1 Title, affiliation and language
A shared section that applies to all BSc and MSc Programmes at the Faculty of Science is
linked to this programme-specific curriculum.

1.1 Title
The MSc Programme in Mathematics-Economics leads to a Master of Science (MSc) in
Mathematics-Economics with the Danish title: Cand.scient. (candidatus/candidata
scientiarum) i matematik-økonomi.

1.2 Affiliation
The programme is affiliated with the Study Board for Mathematics and Computer Science,
and the students can both elect, and be elected, to this study board.

1.3 Corps of external examiners
The following corps of external examiners is used for the central parts of the MSc
Programme:

- Corps of External Examiners for Mathematics (matematik).

1.4 Language
The language of this MSc Programme is English.

2 Academic profile
2.1 Purpose
The MSc Programme in Mathematics-Economics is a research-based interdisciplinary
programme, the objective of which is to educate economists with a sound understanding of
mathematics and statistics and the application of these disciplines within economic theory.
Through a synthesis of the mathematical, statistical and economic fields of study, the
mathematics-economist learns to handle theoretical and practical economic issues.

2.2 General programme profile
The study programme is an interdisciplinary programme offered by the Faculty of Science
and the Faculty of Social Sciences with each faculty supplying a share of the compulsory
courses. On the one hand, the study programme gives future economists with an interest in
mathematics and statistics the opportunity to work with modern mathematical approaches and
techniques. On the other hand, future mathematicians and statisticians obtain a good
understanding of the areas of application of the economic subjects.

The programme's key subject areas are mathematics, statistics (including probability theory)
and economics (including finance, actuarial mathematics and operations research). Moreover,
computer science is included in the programme as a subject.

2.3 General structure of the programme
The MSc Programme is set at 120 ECTS credits.

There are no defined specialisations in this programme.

2.4 Career opportunities
The MSc Programme in Mathematics-Economics qualifies students for a PhD programme,
and depending on the academic specialisation it may also be targeted at business functions
and/or areas such as:
• Economist positions requiring good analytical skills and use of mathematics, statistics and IT.
• Work within the financial sector.
• Work within the public administration.
• Work within the consulting sector.

3 Description of competence profiles
Students following the MSc Programme acquire the knowledge, skills and competences listed below. Students will also acquire other qualifications through elective courses and other study activities.

3.1 Competence profile
On completion of the programme, an MSc in Mathematics-Economics has acquired the following:

Knowledge about:
• Selected research-active areas of economics and statistics, to a high level.
• Vector autoregressiv models, including unit root inference and co-integration.
• Economic stabilization policy with emphasis on monetary policy.
• The game-theoretic approach to industrial organization.
• Optimal stopping problems for investment and consumption in a stochastic environment.

Skills to:
• Read and understand economic and statistical original literature.
• Communicate economic and mathematical issues on a scientific basis.
• Account orally and in writing for inquiries into open economic issues.

Competences to:
• Structure a study of open economic questions, especially of an econometric or finance-related nature and divide it into smaller easily accessible challenges.
• Further develop and adapt economic models for real-life challenges.
• Conduct independent, stringent argumentation.
• Independently take responsibility for his or her own professional development and specialisation.
• Scientifically reflect on mathematical methods for analysing and resolving economic questions.

4 Admission requirements
Students are admitted to the MSc Programme in Mathematics-Economics once a year, with studies starting on 1 September.

Applicants with a Bachelor’s degree in Mathematics-Economics from the University of Copenhagen who complete their Bachelor’s degree in block 1 or 2 may additionally be admitted to the MSc Programme in Mathematics-Economics with studies starting on 1 February of the academic year in question.

4.1 Applicants with a Bachelor’s degree in Mathematics-Economics
Applicants with a Bachelor’s degree in Mathematics-Economics from the University of Copenhagen, other Danish or Nordic universities are directly academically qualified for admission to the MSc Programme.
4.2 Applicants with a closely related Bachelor’s degree
Applicants with a Bachelor’s degree in Actuarial Mathematics or Mathematics from the University of Copenhagen, other Danish or international universities may be admitted if the programme includes:

- Subject elements in microeconomics at least 15 ECTS credits.
- Subject elements in macroeconomics at least 15 ECTS credits.
- Subject elements in finance at least 7.5 ECTS credits.
- Subject elements in statistics on a measure theoretical basis at least 15 ECTS credits.

4.3 Applicants with a related Bachelor’s degree
Applicants with a Bachelor’s degree in economics, physics, computer science or chemistry from the University of Copenhagen or other Danish or international universities may also be admitted if their programme includes the following elements:

- Subject elements in mathematical analysis at least 22.5 ECTS credits.
- Subject elements in linear algebra at least 7.5 ECTS credits.
- Subject elements in microeconomics at least 15 ECTS credits.
- Subject elements in macroeconomics at least 15 ECTS credits.
- Subject elements in finance at least 7.5 ECTS credits.
- Subject elements in statistics on a measure theoretical basis at least 15 ECTS credits.

4.4 Other applicants
The Faculty may also admit applicants who, after a thorough academic assessment, are deemed to possess a Bachelor’s degree with educational qualifications equivalent to those required in Subclauses 4.1- 3.

4.5 Language requirements
4.5.1 Applicants from Nordic universities
Applicants with a Bachelor’s degree from Nordic universities must as a minimum document English language qualifications comparable to a Danish upper secondary school English B level.

4.5.2 Non-Nordic applicants
Applicants with a non-Nordic Bachelor’s degree must be able to document English proficiency corresponding to an IELTS test score of minimum 6.5 or a TOEFL test score of minimum 213 (computer-based), 560 (paper-based) or 83 (Internet-based).

5 Prioritisation of applicants
If the number of qualified applicants to the programme exceeds the number of places available, applicants will be prioritised as follows:

1) Applicants with a Bachelor’s degree in Mathematics-Economics from the University of Copenhagen seeking admission by way of direct extension of their completed BSc programme.
2) Other applicants with a Bachelor’s degree in Mathematics-Economics.
3) Applicants with a Bachelor’s degree in Mathematics or Actuarial Mathematics from the University of Copenhagen.
4) Other applicants.
Applicants are then prioritised according to their total number of ECTS credits within the academic fields and the grades obtained.

6 Structure of the programme
The compulsory subject elements, restricted elective subject elements and the thesis constitute the central parts of the programme (Section 21 of the Ministerial Order on Bachelor and Master’s Programmes (Candidatus) at Universities).

All of the compulsory subject elements (including the thesis) defined below must be followed at the exact time planned according to the table in Appendix 1. Restricted elective and elective subject elements may be freely placed in the remaining blocks.

6.1 Programme components
The programme is set at 120 ECTS credits and consists of the following:
- Compulsory subject elements, 30 ECTS credits.
- Restricted elective subject elements, 45 ECTS credits.
- Elective subject elements, 15 ECTS credits.
- Thesis, 30 ECTS credits.

6.1.1 Compulsory subject elements
All of the following subject elements are to be covered (30 ECTS credits):

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Block</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>NMAA05025U</td>
<td>Econometrics 2: Statistical Analysis of Econometric Time Series</td>
<td>StatØ2</td>
<td>7.5</td>
</tr>
<tr>
<td>NMAK10018U</td>
<td>Macroeconomics 3 – Business Cycles and Monetary Policy</td>
<td>MakØk3</td>
<td>7.5</td>
</tr>
<tr>
<td>NMAK11020U</td>
<td>Microeconomics 3 – Industrial Organization</td>
<td>MikØk3</td>
<td>7.5</td>
</tr>
<tr>
<td>NMAA09045U</td>
<td>Finance 2: Dynamic Portfolio Choice</td>
<td>Fin2</td>
<td>7.5</td>
</tr>
</tbody>
</table>

6.1.2 Restricted elective subject elements
45 ECTS credits are to be covered as subject elements from the following list:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Block</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>NMAA09044U</td>
<td>Operations Research 2: Advanced Operations Research (OR2)</td>
<td>Block 1</td>
<td>7.5</td>
</tr>
<tr>
<td>NMAK10003U</td>
<td>Advanced Probability Theory 1 (VidSand1)</td>
<td>Block 1</td>
<td>7.5</td>
</tr>
<tr>
<td>NMAA05117U</td>
<td>Stochastic Processes in Non-Life Insurance (SkadeStok)</td>
<td>Block 1</td>
<td>7.5</td>
</tr>
<tr>
<td>NMAK15013U</td>
<td>Functional Data Analysis</td>
<td>Block 1</td>
<td>7.5</td>
</tr>
<tr>
<td>NMAA05115U</td>
<td>Stochastic Processes in Life Insurance (LivStok)</td>
<td>Block 1</td>
<td>7.5</td>
</tr>
<tr>
<td>NMAK15011U</td>
<td>Control Theory in Finance and Insurance</td>
<td>Block 1</td>
<td>7.5</td>
</tr>
<tr>
<td>NMAK10012U</td>
<td>Optimization and Convexity (OK)</td>
<td>Block 2</td>
<td>7.5</td>
</tr>
<tr>
<td>NMAK15020U</td>
<td>Statistical Computing</td>
<td>Block 2</td>
<td>7.5</td>
</tr>
<tr>
<td>NMAA05113U</td>
<td>Continuous Time Finance (FinKont)</td>
<td>Block 2</td>
<td>7.5</td>
</tr>
<tr>
<td>NMAK13005U</td>
<td>Introduction to Extreme Value Theory (IntroExtremValue)</td>
<td>Block 2</td>
<td>7.5</td>
</tr>
<tr>
<td>NMAK15024U</td>
<td>Topics in Financial Risk Management</td>
<td>Block 2</td>
<td>7.5</td>
</tr>
<tr>
<td>NMAA11011U</td>
<td>Advanced Probability 2 (VidSand2)</td>
<td>Block 2</td>
<td>7.5</td>
</tr>
<tr>
<td>NMAK10020U</td>
<td>Quantitative Risk Management (QRM)</td>
<td>Block 2</td>
<td>7.5</td>
</tr>
<tr>
<td>AØKA08055U</td>
<td>Contract Theory and the Economics of Organization</td>
<td>Autumn</td>
<td>7.5</td>
</tr>
<tr>
<td>AØKA08012U</td>
<td>Corporate Finance and Incentives</td>
<td>Autumn</td>
<td>7.5</td>
</tr>
<tr>
<td>AØKK08202U</td>
<td>Corporate Finance Theory</td>
<td>Autumn</td>
<td>7.5</td>
</tr>
<tr>
<td>AØKA08216U</td>
<td>Financial Econometrics A</td>
<td>Autumn</td>
<td>7.5</td>
</tr>
<tr>
<td>AØKK08206U</td>
<td>Financial Frictions, Liquidity and the Business Cycle</td>
<td>Autumn</td>
<td>7.5</td>
</tr>
<tr>
<td>AØKA08079U</td>
<td>Health Economics</td>
<td>Autumn</td>
<td>7.5</td>
</tr>
<tr>
<td>Course Code</td>
<td>Course Name</td>
<td>Term</td>
<td>Credits</td>
</tr>
<tr>
<td>------------------</td>
<td>---------------------------------------------------------------</td>
<td>------------</td>
<td>---------</td>
</tr>
<tr>
<td>AØKA08070U</td>
<td>Multivariate analysis and categorized data</td>
<td>Autumn</td>
<td>7.5 ECTS</td>
</tr>
<tr>
<td>AØKA08208U</td>
<td>Praktisk tidsrækkeanalyse</td>
<td>Autumn</td>
<td>7.5 ECTS</td>
</tr>
<tr>
<td>AØKA08091U</td>
<td>Økonomiske prognoser i praksis</td>
<td>Autumn</td>
<td>7.5 ECTS</td>
</tr>
<tr>
<td>AØKA08036U</td>
<td>Årsregnskab og regnskabsanalyse</td>
<td>Autumn</td>
<td>7.5 ECTS</td>
</tr>
<tr>
<td>NMAK15004U</td>
<td>Advanced Operations Research: Stochastic Programming</td>
<td>Block 3</td>
<td>7.5 ECTS</td>
</tr>
<tr>
<td>NMAK11022U</td>
<td>Regression (Reg)</td>
<td>Block 3</td>
<td>7.5 ECTS</td>
</tr>
<tr>
<td>NMAK14013U</td>
<td>Modelling Dependence in Discrete Time</td>
<td>Block 3</td>
<td>7.5 ECTS</td>
</tr>
<tr>
<td>NMAK15010U</td>
<td>Continuous Time Finance 2 (FinKont2)</td>
<td>Block 3</td>
<td>7.5 ECTS</td>
</tr>
<tr>
<td>NMAK15001U</td>
<td>Operations Research 3: Hierarchical optimization and equilibrium</td>
<td>Block 4</td>
<td>7.5 ECTS</td>
</tr>
<tr>
<td>NMAK14022U</td>
<td>Statistics For Non-Linear Time Series Models</td>
<td>Block 4</td>
<td>7.5 ECTS</td>
</tr>
<tr>
<td>NMAK14028U</td>
<td>Project in Statistics</td>
<td>Block 4</td>
<td>7.5 ECTS</td>
</tr>
<tr>
<td>AØKA08088U</td>
<td>Advanced Development Economics (Micro Aspects)</td>
<td>Spring</td>
<td>7.5 ECTS</td>
</tr>
<tr>
<td>AØKA08102U</td>
<td>Financial Markets</td>
<td>Spring</td>
<td>7.5 ECTS</td>
</tr>
<tr>
<td>AØKA08204U</td>
<td>Fixed Income Derivatives: Risk Management and Financial institutions (F)</td>
<td>Spring</td>
<td>7.5 ECTS</td>
</tr>
<tr>
<td>AØKA08020U</td>
<td>Industrial Organization</td>
<td>Spring</td>
<td>7.5 ECTS</td>
</tr>
<tr>
<td>AØKA08021U</td>
<td>International Economics</td>
<td>Spring</td>
<td>7.5 ECTS</td>
</tr>
<tr>
<td>AØKA08094U</td>
<td>Miljø-, ressource- og klimaøkonomi</td>
<td>Spring</td>
<td>7.5 ECTS</td>
</tr>
<tr>
<td>AØKA08186U</td>
<td>Programmering og Statistik med SAS</td>
<td>Spring</td>
<td>7.5 ECTS</td>
</tr>
<tr>
<td>AØKA08073U</td>
<td>Regnskabsanalyse og aktievurdering</td>
<td>Spring</td>
<td>7.5 ECTS</td>
</tr>
<tr>
<td>AØKA08077U</td>
<td>Stikprøveteorit</td>
<td>Spring</td>
<td>7.5 ECTS</td>
</tr>
</tbody>
</table>

### 6.1.3 Elective subject elements

15 ECTS credits are to be covered as elective subjects.

BSc subject elements corresponding to 15 ECTS credits may be included in the MSc Programme without the approval of the study board.

Projects outside the course scope may be included in the elective section of the programme with up to 15 ECTS credits. The regulations are described in Appendix 5 to the shared section of the curriculum.

Projects in practice may be included in the elective section of the programme with up to 15 ECTS credits. The regulations are described in Appendix 4 to the shared section of the curriculum.

### 6.1.4 Thesis

The MSc Programme in Mathematics-Economics includes a thesis corresponding to 30 ECTS credits, as described in Appendix 2 to the shared curriculum. The topic of the thesis must be within the academic scope of the programme.

There are programme specific rules which define parts of the shared curriculum in more detail. The following specific rules apply to this programme:

- The thesis must be written full time.
- The principal supervisor can be from the Department of Economics, the Faculty of Social Science.
6.1.5 Academic mobility
The academic mobility in the MSc Programme in Mathematics-Economics is placed in block 1+2 of the 2nd year. This means that the curriculum makes it possible to follow subject elements and conduct projects outside the Faculty of Science. In addition the student has the possibility to arrange similar academic mobility in other parts of the programme. Both options require that the student follows the rules and regulations regarding pre-approvals and credit.

6.2 Compliance of the requirements for external examiners and assessment
The MSc Programme automatically fulfils the requirement that one-third of the programme's ECTS credits must be subject to external examination and two-thirds of the ECTS credits must be assessed by grades, cf. the Shared Section of the BSc and MSc Curricula for Study Programmes.

ECTS credits transferred are excluded from the calculation of the requirement for external examination and assessment by grades.

7 Exemptions
In exceptional circumstances, the university may grant exemptions from the rules in the curriculum specified solely by the university.

8 Commencement etc.
8.1 Validity
This subject specific section of the curriculum applies to all students enrolled in the programme – see however Appendix 2.

8.2 Transfer
Students enrolled on previous curricula may be transferred to the new one as per the applicable transfer regulations or according to an individual credit transfer by the study board.

8.3 Amendment
The curriculum may be amended once a year so that any changes come into effect at the beginning of the academic year. Amendments must be proposed by the study board and approved by the Dean.

Notification about amendments that tighten the admission requirements for the programme will be published online at www.science.ku.dk one year before they come into effect.

If amendments are made to this curriculum, an interim arrangement may be added if necessary to allow students to complete their MSc Programme according to the amended curriculum.
## Appendix 1 Tables

### Table for students admitted to the programme in September (summer):

#### Table - MSc Programme in Mathematics-Economics

<table>
<thead>
<tr>
<th></th>
<th>Block 1</th>
<th>Block 2</th>
<th>Block 3</th>
<th>Block 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1st</strong></td>
<td>Econometrics 2: Statistical Analysis of Econometric Time Series (StatØ2)</td>
<td>Macroeconomics 3 – Business Cycles and Monetary Policy (MakØk3)</td>
<td>Microeconomics 3 – Industrial Organization (MikØk3)</td>
<td>Finance 2: Dynamic Portfolio Choice (Fin2)</td>
</tr>
<tr>
<td>year</td>
<td>Restricted elective</td>
<td>Restricted elective</td>
<td>Restricted elective</td>
<td>Restricted elective</td>
</tr>
<tr>
<td><strong>2nd</strong></td>
<td>Restricted elective</td>
<td>Restricted elective</td>
<td></td>
<td>Thesis</td>
</tr>
<tr>
<td>year</td>
<td>Elective</td>
<td>Elective</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Compulsory</td>
<td>Restricted elective</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Elective</td>
</tr>
</tbody>
</table>

### Table for students admitted to the programme in February (winter):

#### Table - MSc Programme in Mathematics-Economics*

<table>
<thead>
<tr>
<th></th>
<th>Block 3</th>
<th>Block 4</th>
<th>Block 1</th>
<th>Block 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1st</strong></td>
<td>Microeconomics 3 – Industrial Organization (MikØk3)</td>
<td>Finance 2: Dynamic Portfolio Choice (Fin2)</td>
<td>Econometrics 2: Statistical Analysis of Econometric Time Series (StatØ2)</td>
<td>Macroeconomics 3 – Business Cycles and Monetary Policy (MakØk3)</td>
</tr>
<tr>
<td>year</td>
<td>Restricted elective</td>
<td>Restricted elective</td>
<td>Restricted elective</td>
<td>Restricted elective</td>
</tr>
<tr>
<td><strong>2nd</strong></td>
<td>Restricted elective</td>
<td>Restricted elective</td>
<td></td>
<td>Thesis</td>
</tr>
<tr>
<td>year</td>
<td>Elective</td>
<td>Elective</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Compulsory</td>
<td>Restricted elective</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Elective</td>
</tr>
</tbody>
</table>

*This table is only relevant for students who begin the MSc Programme in Mathematics-Economics in February (block 3).
Appendix 2 Interim arrangements

The Shared Section of the BSc and MSc Curricula for Study Programmes 2014 (rev. 2015) applies to all students admitted in the academic year 2015/16 or earlier.

1 General changes valid for students admitted in the academic year 2014/2015 or earlier

Structure of the programme

Students admitted to the MSc Programme in the academic year 2014/15 or earlier must finish the programme with the original curriculum structure under which they were admitted, as shown in the table below:

- Compulsory subject elements, 30 ECTS credits.
- Restricted elective subject elements, 30 ECTS credits.
- Elective subject elements, 30 ECTS credits.
- Thesis, 30 ECTS credits.

Restricted elective subject elements

For students enrolled in 2014/2015 or earlier 30 ECTS credits are to be covered by subject elements from the following list of restricted elective subject elements:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Subject Element</th>
<th>Block</th>
<th>ECTS Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>NMAA05113U</td>
<td>Continuous Time Finance</td>
<td></td>
<td>7.5</td>
</tr>
<tr>
<td>Courses with the abbreviation “Continuous Time Finance 2 (FinKont2)”</td>
<td>Up to 30 ECTS credits</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other courses held by Department of Mathematics and Department of Economics on MSc level</td>
<td>Up to 30 ECTS credits</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Projects outside the course scope with the principal supervisor from the Department of Mathematical Science or the Department of Economics</td>
<td>Up to 15 ECTS credits</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Thesis

The thesis may either be carried out as a full-time project at the end of the study programme or concurrently with other subject elements. However, the thesis must conclude the programme.

Competence profile

On completion of the programme, an MSc in Mathematics-Economics enrolled in 2014/2015 or earlier has acquired the following:

Knowledge about:
- Selected research-active areas of economics and statistics, to a high level.

Skills to:
- Read and understand economic and statistical original literature.
- Communicate economic and mathematical issues on a scientific basis.
- Account orally and in writing for inquiries into open economic issues.

Competences to:
- Structure a study of open economic questions, especially of an econometric or finance-related nature and divide it into smaller easily accessible challenges.
- Further develop and adapt economic models for real-life challenges.
- Conduct independent, stringent argumentation.
- Independently take responsibility for his or her own professional development and specialisation.
- Scientifically reflect on mathematical methods for analysing and resolving economic questions.
Appendix 3 Description of objectives for the thesis

After completing the thesis, the student should have:

Knowledge about:
- Scientific problems within the study programme’s subject areas.
- A suitable combination of methodologies/theories based on international research for use in his/her work with the problem formulation.
- Theories/models on the basis of an organised value system and with a high degree of independence.

Skills to:
- Apply and critically evaluate theories/methodologies, including their applicability and limitations.
- Assess the extent to which the production and interpretation of findings/material depend on the theory/methodology chosen and the delimitation chosen.
- Discuss academic issues arising from the thesis.
- Draw conclusions in a clear and academic manner in relation to the problem formulation and, more generally, considering the topic and the subject area.
- Discuss and communicate the academic and social significance, if any, of the thesis based on ethical principles.

Competences to:
- Initiate and perform academic work in a research context.
- Solve complex problems and carry out development assignments in a work context.