	7	Elective	1	Semester 2
Actuarial Risk Management 2	MTH7014P	15	7	Elective	1	Semester 2
Risk Analytics Dissertation	MTH7018P	60	7	Core	1	Semester 3

What are the entry requirements?

An upper second class degree is normally required, either in a STEM-related subject (electronic engineering, computer science, mathematics, physics or a related discipline) or Risk-Management-related subject (business, finance, accounting, economics, or a related discipline). Applicants with unrelated degrees will be considered if there is evidence of equivalent content in their academic or professional background. For international students we require English language qualifications IELTS 6.5.

How will the quality of the programme be managed and enhanced? How do we listen to and act on your feedback?

The Staff-Student Liaison Committee provides a formal means of communication and discussion between Schools and its students. The committee consists of student representatives from each year in the school/institute together with appropriate representation from staff within the school/institute. It is designed to respond to the needs of students, as well as act as a forum for discussing programme and module developments. Staff-Student Liaison Committees meet regularly throughout the year.

Each school operates a Learning and Teaching Committee, or equivalent, which advises the School/Institute Director of Taught Programmes on all matters relating to the delivery of taught programmes at school level including monitoring the application of relevant QM policies and reviewing all proposals for module and programme approval and amendment before submission to Taught Programmes Board. Student views are incorporated in this Committee's work in a number of ways, such as through student membership, or consideration of student surveys.

What academic support is available?

All students will be assigned a tutor, with whom they will have regular meetings. In addition the students will have all the standard induction, advice and supervisory arrangements normally offered to students within SMS.

The school handbook will be provided (and made accessible at all times) to students, where all the channels of support will be outlined. These include the support channels within the school and also those available at College level.

Programme-specific rules and facts

N/A

How inclusive is the programme for all students, including those with disabilities?

Queen Mary has a central Disability and Dyslexia Service (DDS) that offers support for all students with disabilities, specific learning difficulties and mental health issues. The DDS supports all Queen Mary students: full-time, part-time, undergraduate, postgraduate, UK and international at all campuses and all sites.

Students can access advice, guidance and support in the following areas:
- Finding out if you have a specific learning difficulty like dyslexia
- Applying for funding through the Disabled Students' Allowance (DSA)
- Arranging DSA assessments of need
- Special arrangements in examinations
- Accessing loaned equipment (e.g. digital recorders)
- Specialist one-to-one "study skills" tuition
- Ensuring access to course materials in alternative formats (e.g. Braille)
- Providing educational support workers (e.g. note-takers, readers, library assistants)
- Mentoring support for students with mental health issues and conditions on the autistic spectrum.

Links with employers, placement opportunities and transferable skills

The staff involved in the Risk Analytics MSc have strong links and research collaboration with a range of international academic institutions and industry. Companies are involved in some of the teaching activities, as well as business use cases, such as SAS.

Many of the skills taught in this programme are highly transferable. For example, the programming skills (especially in Python) are widely sought by employers in many diverse industries, not least information technology companies, fintech startups and so on.

Programme Specification Approval

Person completing Programme Specification:	Pedro Vergel
Person responsible for management of programme:	Lei Fang
Date Programme Specification produced / amended by School / Institute Education Committee:	08/06/2023; reviewed 26 Sep 23 by S. Beheshti, DoE
Date Programme Specification approved by Taught Programmes Board:	04 October 2023