ECON20003

Quantitative Methods 2

SUBJECT GUIDE

Semester 2, 2019

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Contents

<u>Preliminaries</u>

Introduction

Welcome to Quantitative Methods 2 (QM2). Having solid quantitative problem-solving skills is essential for future careers in commerce. Learning these skills can be challenging, but they are becoming crucial for success in business and economics. QM2 should not be a hard subject, but it does require the mastery of analytic skills, and thus it requires your constant attention throughout the semester.

Subject Aims

The overall aim of this subject is to help you become proficient in the use of quantitative techniques essential for analysis in business and economics. A wide range of skills will be covered during the semester. On successful completion of the subject, you should be able to:
(a) Identify the correct technique to solve a particular quantitative problem,
(b) Implement each technique, and
(c) Interpret the results from these techniques.
You will use the skills you develop in QM2 in the business and economics subjects you study during the remainder of your time at the University of Melbourne, and, most importantly, in the workplace.

Recommended Text

There is no prescribed textbook for this subject, but there are two recommended textbooks:

1) SSK - Selvanathan, E.A., Selvanathan, S. and G. Keller (2017): *Business Statistics*, 7th edition, published by Cengage Learning Australia.

   This edition is the latest version of this popular textbook. In case you have the 6th edition from QM1, do not worry, it will suffice. Note, however, that the abridged version of this textbook sold by some bookshops is NOT the recommended text for QM2.

2) HGL - Hill, C.R., Griffiths, W.E. and Lim, G.C. (2018): *Principles of Econometrics*, 5th edition, published by Wiley.

In addition, comprehensive lecture slides will be provided for all topics.

Learning Outcomes

Subject Objectives

On successful completion of this subject, students should be able to

- Conduct and interpret a number of parametric and non-parametric tests;
- Conduct simple and multiple regression analysis, construct appropriate tests on regression coefficients, analyse and interpret the estimation results, and explain the findings;
- Identify the circumstances under which certain test procedures may not be valid;
- Analyse several specific models often employed in the various fields within business and economics;
- Identify the circumstances under which a model with a binary dependent variable is appropriate;
- Evaluate the results from estimating logit and probit models;
- Explain the difficulties that can arise when studying time series data;
- Test for unit roots and go through the necessary steps to select an autoregressive distributed lag model;
- Use an autoregressive distributed lag model for forecasting and multiplier analysis.

Generic Skills

In this subject you will have the opportunity to develop important generic skills. These skills are grouped below by level of development in QM2.

High level of development:

Statistical reasoning; application of theory to practice; interpretation and analysis; synthesis of data and other information; evaluation of data and other information; and use of specialised computer software.

Moderate level of development:

Oral communication; written communication; critical thinking; problem solving; and receptiveness to alternative ideas.

Some level of development:

Team work; and accessing data and other information from a range of sources.

Awareness Issues

At a broader level, studying this subject will increase your awareness and the breadth of questions that are investigated within business and economics, the wide range of statistical information that is publicly available, and the future subjects you can take to learn more quantitative techniques.

Prerequisites

The main subject pre-requisite for Quantitative Methods 2 is ECON10005 (Quantitative Methods 1), the first year quantitative subject taught in the Faculty of Business and Economics, or an equivalent subject taught at another tertiary institution. Other subjects that can also be used as pre-requisites are: MAST10010 and MAST10011. Basic statistical knowledge covered in these subjects will be assumed in QM2, as will some basic mathematics and calculus knowledge that you would have learnt in high school. Some knowledge of how to use a spreadsheet package such as Excel is also expected of students.

Contact Details for QM2 Staff

Lecturer

Dr László Kónya
Room: 460, 4th floor, FBE Building
Phone: 8344 0355   Email: l.konya@unimelb.edu.au
Consultation hours: Monday 1:00-2:00 PM and Thursday 11:00 AM -12:00 PM or by appointment.

Tutorial Coordinator

Mr Richard Hayes
Room: 473, 4th floor, FBE Building
Phone: 8345 8261   Email: rjhayes@unimelb.edu.au
Consultation hours: Tuesday 10:00 AM to 11:00 AM or by appointment.
Administrative related queries only (e.g., tutorials or marks) should be directed to Richard.

Email Protocol

While academic staff endeavour to address queries received via email, it is more appropriate to resolve substantive questions face-to-face during normal consultation hours. With this in mind, all students are encouraged to familiarise themselves with the consultation hours offered by the lecturer and the tutors in this subject. In addition, students may use the Online Tutor to post questions regarding the subject. Details on how to access and use the Online Tutor are provided later in this document.

Please do not use non-university email addresses. Staff may not respond to student emails that do not come from a University email address. Emails from non-University email addresses may be filtered by the University's spam filter, which means that staff may not receive your email. All correspondence relating to this subject will only be sent to your University email address.

Lectures and Tutorials

Lecture Times

There are two one-hour lectures per week, with each lecture being repeated in a 2nd stream.

Lecture / Stream	Day	Time	Location
Lecture 1 / Stream 1	Tuesday	11:00 AM	PAR-The Spot-B01 (Copland Theatre)
Lecture 1 / Stream 2	Wednesday	1:00 PM	PAR-Chemistry-189 (Masson Theatre)
Lecture 2 / Stream 2	Friday	1:00 PM	PAR-Chemistry-189 (Masson Theatre)
Lecture 2 / Stream 1	Friday	3:15 PM	PAR-Sidney Myer Asia Ctr-B02 (Carrillo Gantner Theatre)

Lecture schedule

Week	Lecture (Date)	Topic	Readings from SSK 7th ed. & HGL 5th ed.
1	1 (30 & 31 July) 2 (2 August)	Introduction and General Information about Quantitative Methods 2 (QM2) Estimation and Hypothesis Testing	SSK: § 9.3-9.4 10.1-10.3, 10.5, 12.1-12.4 HGL: § C.3-C.6
2	3 (6 & 7 August) 4 (9 August)	Desirable Properties of Point Estimators Parametric and Nonparametric Techniques The Assumption of Normality	SSK: § 10.1 HGL: § C.7.4, C.9.2
3	5 (13 & 14 August) 6 (16 August)	Comparing Two Population Means or Central Locations with Parametric and Nonparametric Techniques	SSK: § 11.1-11.4, 13.1-13.3 20.1-20.2 HGL: § C.7.2
4	7 (20 & 21 August) 8 (23 August)	The Chi-Square, *t* and *F* Distributions Inferences about One or Two Population Variances Inferences about One or Two Population Proportions	SSK: § 9.5, 10.4, 12.6, 13.3 14.1-14.2 HGL: § C.4.1, C.7.1, C.7.4
	Assignment 1 due in by 4pm on Friday August 23		
5	9 (27 & 28 August) 10 (30 August)	Comparing Several Population Means with One-Way Analysis of Variance (ANOVA) Based on Independent Samples and Randomised Blocks	SSK: § 15.1, 15.3-4, 20.3

6	11 (3 & 4 Sept.) 12 (6 September)	Chi-Square Tests for the Analysis of Frequencies Measures of Association	SSK: § 16.1-16.4 HGL: § 4.2.1, B.1.5
7	13 (10 & 11 Sept.) *Mid-semester online test 10-12 September* 14 (13 September)	Simple Linear Regression: Specification, Estimation and Assessment	SSK: § 17.1-17.4 HGL: § 2.1-2.7

8	15 (17 & 18 Sept.)
	16 (20 September)
		Multiple Linear Regression
		General *F*-test
		Omitted and Irrelevant Variables
		Alternative Functional Forms
			SSK: § 17.5, 17.7
			    18.1-18.2
			HGL: § 5.1, 5.2.1-5.2.4
			    5.3-5.6, 6.1, 6.3, 7.3

Assignment 2 due in by 4pm on Friday September 20			
9	17 (24 & 25 Sept.) 18 (26 September)	Multicollinearity Heteroskedasticity Using the Sample Regression Equation Dummy Independent Variables in Regression Models	SSK: § 17.5, 17.7, 18.3, 19.2 HGL: § 7.1-7.2, 8.1-8.3 8.6.4-8.6.5
Mid-semester break			
10	19 (8 & 9 October) 20 (11 October)	Dummy Independent Variables in Regression Models (cont.) Dummy Dependent Variable Models: Linear Probability, Logit and Probit Models	SSK: § 19.2-19.3 HGL: § 7.1, 7.4, 16.1, 16.2.1-16.2.2, 16.2.4
11	21 (15 & 16 Oct.) 22 (18 October)	Cross-Sectional vs. Time-Series Data Regression Analysis with Time Series Data Autocorrelation	SSK: § 4.2, 18.4 HGL: § 1.5, 9.1, 9.4.3, 9A.1
Assignment 3 due in by 4pm on Friday October 18			
12	23 (22 & 23 Oct.) 24 (25 October)	Stationary and Non-Stationary Processes Random Walks Spurious Regression	HGL: § 9.2, 12.1-12.2, 12.3.1-12.3.5

Lecture Participation and Capture

Lecture slides will be placed on the LMS prior to each lecture. Students are encouraged to read the slides prior to each lecture and to bring a hard or soft copy of them to the lecture. You are also encouraged to read the relevant part in one of the recommended textbooks before attending each lecture. Be prepared to take some notes in lectures, as some important explanations of the material might not be detailed on the slides.

The lectures will be recorded and made available to students using the University's Lecture Capture system, accessible via the LMS. These recordings will allow you to revise lectures during the semester, and to review lectures in preparation for the end of semester exam. Please note, however, that Lecture Capture recordings are not meant to be a substitute for lecture attendance; rather they are designed for revision. Occasionally a Lecture Capture recording can fail, usually due to technical reasons. In such cases, the lecture recording may not be available.

Tutorial Schedule and Participation Requirements

Students are expected to attend a one hour tutorial each week. Tutorials commence in the **first week** of semester (week beginning Monday 29 July). They are designed to practice skills covered during lectures in the previous week and are a fundamental component of the subject. Tutorial participation and attendance is worth 10% of your final assessment.

First tutorial

It serves to introduce EViews, the software that is used in the subject for all tutorials and assignments.

Later tutorials

With the exception of the first tutorial, each tutorial consists of the following two components:

PART A: Exercises and questions to be completed and answered during the tutorial. Detailed tutorial notes will be provided to assist students to complete these exercises manually and/or with EViews in their own pace.

PART B: Exercises and questions for assessment. Time permitting you can start working on them during the tutorial class, but otherwise you are supposed to work on them in your own time and to complete them by the next tutorial. Your solutions and answers will be checked by your tutor during the next class, so copy and save everything in a Word document and bring a hard copy for every tutorial ready to be handed in.

To gain 10% credit for tutorial participation, attendance is required for at least 10 of the 11 tutorials from week 2 onwards. In addition, you need to (i) attempt the part A questions during the tutorial, and (ii) show evidence to the tutor that you have successfully completed the PART B homework questions.

Not attending a tutorial **or** not completing the PART B questions will result in the loss of 1 mark for that week. Students only get a tutorial mark for attending the tutorial in which they are <u>officially enrolled</u> (the 'official' tutorial). Students with a legitimate reason (such as illness) for attending a tutorial other than their official one (or for being unable to attend any tutorial) can apply to have the tutorial mark for that week transferred to the exam by emailing the tutorial coordinator (Richard Hayes) their documentary evidence (such as a medical certificate) within a week of missing the official tutorial. (Late requests or requests sent to tutors will not be considered.) No more than two tutorial marks will be transferred for any student during the semester.

Tutorials and data sets will be available on the LMS.

<u>What to bring to tutorials</u>

- A printout of the tutorial questions.
- A calculator.
- Your solutions to the previous tutorial's Part B exercises.
- A USB drive containing the data files for the current tutorial and your EViews workfiles with all output for the previous tutorial's Part B exercises.

Enrolling in Tutorials

Students should enrol in tutorials via the Student Portal. After subject registration, students are allocated to available classes. It is a student's responsibility to ensure their registrations produce a clash-free timetable. Changes can be made until Friday 23 August by following the instructions provided in the Student Portal. A change to your allocated tutorial time can only be made if there is space in alternative tutorials. Late enrolment into tutorials is handled by STOP 1. Tutors and the lecturer cannot help students with tutorial changes. More information on tutorial enrolments including late enrolments is available on the university's websites:

https://students.unimelb.edu.au/stop1
http://ask.unimelb.edu.au/app/answers/detail/a_id/6036

Assessment

Assessment Overview

Assessment Task	Due date	Weighting
First Assignment	Friday August 23, 4pm	5%
Mid-semester online test	September 10-12	5%
Second Assignment	Friday September 20, 4pm	5%
Third Assignment	Friday October 18, 4pm	5%
Participation in tutorials	Weekly	10%
End-of-semester exam	Exam Period	70%

Assignments

Students are required to complete three assignments which make up 15% of the total marks. They should be submitted electronically via the LMS. Detailed information on the content of the three assignments and how to submit them will be provided during the semester. The assignments often involve undertaking quantitative analyses using the EViews statistical software package. They should be submitted as PDF files.

You can complete an assignment by yourself as an "individual assignment" or you can form a group of 2 and submit a group assignment. Students who are in a group must be enrolled in the same tutorial, and must form their own group. Both students in a group will receive the same mark. No marks will be allocated if an assignment is submitted with more than 2 in the group or with group members from different tutorials.

No late assignments are accepted and no extensions will be given so that those who do submit their assignments on time can get timely feedback. Students who have valid reasons for not submitting an assignment can apply for special consideration to get the assignment mark transferred to the final exam; the link is http://students.unimelb.edu.au/admin/special.

Mid‑Semester Online Test

The mid-semester test will be held during week 7 of the semester. Students can undertake the test at any time of their choosing between 10 AM on Tuesday September 10 and 4 PM on Thursday September 12. There is a time limit of 30 minutes to complete the test; it will consist of 10 multiple choice questions and 5 true or false questions. The test will be accessible online via the LMS.

The test will cover the material presented during lectures up to the end of week 5, and material covered in tutorials up to the end of week 6. Please be aware that the test has a strict time limit, and prepare accordingly. You will need to have critical value tables for each of the distributions covered during lectures. These tables are printed in Appendix C of the *SSK*

textbook, and are also provided on the LMS. You will also need a calculator, as some calculations may be required to answer certain questions.

End-of-Semester Exam

A 2-hour end of semester exam, worth 70% of the final grade for this subject, will cover all the material covered during lectures and tutorials throughout the semester. This exam will occur during the University's normal end of semester assessment period, with the time, date and location provided by the University's administration later in the semester. Critical value tables for each distribution required to complete the exam will be provided to students in the exam package, as will a formula sheet. You will not be asked to provide EViews instructions, but you will have to interpret EViews outputs.

Hurdle requirement: You must pass the exam to successfully complete the subject.

Approved calculator: There is only one approved calculator for the exam, Casio FX82 (with any suffix). You will need to bring one of these calculators into the exam.

Exam Policy

The Faculty requires that students are available for the entire examination period. Supplementary exams will not be provided in cases of absence during the examination period, unless the absence is due to serious illness or other serious circumstances. See the Special Consideration web site for more information:
http://students.unimelb.edu.au/admin/special

Plagiarism and Collusion

Presenting material from other sources without full acknowledgement (referred to as plagiarism) is heavily penalised. Penalties for plagiarism can include a mark of zero for the piece of assessment or a fail grade for the subject.

Plagiarism is the presentation by a student of an assignment identified as his or her own work even though it has been copied in whole or in part from another student's work, or from any other source (e.g. published books, web-based materials or periodicals), without due acknowledgement in the text.

Collusion is the presentation by a student of an assignment as his or her own work when it is, in fact, the result (in whole or in part) of unauthorised collaboration with another person or persons. Both the student presenting the assignment and the student(s) willingly supplying unauthorised material are considered participants in the act of academic misconduct, and can be penalised accordingly.

Special Consideration

Students who have been significantly affected by illness or other serious circumstances during the semester may be eligible to apply for Special Consideration.

The following website contains detailed information relating to who can apply for Special Consideration and the process for making an application:

http://students.unimelb.edu.au/admin/special

Further Assistance

If you need assistance during the semester, you have several options:

Online Tutor

The Online Tutor allows students to direct questions to a QM2 tutor via the LMS. The Online Tutor can be accessed 24 hours a day, 7 days a week. On weekdays, the Tutor will attempt to answer your question within 24 hours.

Your questions and the tutor's answers can be accessed by all students in the subject, allowing everyone to benefit from the question and answer. Importantly, your identity will not be revealed to other students. Even if you do not want to ask a question, you can still view existing questions and answers.

Note that the Online Tutor is not designed to replace attendance at tutorials, but rather to complement the tutorial process. Nor is it intended to be a substitute for thought or using your own brain power. You will learn more effectively if you first make a conscientious effort to work things out for yourself. Simple questions that can be answered by referring to the prescribed readings or the lecture slides will not usually be answered. You can access the Online Tutor via the Online Tutor link, located in the navigation menu of the LMS.

When using the Online Tutor, please adhere to the following.

1. Students must first check that their question has not already been answered on the Online Tutor. The Online Tutor system has a search facility for doing such checks.
2. Questions should be short, with only one specific question in each posting. If students have more than one question, use a separate posting for each one.
3. Questions must be specific. They should NOT be open ended, such as "I do not understand what a t-test is. What is it?" If you do not understand concepts, please see a tutor or the lecturer during their consultation hour.
4. Do not ask for the solutions to tutorial questions or assignment questions, even after they are completed. Brief solutions to tutorial questions and assignment questions will be made available on the LMS.

Lecturer Consultations

László Kónya is available for consultations on Tuesday from 1:00 PM to 2:00 PM and on Wednesday from 11:00 AM to 12:00 PM during the semester. All other times will require an appointment. Please do not assume that the times immediately after or before lectures are available for consultation; the lecture theatres are usually occupied with other classes at those times.

Tutor Consultations

There are several tutors for this subject. Starting from week 3, each tutor will set aside one hour in each week to meet with students for individual consultations. The times and locations for consultations with these tutors will be provided on the LMS page under the "Tutor Consultation Hours" menu item. Students should attend the consultation hours of their own tutor.

If there is some legitimate reason why a student cannot attend the consultation hours of their own tutor, they can attend the consultation hours of one of the other tutors on the list. However, tutors will give priority to their own students.

<u>Other Information</u>

Statistical Software

Students will be using the EViews statistical software package to complete tutorial questions and assignments. If you are not familiar with EViews, do not worry. Detailed EViews instructions with screen shots will be included in the tutorial materials. The EViews statistical software is available on the computers in the Bouverie Street Undergraduate computer laboratory. The Student Version is available for separate purchase from the University Bookstore or from http://www.eviews.com/EViews10/EViews10SV/evstud10.html.

If you go to this EViews web site, you will notice that there are two versions of the student version. The regular Student Version costs US$39.95. The Student Version Lite is free. The main *disadvantag*e of the Lite version is that you cannot save your work in an EViews workfile. You can copy and paste your results into a Word file (for example) but you cannot return at a later time to previously-created results in an EViews workfile. If you need previously-created results for further analysis, you must re-create them. The main *advantage* of the Lite version is its zero price.

I strongly recommend you to have the Student Version so that you can access EViews when and where you like. If purchasing the regular Student Version would cause you some financial distress, download Student Version Lite.

There is one more option, but it is an unreliable one. Access is not always guaranteed and interruptions can occur. Both can be frustrating just before an assignment is due. This option is to access EViews from home via the University's Citrix server. To do so, please follow the instructions below.

- Click on https://www.citrix.com/products/receiver/
- After it's downloaded, run the *Citrix Receiver.exe* program
- At Welcome message, click Start
- Accept license agreement, click Install
- After a while, it should say installation successful. Click Finish
- Launch Citrix Receiver from Start prompt
- In Add account box, enter myuniapps.unimelb.edu.au

- On next screen, enter your username (in form of student*yourusername*) and password and click log on
- If a script error message appears, click 'yes' (to run scripts)
- At Welcome screen, click Accept
- At myUniApps, clicking on Apps (on dark blue toolbar at top of screen) should reveal EViews9 (after scrolling down); EViews8 is there too
- A few minutes after clicking EViews9 icon, EViews9 should appear

[The latest version of EViews is Version 10. However, as of 22 February 2018, it has not yet been installed on the Citrix server. The EViews commands, options and output that we will be using are the same in Versions 9 and 10.]

Comparison of QM2 with Econometrics 1

This subject covers different material to that covered in ECOM20001 Econometrics 1. The techniques covered in QM2 are more varied, and are less focused on regression analysis. There is still a significant proportion of QM2 devoted to regression analysis, but the statistical techniques covered in QM2 provide a more general overview of techniques in addition to regression. Specifically, QM2 includes an introduction to nonparametric methods, analysis of variance, and chi-square tests for the analysis of frequencies that are typically not covered in Econometrics 1. Note that QM2 is not necessarily easier than ECOM20001. We cover a larger breadth of material, but in less depth. In recognition of the complementary nature of these subjects you may take both QM2 and Econometrics 1. You can learn more econometrics in later years without doing Econometrics 1 by taking Basic Econometrics (ECOM30001) in 3rd year. Students contemplating honours in Economics or Finance must include ECOM20001 Econometrics 1 and ECOM30002 Econometrics 2 in their program.