

# Part C Dissertations in Statistics: Guidance Notes 2015–16

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# 1 Introduction

In the Part C examination, each candidate must offer

- (a) 5 units from the schedule of units for Part C, and
- (b) a dissertation on a statistics project.

Of the 5 units in (a), at least one has to be a statistics unit.

The dissertation in (b) is the equivalent of 3 units, so it should correspond to  $\frac{3}{8} = 37.5\%$  of a student's Part C workload. These notes provide some guidance for students and supervisors on projects/dissertations.

## 1.1 The amount of work involved

A project has the same weight as three 16-lecture courses. Accordingly, a student should think of the project work as being equivalent to the work for three lecture courses, and corresponding to  $\frac{3}{8} = 37.5\%$  of a full academic year's work. The project work is mainly concentrated in Michaelmas Term, the Christmas Vacation, and Hilary Term. We recommend that students do some preparatory reading for their projects over the preceding Summer Vacation.

There is always a risk that a project might not succeed, especially if the original plan had involved some original research. Although this is a rare occurrence, examiners are aware of the possibility. They accept that a well-written account of the work done, with an explanation of why the original aims were not met, can nevertheless be worthy of high credit.

## 1.2 The amount of supervision

Students can expect to have up to about 12 hours of project supervision with their supervisor spread across Michaelmas and Hilary terms. Supervisors may strongly prefer that this supervision takes place during full term, so students should take this into account when planning their work.

Supervisors are only expected to read and comment on the draft dissertation once. It is reasonable to allow a week or so for work to be read, so it is particularly important that students take this into account when planning final writing.

Supervisors will be asked to keep a log of the amount and the nature of the project supervision that they give. They will also be asked to comment on any distinctive independence or originality of the dissertation that would merit the award of unusually high marks. This log will be passed on to the Part C Examiners.

## 1.3 Choice of subject

The dissertation can take the form of a data analysis or simulation project or a theoretical project in probability, statistics or operational research. It is important that it gives the student an opportunity to present his or her own work. It is understood that only in exceptional cases will this include original research. Sometimes it will be an analysis of a fresh dataset using a range of methods, some of which are new to the student. Sometimes it will be a matter of organising, presenting, or completing material culled (and understood) from advanced textbooks, monographs or journals.

## 1.4 Project approval

*All projects undertaken must have been approved in advance by the Statistics Projects Committee.* This should normally happen in the Trinity Term before the student starts Part C.

## 2 The dissertation

For formal regulations, see Section 3.

The dissertation should not exceed the equivalent of 10,000 words (excluding diagrams, tables, references and texts of computer programs). Unnecessarily lengthy projects may be penalised. The examiners give credit for qualities such as content, accuracy, organisation, clarity and style. A dissertation should be self-contained except insofar as it cites material from Prelims, Part A and Part B, and standard works or journals. Proper credit must be given to sources – see Sections 2.5 and 2.7. The dissertation must be typed. Computer-based facilities allow steady accumulation of material and effective editing. Moreover, although some word-processing and typesetting systems are very poor for mathematical work, others, such as dialects of  $\text{\TeX}$ , offer the possibility of very well presented output.

### 2.1 Submission information

Two copies of the dissertation, and in addition one identical electronic copy (PDF), identified by the candidate's examination number only, must be submitted to

The Chairman of the Examiners  
Honour School of Mathematics and Statistics (Part C)  
Examination Schools  
Oxford

*by 12 noon on the Monday of week 10 of Hilary Term.*

Both copies of the dissertation should be bound. Hard bindings are not required and cheaper forms of soft binding, such as thermal binding or comb binding, are in most cases perfectly adequate. Loose leaves in ring binders or held together by paper clips, are not acceptable.

Every candidate must complete and sign the declaration of authorship, available on the Department of Statistics website, to the effect that the dissertation is their own work, except where acknowledgement is made.

So, by the deadline, every candidate should submit (at the Examination Schools) a sealed envelope bearing their examination number that contains:

- two copies of the dissertation (paper copies), and
- the pdf copy (on CD, or USB stick), and
- their declaration of authorship.

### 2.2 Writing

Since it is the dissertation which is seen and considered by the examiners, its writing should be treated as a substantial part of the work involved and a suitable amount of time should be allocated to it.

You should put effort into presenting your work as clearly as possible. The paper by Ehrenberg [1] is only 4 pages long and contains good advice on technical writing. Strunk

and White [11] is a guide to writing more generally. Katzoff [2] is an older report on technical writing – the following sentence, taken from early in the report, is excellent advice:

‘If you remember nothing else of this pamphlet, you will have retained the essence if, when writing your report, you continuously bear in mind the busy reader, who has only a limited time to devote to your report and who, in addition, may not be very familiar with your subject.’

### 2.3 Writing mathematics

Excellent brief advice on mathematical writing is to be found on the London Mathematical Society website [7]. The book of Krantz [4] is also recommended, as is the older book by Steenrod, Halmos, Schiffer and Dieudonné [10]. Section 1 of Knuth, Larrabee and Roberts [3] is a mini-course on technical writing and there is plenty of good advice in the rest of the book too.

### 2.4 Books and software

You are welcome to use the Department of Statistics library and to apply for a departmental computer account to use for your project, for example in order to use the R package and/or to use  $\LaTeX$  to prepare your dissertation. If you would like to use the library or apply for a computer account, please contact the Academic Administrator in the Department.

Should you use  $\LaTeX$ , the standard reference is Lamport [5], and an excellent online guide is *The Not So Short Introduction to  $\LaTeX 2_{\epsilon}$*  [9]. If you have your own computer and are looking to install a version of  $\TeX/\LaTeX$ , the MiK $\TeX$  distribution [8] is excellent.

### 2.5 Referencing

It is important that you cite the work of others when appropriate and, in particular, that you avoid plagiarism. The Academic Good Practice section of the University website <http://www.ox.ac.uk/students/academic/goodpractice/> gives useful information and advice. Supervisors may recommend papers which illustrate good practice in writing and citing sources.

For referencing, several conventional systems are in use. One system is to label references by name and year (e.g., “Smith (2008) showed that ...”). An alternative is to use name and number (e.g., “Smith [12] showed that ...”). It is perfectly acceptable for you to use either of these systems.

The London Mathematical Society’s advice to its authors [6] explains a common version of the second system.

### 2.6 Sample chapter

By the end of week 1 of Hilary Term (or earlier), it is strongly recommended that you give a sample chapter of your dissertation to your supervisor and ask them for feedback on your work. In particular, this would be a good time to have a discussion about avoiding plagiarism (unless you have already discussed this).

### 2.7 Plagiarism

The University definition of plagiarism is as follows.

“Plagiarism is presenting someone else’s work or ideas as your own, with or without their consent, by incorporating it into your work without full acknowledgement. All published and unpublished material, whether in manuscript, printed or electronic form, is covered under this definition. Plagiarism may be intentional or reckless, or unintentional. Under the regulations for examinations, intentional or reckless plagiarism is a disciplinary offence.”

So plagiarism is something that you must avoid.

It is of the utmost importance that your dissertation is your own work. Whenever you include a quotation, or paraphrase of the work of others, you should make this clear by giving a reference. Direct quotations should be within quotation marks, or indented. Such direct quotations should be rare, such as where you want to discuss another writer’s opinion. Do not be tempted to construct large sections directly from sources: the examiners want to see evidence that you understand the material, not just that you are able to use Google and cut and paste. Your project supervisor will be able to give you advice about the style and format of references, and the extent to which they are needed when you describe the background to your work.

Please see the University’s guidance on plagiarism at <http://www.ox.ac.uk/students/academic/guidance/skills/plagiarism> for further information on plagiarism and on the seriousness of plagiarism.

### 3 Regulations and marking

Dissertations will be assigned USMs according to the same principles as Mathematics/Statistics exam papers. In arriving at these marks, the relative weights for theoretical dissertations given to content, presentation and mathematics/statistics will be 25%, 25% and 50% respectively. For dissertations on data analyses, simulations or similar topics, the examiners will assign 25% for content, 25% for presentation and 50% for the quality and appropriateness of the data analysis/simulation (see Section 3.2 for further details).

#### 3.1 Regulations governing dissertations

##### (1) *Subject, authorship, and format*

The subject of the dissertation shall be a project which shall be supervised by a member of the Faculty of Statistics or, in exceptional circumstances, by some other person of equivalent seniority approved by the Chairman of the Statistics Projects Committee of the Academic Committee of the Department of Statistics.

The dissertation shall be the candidate’s own work; it may, for example, be a computation based on known results or a critical review of publications in probability, statistics or operational research, or a data analysis or simulation project. The supervisor may discuss with the candidate the field of study, recommend references, and discuss what methods are appropriate; the supervisor may also read and comment on a first draft. Every candidate shall sign a declaration of authorship to the effect that the dissertation is their own work, except as permitted by this regulation or where acknowledgement is made, and this declaration shall be placed in a sealed envelope bearing the candidate’s examination number and presented together with the dissertation.

The dissertation should be typed, and must be held firmly in a stiff cover. Its length should not exceed the equivalent of 10,000 words (excluding diagrams, tables, references and texts of computer programs). Unnecessarily lengthy projects may be penalised.

##### (2) *Approval and allocation of topic*

Candidates shall, after consultation with their tutors, submit to the Chairman of the Statistics Projects Committee of the Academic Committee of the Department of Statistics,

- *either* (I) the title that they propose together with
  - a brief description (of at least 100 words) of the project which will be the subject of the dissertation. This should be sufficiently detailed for the members of the committee to judge whether the project is of appropriate depth and whether it is possible to find a suitable assessor in the University. If possible, candidates should include details of the main references books, papers, etc.;
  - a statement of approval from the person who has agreed to act as supervisor (a potential supervisor may be approached either by the candidate or through the candidate's tutor: alternatively, advice may be sought at an earlier stage from the Statistics Projects Committee).
- *or* (II) a ranked list of suggestions from a list compiled by the Statistics Projects Committee for which the candidate has the prerequisites required. Candidates who do not provide a list will be given low priority in the allocation of popular projects.

No dissertation will be accepted if it has already been submitted, wholly or substantially, for a degree of this University, or for a degree of any other institution.

The application (I) shall be made not earlier than the first day of Trinity Full Term in the year preceding the examination and not later than Monday of the sixth week of the Trinity Full Term in the year preceding the examination. The Statistics Projects Committee of the Department of Statistics will decide, as soon as possible, whether or not to approve the proposal and will advise the candidate forthwith.

Candidates whose proposal (I) was not approved by the Statistics Projects Committee must choose an alternative project from a list of suggestions compiled by the Statistics Projects Committee as explained under (II).

Details of approved projects shall be forwarded by the Chairman of the Committee to the Chairman of the Examiners not later than the first day of the following Hilary Full Term.

### (3) *Submission*

The submission deadline is *12 noon on the Monday of week 10 of the Hilary Full Term preceding the examination.*

By this deadline, in a sealed envelope addressed to

The Chairman of the Examiners  
Honour School of Mathematics and Statistics (Part C)  
Examination Schools  
Oxford

candidate's must submit

- two copies of their dissertation (paper copies), and
- an identical electronic copy (PDF, on CD or USB stick), and
- their declaration of authorship.

At the same time, the supervisor shall submit to the Chairman of the Examiners a confidential report, which includes a record of meetings with the candidate, the purpose of which is to assist the examiners to determine how much assistance the candidate has received in the preparation of the dissertation; this report will be on a form supplied for the purpose by the Chairman of the Examiners. Supervisors will also be asked to comment on any distinctive independence or originality of the dissertation that would merit the award of unusually high marks.

Both copies of the dissertation should be bound. Hard bindings are not required and cheaper forms of soft binding, such as thermal binding or comb binding, are in most cases perfectly adequate. Loose leaves in ring binders or held together by paper clips, are not acceptable.

### 3.2 General information on assessment and marking

When writing your dissertation, you should be aware of how the examiners will assess it and mark it. The most important point is that the project is in probability, statistics or operational research. In fact, marks will be awarded in the following proportions:

- Mathematics/Statistics or Data analysis/simulation 50%
- Content 25%
- Presentation 25%.

Here is a brief explanation of these terms:

*Mathematics/Statistics:* Proofs and assertions should all be correct, written in your own words, and illustrated using your own worked examples. In applied topics, the derivation of the model should be properly justified.

*Data analysis/simulation:* The data analysis has to be correctly and suitably done, including the choice of model. Similar comments apply to simulation.

*Content:* You must do more than rehash text books and lecture notes. You should use multiple original sources, and present the material in your own words with your own critical overview. The Examiners are looking for your thoughts and contributions.

*Presentation:* The mathematics must be clear and well laid out; formulae must be clearly presented, tables and graphs properly referenced in the text; an abstract and a bibliography must be provided; the English should be clear and grammatically correct. Give some thought to notation, choice of typeface, and numbering of equations and sections. Do not fail to number the pages. Finally, be sure to supply complete and accurate references for all the sources used in completing the project, and be sure to cite them properly in the text. Section 2 above gives detailed advice on this, and Appendix ?? below gives further general information on plagiarism and on the seriousness of plagiarism.

### Programming and code

Where projects contain a substantial amount of programming, candidates are encouraged to include key elements of their commented code in an appendix to the dissertation. This appendix will not contribute towards the word-count.

### 3.3 Late submission

Late submission of Part C dissertations will normally result in the following penalties.

- Where permission for late submission has been granted by the Proctors, no penalty will be imposed.
- Where permission for late submission has not been granted by the Proctors, the normal penalties based on a submission deadline of Monday 12 noon are as follows:

Lateness	Cumulative mark penalty
Up to 4 hours, i.e. up to Monday 4pm	1
4–24 hours, i.e. up to Tues 12 noon	10
24–48 hours, i.e. up to Weds 12 noon	20
48–72 hours, i.e. up to Thurs 12 noon	30
72–96 hours, i.e. up to Fri 12 noon	40
96–101 hours, i.e. up to Fri 5pm	50

The final mark cannot be negative, it is truncated at zero if necessary.

The cumulative penalty above would be deducted from the dissertation mark, when the dissertation mark is expressed out of 100. For example, if a student submits a dissertation 20 hours late, and that dissertation in itself is worth 65 marks, then the penalty above means that s/he loses 10 marks and so the final mark is 55.

- Where permission for late submission has not been granted by the Proctors and the dissertation is over 101 hours late, the Examiners would refer the case to the Proctors for guidance as to what penalty to impose.

## References

- [1] A. S. C. Ehrenberg, *Writing Technical Papers or Reports*, The American Statistician **36** (1982), no. 4, 326–329. <http://www.jstor.org/stable/2683079?origin=JSTOR-pdf>.
- [2] S. Katzoff, *Clarity in Technical Writing*, Second Edition, NASA, 1964. <http://ntrs.nasa.gov/search.jsp?N=4294965273>.
- [3] D. E. Knuth, T. Larrabee, and P. M. Roberts, *Mathematical Writing*, Mathematical Association of America, 1989. Available at <http://tex.loria.fr/typographie/mathwriting.pdf>.
- [4] S. G. Krantz, *A Primer of Mathematical Writing*, American Mathematical Society, 1997.
- [5] L. Lamport, *L<sup>A</sup>T<sub>E</sub>X: A Document Preparation System*, Second Edition, Addison Wesley, 1994.
- [6] London Mathematical Society, *References*. <http://www.lms.ac.uk/publications/documents/references.pdf>.
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- [8] *MiK<sub>T</sub>E<sub>X</sub>*. <http://www.miktex.org/>.
- [9] T. Oetiker, H. Partl, I. Hyna, and E. Schlegl, *The Not So Short Introduction to L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub>*. <http://www.ctan.org/tex-archive/info/lshort/english/lshort.pdf>.

- [10] N. E. Steenrod, P. R. Halmos, M. M. Schiffer, and J. R. Dieudonné, *How to Write Mathematics*, American Mathematical Society, 1973. Second Edition, 1981.
- [11] W. Strunk Jr. and E. B. White, *The Elements of Style*, Fourth Edition, Longman, 1999. First Edition, 1918 available at <http://www.bartleby.com/141/>.