MSc Statistics (Research), MSc Statistics (Financial Statistics) (Research) and MSc Statistics (Social Statistics) (Research) Dissertation Guidelines 2018-19

1. Summary

Taking *ST499 Dissertation* gives you an opportunity to study in depth a topic of specific interest to you, and to apply knowledge and skills gained during the MSc programme. Your study may involve the application of one or more of the topics covered in the MSc. The project should be logically structured, well-researched and clearly written. There is an upper page limit of 50 single-sided sheets of A4 (minimum font size of 11pt and line spacing 1.5), but making your dissertation much shorter than this may not give you enough space to argue your point convincingly; see Section 5.2. The project accounts for 25% of the MSc and you should allocate your time and effort accordingly. It is important not to leave the project until summer: it is expected that you will spend a substantial amount of time on the project in Michaelmas and Lent terms. The deadline for submission is **Wednesday 28th August 2019**; see Section 6.

2. Choosing a topic, finding a supervisor and writing a project proposal

The first step is for you to find a topic and supervisor. A list of potential topics is normally circulated (and posted on Moodle) by mid-October, including an overview of each project and any prerequisite courses. If you are interested in any of the listed topics, please contact the member of staff who has proposed the topic.

You may also propose your own topic. To find a supervisor, it is helpful to consult the list of topics and also the webpages of Department of Statistics academic staff: http://www.lse.ac.uk/Statistics/People. This will give you an idea of staff research interests and whether or not you may be interested in writing a dissertation under their supervision. If you do not fully understand a member of staff's research interests, but suspect they may be aligned with yours, do not be shy to approach them and ask for clarification. This can be done by sending an email, or by attending their advice and feedback office hour. Staff will be more than happy to help with your research queries.

Please contact supervisors quickly to avoid disappointment, and by **Friday 2nd November 2018** at the latest. Some suggested topics and research areas may be more popular than others, and dissertation supervisors may get "booked up" quickly.

The next step is to submit a project proposal. This should be a word processed document taking up to one side of A4 paper. The purpose is to describe a problem that you think merits investigation. It is an opportunity for you to convince us that you have the interest and the ability to pursue a project successfully. Project proposals will usually be written in collaboration with your dissertation supervisor. The proposal must be submitted by email to Sarah McManus (s.mcmanus@lse.ac.uk), the MSc Programme Manager, by **12.00 Midday Friday 16th November 2018.**

3. What you can expect from your supervisor

The project is intended to be an independent piece of work. Supervisors can be expected to offer advice on reading, guidance on the research approach and project structure, and some comments on the early draft sections. Supervisors cannot be expected to correct spelling and grammar, or to comment on a complete draft of the dissertation.

You should have your first meeting with your supervisor towards the end of Michaelmas term (after your topic has been approved). You should then expect to meet approximately 5 times during Lent term. It is your responsibility to contact your supervisor to arrange meetings. Please note that supervisors will not always be available outside term-time, so you should make sure you know when you supervisor is going to be available for face to face meetings and that you have their contact details for periods that they are not in the department. Formal supervision ends two weeks after the end of summer term on **Friday 28th June 2019.**

To get the most out of your supervisory meetings, it is a good idea to email your supervisor a brief progress update in advance of each meeting. It is also recommended that you write up a note after each meeting, summarising what was discussed and ideas to be followed up before the next meeting.

4. Types of project

MSc projects may take many forms, for example:

- Analysis of a previously unanalysed dataset, or one for which existing analyses are unsatisfactory, in your or your supervisor's view. The dataset may be proposed by you, or your supervisor. You should limit yourself to readily-available datasets: do not attempt to design a survey and collect the data yourself as your time constraints will not permit you to do this. A typical aim of this type of project would be to answer interesting scientific questions regarding the data.
- Attempt at innovation in statistical methodology. You (or your supervisor) may be interested in proposing a 'new' statistical method – typically when existing methods do not do a good job for a particular dataset of interest. The degree of innovation may obviously vary between projects. The validity of the new method may be evidenced theoretically (which is typically challenging), or by simulation (which may be easier).
- Comparison and critique of existing statistical methodologies. This type of project again typically revolves around a dataset or a class of datasets, coming with a well-defined scientific question. Your job would be to compare the performance of existing statistical methods on these data, and possibly on simulated data, to draw conclusions about which methods are `better' than others.

Some programming, often in R or Stata, will typically be required in all types of projects.

5. Content and Approach

The project is an extended piece of written work. You must show your ability to organise your material clearly and logically. A statistically well-informed reader (not necessarily a specialist in your chosen subject) should be able to follow your reasoning. You must demonstrate a thorough knowledge of the academic and professional literature relevant to the research topic, and a critical awareness of the contribution of different researchers. It is important that the project explains clearly the methods you have applied and the reasons for your choice of approach. You should show a clear understanding of any shortcomings of your study, in relation to both the methods employed and the quality of the data used. The examiners will pay close attention to the way in which you present your results. As trained statisticians, you are expected to be able to use tables and graphs to present complete yet succinct summaries of your results. Your dissertation should also provide the conclusions of your study and possibly suggestions for further work.

You may find it helpful to look at copies of dissertations from previous years to get an idea of content, layout and format. A selection of previous dissertations will be available on the ST499 Moodle page.

5.1 Layout

The elements described below are required parts of the dissertation. Marking is done anonymously; please do not include your name on any part of the dissertation. The required layout is described below.

- Title page: this should include "Department of Statistics 2019", the title of the dissertation, your candidate number, and the statement "Submitted for the Master of Science, London School of Economics, University of London".

- Contents: This is made up of three elements each giving page numbers:
  - Table of contents: an ordered list of the sections and subsections of the project (include the bibliography and any appendices),
  - List of figures: an ordered list of diagrams,
  - List of tables: an ordered list of tables.

- Summary: a summary of the work in no more than 300 words.

- Introduction: introductory section that should include the aims of the study and a brief outline of the main sections of the dissertation.

- Main sections: including a review of the literature, description of methods used and the results of the study.

- Conclusion: conclusions that can be drawn from your work, possible extensions and further work.

- Bibliography: plagiarism is viewed as a serious offence and you should take great care to cite all of the sources used in your project. More details are given in Sections 5.3 and 8.

The inclusion of appendices is not encouraged. However, if necessary, appendices should go after the bibliography. Appendices may be used for technical material or additional results that do not belong within the main text of the dissertation.

Typesetting will typically be done in the "LaTeX" document preparation system, using the 'report' document class. Please see http://www.latex-project.org/ for more information, including documentation. There are numerous online tutorials available for beginners (e.g. http://www.latex-tutorial.com/tutorials/). Microsoft Word is also acceptable, but be sure to use the Equation Editor for all equations.

5.2 Length and format of dissertation

The dissertation must be a maximum 50 singled-sided A4 pages including the bibliography and any appendices (but not including title, contents and summary page). Anything beyond the 50th page will be ignored. The page limit is set to ensure that only relevant material is included. In particular, tables and diagrams should be included only when they are referred to somewhere in the text. Any devices used to try to get around the page limit will result in marks being deducted; please do not use non-standard fonts or shrunken diagrams.

You may want to avoid the temptation of submitting a dissertation that is much shorter than 40 pages. While a longer paper is not always more convincing, you should give yourself an opportunity to argue your point fully. Shorter dissertations, unless they have a complete feel to them, often provoke questions of why particular extra material has not been included.

The dissertation should be word processed on A4 paper using only one-side of the page. The font size must be at least 11pt. The line spacing should be at least 1.5. The left-hand margin should be 3.5cm and the right-hand margin 2.0cm. Pages should be numbered; use roman numerals (i, ii,...) for the title page, contents page and summary; use Arabic numerals (1, 2,...) for the remainder of the dissertation starting with 1 on the first page of the introduction. Sections should be numbered consecutively, starting with 1. Introduction. Start new sections at the top of a new page. Tables and diagrams should be numbered. The required layout is easy to achieve in the Latex system.

Hand-written diagrams are not acceptable. Do not use footnotes. Take care over style, grammar, punctuation and general presentation. In summary, the format should be as follows:

- title, contents, summary + maximum 50 single sided A4 pages,
- font size minimum 11pt,
- line spacing minimum 1.5,
- left-hand margin 3.5cm, right-hand margin 2cm,
- title, contents, summary -- numbered using i, ii,...,
- remainder of dissertation -- numbered using 1, 2,...,

- number sections, new sections start on new pages,
- number tables and diagrams,
- no footnotes.

5.3 References and bibliography

For references use the `Harvard' or bracket system within the text. For example:

- "De Jong and Shephard (1995) put forward...",
- "Several authors (De Jong, 1989; Kohn and Ansley, 1989; Koopman, 93) make use of a..."
- "Harvey (1993, p.25) says, `Whether or not a mixed process is stationary depends solely on its autoregressive part', but..."

In the bibliography, list works cited in alphabetical order by author. Give the author's surname, initials, year of publication, and title of work. For books, give the place of publication and publisher; for journal articles give the name of the journal, volume and pages; for articles in published collections, give the name of the editor, title of book, place of publication and publisher; for online sources give the source organisation, the URL and the date accessed. The appropriate use of italics and bold is important. Examples of citations of (in order) a book, journal article and book chapter are:

- Harvey, A. C. (1993). *Time Series Models* (2nd edition). London : Harvester-Wheatsheaf.
- De Jong, P. and Shephard, N. (1995). The simulation smoother for time series models. *Biometrika* 82, pp339-350.
- Bradshaw, J. and Deacon, A. (1986). Social Security, in P. Wilding (ed.), *In Defence of the Welfare State*. Manchester: University Press.

Again, this is straightforward to achieve in the Latex system (using BibTeX). EndNote is a useful software tool for managing your sources. References entered into EndNote can be exported into BibTex format (or imported directly into Word).

Note that for online sources referencing styles are not very well established, but it is essential to cite any material you have used (see Section 8). Be careful to use only reputable sources -- there is a lot of unreliable information on the web.

5.4 Computer programs and output

You may put a substantial amount of time and effort into writing computer programs or manipulating data. The code you have written is unlikely to be of interest to the reader. However, if you feel that it is important that the examiners see electronic material, you should include it on a USB stick or similar. Think carefully about what will enhance the reader's understanding of what you have done. The examiners will not appreciate receiving a large number of files that are irrelevant or incomprehensible. If you decide to include a USB stick, its contents and any instructions for using the contents should be carefully described in an appendix. Do not include program listings in your dissertation.

6. Submission and Assessment

The deadline for submission is **Wednesday 28th August 2019.** Extensions will not normally be granted. The requirements for submission are as follow:

1. 2 bound copies (ring binding in soft covers) of the dissertation with any USB stick securely attached

2. A copy of the title page and summary with your name written on (this is for staff in the Professional Services Office to keep track of your dissertations).

3. All dissertations will be uploaded onto Turnitin, the School's plagiarism detection software.

4. At the time of submission, you will be asked to grant your permission for your dissertation to be used as an exemplar for future MSc students.

Your project will be marked by two members of staff, one of whom will normally be your supervisor, and a selection will then reviewed by the external examiner. Marks are awarded for the overall structure of the project as well as for the quality of the research carried out. The extent to which you use your own (good) ideas and initiative will also be taken into account.

The provisional examination results will be published on LSE for You at the beginning of August 2019. The project mark and final degree result will be released after confirmation by the School Board of Examiners. When confirmed, the 2018-19 dates for publication of results will
be available at:
http://www.lse.ac.uk/intranet/students/registrationTimetablesAssessment/examinationsAndResults/Results/publication.aspx

7. Penalties for late submission

The School regulations for late submission are as follows:

1. If a student believes that s/he has good cause not to meet the deadline (for example illness), s/he should first discuss the matter with the course teacher and seek a formal extension from the Chair of the Examination Board. Normally extensions should only be granted where there is a

good reason backed by supporting evidence (for example a medical certificate).

2. Any extension should be confirmed in writing to the student.

3. If a student fails to submit by the set deadline (or extended deadline as appropriate) the following penalties will apply:

"Five marks out of 100 will be deducted for coursework submitted within 24 hours after the deadline and a further five marks will be deducted for each subsequent 24-hour period (working days only) until the coursework is submitted."
See the General Academic Regulations for more information:
https://info.lse.ac.uk/Staff/Divisions/Academic-Registrars-Division/Teaching-Quality-Assurance-and-Review-Office/Assets/Documents/Calendar/GeneralAcademicRegulations.pdf

8. Penalties for Plagiarism

Plagiarism is taking someone else's work or ideas and passing them of as your own. This arises in course work as sections of text lifted from books or internet sources and submitted as the student's own work. It includes phrases or sentences taken from someone else work and mixed in with your own. Plagiarism is a very serious offence that is quite easy to detect. You are strongly encouraged to read widely and assimilate ideas from as many sources as possible. However, when you use other people's work you must give a proper reference. Please note that this applies to any lecture materials you have used from LSE or elsewhere.

School regulations state "All work for classes and seminars as well as scripts (which include, for example, examinations, essays, dissertations and any other work, including computer programs) must be the student's own work. The definition of a student's own work shall include work produced by collaboration expressly permitted by the department or institute concerned. Quotations must be placed properly within quotation marks and must be cited fully and all paraphrased material must be clearly acknowledged. Infringing this requirement, whether deliberately or not, or the deliberate or accidental passing off of the work of others as the work of the student is plagiarism."

Full details of disciplinary procedures in the case of plagiarism can be found at:
https://info.lse.ac.uk/Staff/Divisions/Academic-Registrars-Division/Teaching-Quality-Assurance-and-Review-Office/Assets/Documents/Calendar/RegulationsAssessmentOffences-Plagiarism.pdf

9. Organising your time

Work on your project will be interrupted by the exams. The exams should be your main focus towards the end of Michaelmas term (ahead of the Lent Term Week 0 exams) and from Easter until the end of the main summer exam period. That leaves Michaelmas term, Lent term and the summer to work on your project. Below is a list of some of the things you should be working on during Michaelmas and Lent terms.

1. References: Your focus should be on quality rather than quantity. A few good references are infinitely preferable to a lot of semi-relevant material. You should concentrate on the key contributions that have led to the current state of knowledge in the field. When you come to write up your literature review, tracing the flow of ideas in a rough chronological order is often a useful device.

2. Aims: You should work out a list of four or five aims for your project. These may take the form of questions to answer, properties to establish, hypotheses to test or theorems to prove/find counter-examples for. Your aims will evolve as you work on your project; you should not feel bound by them. However, aims are very useful if you start to feel lost.

3. Software: Unfortunately the department cannot provide computing facilities or software. You should use software that is available to you on your own machine or via the School's network. Remember that R is free to download onto your own machine.

4. Data: Decide on the data that you are going to use and get these data into a format suitable for the software that you have chosen. You may need to address issues such as missing values and outliers.

Each dissertation student is required to give a **10-15 minute presentation** about their research at a session to be held at the end of February 2019. This should include an overview of the problem, a review of key literature, details of any data analysis or simulations to be carried out, and a timetable for the remainder of the project.

By Easter: you should have:

a) written the literature review and bibliography;
b) ensured you have access to the appropriate software and learned how to use it;
c) prepared your data in an appropriate format for analysis OR a clear idea of the simulations that you are going to perform,
d) a skeleton structure of chapters for your dissertation,
e) a clear idea of what you are going to do over the summer.

However you plan your work, it is extremely important to start early (i.e. in the Michaelmas term) and be systematic. It is typically better to do a little each week, than a lot in one week and then nothing for many subsequent weeks. You should have regular and frequent meetings with your supervisor. It is your responsibility to arrange meetings with your supervisor.

10. Some suggestions about writing up

You should try to write up as you are going along. This does not mean spending a long time getting each section in a perfect finished form. However, you should keep a careful record of your progress. This is particularly important when working with computers; it is easy to generate a lot of files.

- When you do data analysis or perform a simulation experiment, write down what you did (method), what the results were and the names/locations of the relevant computer files.

- When you find a good reference add it to a master list of references immediately. Consider using reference management software such as Endnote.

Finally, no matter how long you spend on data analysis or simulations, it is the dissertation that you hand in that will be assessed. You should make sure you leave sufficient time to do a good job of writing up. If your dissertation is well written, the examiners will view your work more favourably. Here are some points to bear in mind.

- The dissertation is a piece of scientific writing; it does not have to be entirely humourless but it is best to avoid the use of superlatives, exclamation marks and flowery language.

- Your aim is straightforward communication of what you have achieved to a statistically well informed reader; avoid the use of complicated or unnecessarily formal language.

- Avoid the use of vague language. Using definite terms will give your writing greater authority; for example, `is' instead of `can be' and `will' instead of `could'.

Read good science and statistics books and papers to learn from others and develop your own writing style. Although statistics is quite different from mathematics, you may want to read Paul Halmos' essay entitled "How to Write Mathematics"(http://www.math.uh.edu/~tomforde/Books/Halmos-How-To-Write.pdf)

11. Key dates

2nd November 2018	Contact prospective supervisor by this date
12pm 16th November 2018	Submission of 1-page proposal
End of February 2019 (date tba)	Presentation of work in progress
28th June 2019	End of formal supervision period
28th August 2019	Submission of final dissertation