Unit Outline*

INMT8505

Multivariate Analysis

Semester 1, 2010
Crawley

Associate Professor Min Qiu

Business School
www.business.uwa.edu.au

* This Unit Outline should be read in conjunction with the Business School Unit Outline Supplement available on the Students web site http://www.business.uwa.edu.au/students
UNIT DESCRIPTION

Introduction

Welcome to the study of multivariate analysis. The unit and the instructional material have been developed to cover a wide range of statistical techniques that can be used to aid managerial decision-making. It will expose the student to the more common multivariate techniques used in business and government.

The lecturer is Dr Min Qiu, a transport specialist with 26 years of experience in transport, logistics and supply chain management, gained through teaching, research and consultancy in China and Australia. Min achieved his Bachelor Degree in Road and Traffic Engineering at Tongji University in Shanghai, did his PhD at The University of Western Australia in Transport Economics, and completed his Graduate Business Qualification at Curtin University of Technology in Australia. Min is currently Associate Professor in Business School at The University of Western Australia. Prior to his current employment, he was Research and Development Officer for Transport Modelling and then Road Performance Evaluation Manager at Main Roads Western Australia, Senior Transport Engineer at PPK Environment & Infrastructure Pty Ltd in Australia, Senior Transport Planning Engineer at GHD Pty Ltd in Australia, and Lecturer at Tongji University in China.

Unit content

The unit covers the subjects of multiple regression, exploratory factor analysis, analysis of variance, cluster analysis, multidimensional scaling, multinominal logistic and choice models, and structural equation modelling.

The goal of the unit

This unit is pitched at students in a master program who desire to sharpen their quantitative skills in dealing with complex real-world problems in the private and public sectors, and at honour and PhD students for whose research projects quantitative competences are essential.

Learning outcomes

On completion of this unit, students should be able to:

- Translate complex relationships in question into a statistical problem.
- Identify a corresponding statistical technique to solve the problem.
- Evaluate the suitability and quality of the existing data for relevant statistical analyses.
- Understand critical issues in administering data collections.
- Use computer packages to carry out statistical analyses.
- Interpret the outcomes of statistical analyses with their appropriateness, qualifications and limitations.
Educational principles and graduate attributes

In this unit, students will be encouraged and facilitated to develop the ability and desire to:

- Develop competencies to work more effectively in teams through the preparation of a group in-class presentation of a critique of an academic paper on applications of statistical techniques.
- Develop more effective communication skills through a class presentation on the critique paper by responding to any questions that arise following that presentation.
- Develop problem solving skills through carrying out statistical exercises in the computer lab and through individual assignments of statistical analysis of a set of data.
TEACHING AND LEARNING RESPONSIBILITIES

Teaching and learning strategies

At the University of Western Australia, student learning encompasses experiences both within and beyond the formal setting of classrooms, laboratories and lecture theatres.

The lectures will be held in BUSN: 201 (1.5 hours, 2:00 – 3:30 pm) and the lab/tutorials in the Business School Computer Lab BUSN: G86 (1.5 hours, 3:30 – 5:00 pm) on Mondays.

Techniques for solving multivariate analysis problems using software packages will be introduced in the lectures and labs. Preparation involves reading the lecture notes and textbook chapters, and preparing the chapter questions set for that week. The purpose of the lab/tutorial is to help you learn.

The unit makes much use of the computer. Therefore, you will need to spend several hours each week in the computer lab. It is therefore essential that you get a computing account.

Teaching and learning evaluation

You may be asked to complete two evaluations during this unit. The Student Perception of Teaching (SPOT) and the Students’ Unit Reflective Feedback (SURF). The SPOT is optional and is an evaluation of the lecturer and the unit. The SURF is completed online and is a university wide survey and deals only with the unit. You will receive an email from the SURF office inviting you to complete the SURF when it is activated. We encourage you to complete the forms as your feedback is extremely important and can be used to make changes to the unit or lecturing style when appropriate.

Attendance

Participation in class, whether it is listening to a lecture or getting involved in other activities, is an important part of the learning process. It is therefore important that you attend classes. More formally, the University regulations state that ‘to complete a course or unit students shall attend prescribed classes, lectures, seminars and tutorials’. Students should not expect to obtain approval to miss more than two classes per unit unless there are exceptional circumstances.
CONTACT DETAILS

We strongly advise students to regularly access their student email accounts. Important information regarding the unit is often communicated by email and will not be automatically forwarded to private email addresses.

<table>
<thead>
<tr>
<th>Unit coordinator/lecturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name: Associate Professor Min Qiu</td>
</tr>
<tr>
<td>Email: <a href="mailto:mqiu@biz.uwa.edu.au">mqiu@biz.uwa.edu.au</a></td>
</tr>
<tr>
<td>Phone: 6488 3729</td>
</tr>
<tr>
<td>Consultation hours: Tuesday 1:00 pm – 3:00 pm</td>
</tr>
<tr>
<td>Lecture day and time: Monday 2:00 pm – 5:00 pm</td>
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<tr>
<td>Lecture venue: BUSN: 201 Case Study Room</td>
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</tbody>
</table>

TEXTBOOK & RESOURCES

Recommended/required text


Software requirements

The software packages are Excel, SPSS, AMOS and NLOGIT.
<table>
<thead>
<tr>
<th>Week #</th>
<th>Lecture topic</th>
<th>Lab work</th>
<th>Textbook readings</th>
<th>In-class presentation</th>
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<tbody>
<tr>
<td>1</td>
<td>Statistics Revision</td>
<td>Handout 1</td>
<td>1-13, 37-97</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Statistics Revision (cont’d) / Examining the Data</td>
<td>Handout 2</td>
<td>1-13, 37-97</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Multiple Regression Analysis</td>
<td>Handout 3</td>
<td>169-226</td>
<td></td>
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<tr>
<td>4</td>
<td>Multiple Regression Analysis (cont’d) / Factor Analysis</td>
<td>Handout 4</td>
<td>226-267, 101-164</td>
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<tr>
<td>5</td>
<td>Factor Analysis (cont’d)</td>
<td>Handout 5</td>
<td>101-164</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Logistic Regression</td>
<td>Handout 6</td>
<td>269-275, 355-381</td>
<td>Group 1</td>
</tr>
<tr>
<td>7</td>
<td>Multivariate Analysis of Variance</td>
<td>Handout 7</td>
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<tr>
<td>8</td>
<td>Cluster Analysis</td>
<td>Handout 8</td>
<td>555-598</td>
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</tr>
<tr>
<td>9</td>
<td>Multidimensional Scaling</td>
<td>Handout 9</td>
<td>629-660</td>
<td>Group 4</td>
</tr>
<tr>
<td>10</td>
<td>Discrete Choice Modelling</td>
<td>Handout 10</td>
<td>Handout</td>
<td>Group 5</td>
</tr>
<tr>
<td>11</td>
<td>Structural Equation Modelling</td>
<td>Handout 11</td>
<td>705-836</td>
<td>Group 6</td>
</tr>
<tr>
<td>12</td>
<td>Structural Equation Modelling (cont’d)</td>
<td>Handout 12</td>
<td>705-836</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Revision</td>
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ASSESSMENT MECHANISM

The purpose of assessment

There are a number of reasons for having assessable tasks as part of an academic program. The assessable tasks are designed to encourage you to explore and understand the subject more fully. The fact that we grade your work provides you an indication of how much you have achieved. Providing feedback on your work also serves as part of the learning process.

Assessment mechanism summary

<table>
<thead>
<tr>
<th>Item</th>
<th>Weight</th>
<th>Due date</th>
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</thead>
<tbody>
<tr>
<td>Assignment 1 – Project proposal</td>
<td>5%</td>
<td>April 12 2010 (by 5:00 pm)</td>
</tr>
<tr>
<td>Assignment 2 – Project report</td>
<td>35%</td>
<td>May 28 2010 (by 5:00 pm)</td>
</tr>
<tr>
<td>Group assignment – In-class presentation</td>
<td>15%</td>
<td>Begin in Week 6. See Unit Schedule</td>
</tr>
<tr>
<td>Final exam</td>
<td>45%</td>
<td>Exam period</td>
</tr>
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</table>

Note 1: Results may be subject to scaling and standardisation under faculty policy and are not necessarily the sum of the component parts.

Note 2: The grade FC indicates failure to complete an identified essential assessment component and means failure of the unit.

Note 3: Your assessed work may also be used for quality assurance purposes, such as to assess the level of achievement of learning outcomes as required for accreditation and audit purposes. The findings may be used to inform changes aimed at improving the quality of Business School programs. All material used for such processes will be treated as confidential, and the outcome will not affect your grade for the unit.

Assessment components

Assignment 1 and 2 - Project proposal and report

- You are required to perform the data analysis using your own database. You can choose a situation/case you are familiar with or you can understand, and use meaningful public statistics published by Australian Bureau of Statistics, different bureaus, institutions, agencies, government (e.g. health, community profiles, environment, quality of life, employment, education), industry, commerce, market research, etc. or data bases used in specialised businesses/activities. You can also use international statistics or from your own country. Focus on some specific questions you are attempting to answer, and try to formulate some hypotheses you would like to check or confirm. Choose the appropriate methods to perform the analysis. Interpret the results and make your own comments on them description and guidelines.

- Guidelines for Assignment 1- Project proposal
  All students must submit a written proposal, which needs to be approved before work on the project can commence (5% of the final grade). Proposals should be handed in by Monday, April 12 (Week 7) and should have about 700-800 words with double spacing, 2cm (min) margins, and size 12 font.
Content for the project proposal should include:

- **Introduction** - Description of the problem situation, objectives of the study.
- **Method** - Source of information, sampling method & size, data collection, validity and reliability of data, description of models, techniques, packages and methods of analysis to be used in the study.

### Guidelines for Assignment 2 – Project report

The major project should be handed in by Friday May 28 (Week 13) and should be no longer than 4000 words excluding appendices and tables. The text needs to be double spacing, 2cm (min) margins, and size 12 font.

### Content for the project report

The following composition indicates the relative importance you have to give to each stage of the project and how to structure your report. The marks for the elements of the assignment (35% of the final grade) are:

- **Introduction** - Formulation, Investigation – outline the context of the problem, background needed to understand the study case; objectives of the study and key features you might want to investigate; hypotheses/assumptions to be tested (10%)
- **Method/Analysis** – source of information, sampling method & size, collection, validity and reliability of data, relevant description of the methods, explanation, interpretation of the results, relevant printouts; brief outline of the results obtained (50%)
- **Conclusions and recommendations** – statements of what has been found, confirmed, demonstrated (30%)
- Also include **References, Abstract, Table of Contents** (10%)

### In-class presentation

- The review presentation (in groups of two students) comprises a critical review of one journal article that relates to any one of the following:
  - a specific concept or technique discussed or used during this course, such as 'the advantages of using multiple item scales', or 'how multiple item scales are developed', or 'issues of validity or reliability' etc; or
  - how any one of the multivariate techniques has been used in practice (i.e. an application of them, for example, multiple regression); or problems/issues relating to the use of a particular multivariate technique.

The presentation should be viewed as a communication exercise to be carried out in a professional manner, assuming an audience of other professionals who are not familiar with the speaker’s subject area.

The presentations will begin in Week 6. Questions will be asked by other students. A presentation should be about 20 minutes (i.e., 15 minutes for the presentation and 5 minutes for questions) and presented by using Microsoft PowerPoint.

The student presenting the article is expected to decide on the article at least one week before the presentation and to provide a copy to the lecturer, so that it can be copied for distributing to students one week before the presentation. All students are expected to read the journal article before the presentation and to be able to ask questions.
A checklist is provided below for preparation of presentations. Students should:

- Prepare a brief ‘point form’ summary of the author(s) objective(s), major finding(s) and conclusion(s);
- Consider Items #5 and #13 in the checklist, select three additional items (covering all headings) and state which of these the presentation are to be addressed during the presentation;
- Prepare a list of 2-3 questions or comments, which address the significance of the research (e.g. criticisms, areas of uncertainty or ideas for future research).

Non-presenters are also expected to prepare themselves for the presentations by their colleagues.

In past years, students presented papers from:
- Journal of Global Marketing
- Journal of Applied Psychology
- Journal of Advertising Research
- Academic Medicine
- Consumer Interests Annual
- The British Journal of Sociology
- American Sociological Review
- International Journal of Clothing Science and Technology
- Technological Forecasting and Social Change
- Journal of Business Research
- Journal of Marketing
- Environment and Behaviour
- Journal of Public Policy and Marketing
- Journal of Marine Research
- International Journal of Wine Marketing

This is just to give an idea of the broad area for multivariate analysis applications.

Checklist for critiquing a research article

**Introduction**
1. Read the statement of purpose at the end of the introduction. What was the objective of the study?
2. Consider the title. Does it precisely state the subject of the paper?
3. Read the statement of purpose in the abstract. Does it match that in the introduction?
4. Check the sequence of statements in the introduction. Does all information lead directly to the purpose of the study?

**Methods**
5. Review all methods in relation to the objective of the study. Are the methods valid for studying the problem?
6. Check the methods for essential information. Could the study be replicated from the information given?
7. Review the methods for possible flaws. Is the sample selection adequate? Is the experimental design appropriate?
8. Check the sequence of statements in the methods. Can the methods be made clearer?
Results
9. Scrutinise the data, as presented in tables and illustrations. Does the title or legend accurately describe the content? Are column headings and labels accurate? Are the data organised for ready comparison and interpretation?
10. Review the results as presented in the text while referring to data in the tables and illustrations. Does the text complement, and not simply repeat, data? Are there discrepancies in results between text and tables?
11. Check calculations, if possible, and the presentation of data.
12. Review the results in the light of the stated objective. Does the study reveal what the researcher intended?

Discussion
13. Check the interpretation against the results. Does the discussion merely repeat the results? Does the interpretation arise logically from the data, or is it too far-fetched? Have shortcomings of the research been addressed?
14. Compare the interpretation to related studies cited in the article. Is the interpretation at odds or in line with other researchers' thinking?
15. Consider the published research on this topic. Have all key studies been considered?
16. Reflect on directions for future research. Has the author suggested further work, research directions?

Overview
17. Consider the journal for which the article is intended. Are the topic and format appropriate for that journal?
18. Reread the abstract. Does it accurately summarise the article?
19. Check the structure of the article (first headings and then paragraphing). Is all material organised under the appropriate heading? Are sections subdivided logically into subsections or paragraphs?
20. Reflect on the author’s thinking and writing style. Does the author present this research logically and clearly?

Final Exam

Information on the format of the exam will be provided later in the semester.

Submission of assignments

Please remember to attach an Assignment Cover Sheet to the front of your assignment. You can download and print your Assignment Cover Sheet from the Students web page http://www.business.uwa.edu.au/students/assessments

Hard copies of Assignment 1 and 2 need to be handed in over the counter at the Postgraduate Student Centre by 5:00 pm on the corresponding dates specified in table under the heading “Assessment mechanism summary”.

Student Guild

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