

**The University of New South Wales
School of Aviation**

**AVIA5032 – Quantitative Analysis for
Aviation Economics**

2016 Course Outline

Course Staff

The lecturer-in-charge is Dr David Tan of the School of Aviation. David can be contacted via e-mail at david.tan@unsw.edu.au.

About the Editor/Facilitator

David joined the School of Aviation in December 2011. He specialises in aviation finance/economics and econometric methods for aviation research. Having completed his PhD in Banking and Finance at the University of New South Wales, David held a Lecturer in Finance position at the Australian National University for 3 years until expanding his research interests towards aviation economics. His research interests include airline finance and economics, corporate governance, asset pricing, and applied econometrics.

Course Information

Aims

Is investing in the aviation industry a profitable venture? Do newer flight control systems significantly reduce the occurrences of accidents? Is the investment in more modern aircraft reducing delays in flight departure times? Do different airline business models result in substantially different pricing strategies?

How can one conduct an empirical test of the above propositions? How can one distinguish between randomness and a real statistical difference? How large does a sample have to be in order for one to be confident in the empirical results? This course will teach you how to conduct empirical research in aviation. This is an online course designed for post-graduate students focusing on the application of quantitative methods in the fields of aviation, transport and tourism. In today's world, quantitative skills are essential for managers and analysts in every industry. These skills are particularly important for those within the aviation and transport fields, as modelling historical data, understanding trends and drivers, and forecasting are crucial requisites for success.

This course provides the student with a fundamental understanding of the quantitative skills and techniques applied in the aviation and transport industry. This course implements an applied teaching approach, using seminal papers in the field

as case studies to provide students with the ability to grasp and understand contemporary issues and academic journals in aviation/tourism. Students will be introduced to Shazam – an efficient and low-cost econometrics software package – while using real world data to conduct analyses. This course is self-contained assuming only basic calculus and algebra as prior knowledge.

This course is encourage for those students undertaking AVIA5020 and wish to complete a research project involving quantitative analysis. Moreover, this course will provide students with the skills to empirically test some of the concepts taught in AVIA5030, such as modelling aviation and tourism demand, and modelling transport choices by tourists.

Much of your communication will be via email. Please use your university email address for all formal correspondence. The only way to submit assignments is through the Moodle site. Your marks will appear there and you will be able to access an online copy of your report with a marking rubric and comments. The due dates for assignments are shown on the Moodle site. From time to time I may post additional material through Moodle – usually as a web link.

A good practice to adopt when you submit assignments or attachments is to name the file with a unique name. Include your name, the subject number, and the assessment number (e.g. Lee5032a2.doc). Please do not send a file labelled quiz1.doc. Please ensure identification information (name, subject, student number etc) is on the title page of the document.

Learning Outcomes

On completion of this course students should be able to:

- Understand the different types of data structures, and the underlying concepts of econometrics, including ceteris paribus, causality vs correlation, and probability density functions.
- Demonstrate an understanding of the simple and multiple linear regression models and the ability to conduct inference and diagnostic tests.
- Demonstrate an understanding of the issues in time series analysis and the ability to implement ARMA and ARIMA models.
- Demonstrate an understanding of panel data and the appropriately selecting model specifications.
- Demonstrate an understanding of discrete choice models and identifying situations when such models are appropriate, and the ability to apply and interpret these models in a research setting.
- Demonstrate an understanding of spectral analysis and its applications in aviation and transport research.
- Apply the modelling skills taught in this course using Shazam and real world data.
- Understand the model selection process and research ethics.

Location

This course runs for the duration of Semester 1.

The course is delivered electronically via UNSW Moodle, on a distance-learning basis. The core component of delivery is the course manual. Course manuals are written by experts from various backgrounds within the aviation industry and a cross section of disciplines at UNSW. Each manual has been designed to guide the learner in the most effective and efficient way. As new concepts are introduced, practical exercises are provided so you can develop skills, which can be applied immediately in your workplace. Students are able to study at their own pace, in accordance with their particular work schedules and locations. Academic review and feedback is delivered via e-mail.

Learning and Teaching Philosophy

This course aims to provide students with a solid background and skills in quantitative analysis to apply in their own research and understanding of the industry. Students who complete this course will be better able to understand and assess research papers in the aviation and transport literature.

Internet

Online content and study materials can be accessed via UNSW Moodle:
<http://moodle.telt.unsw.edu.au>

Assessment

The MScTech (Aviation) Program's approach to assessment closely follows that of the Australian Open Learning Program of the Australian Graduate School of Management. At all times assessment is intended to form a component of the learning process and quizzes and take-home exams are designed to assist you in learning and applying the skills taught in AVIA5032. Written comments will accompany your returned quizzes and exams and should provide useful feedback.

Criteria for Assessment

The criteria for assessment of all written work will be:

- A demonstrated understanding of the concepts and problems studied.
- A demonstrated ability to apply the skills learnt to real data.
- A demonstrated ability to build upon on the materials taught in this course.
- All assignments must have a completed cover sheet attached to the front of your assignment. These will be supplied.

- piecing together sections of the work of others into a new whole;
- presenting an assessment item as independent work when it has been produced in whole or part in collusion with other people, for example, another student or a tutor; and,
- claiming credit for a proportion a work contributed to a group assessment item that is greater than that actually contributed.²

Submitting an assessment item that has already been submitted for academic credit elsewhere may also be considered plagiarism.

The inclusion of the thoughts or work of another with attribution appropriate to the academic discipline does not amount to plagiarism.

Students are reminded of their Rights and Responsibilities in respect of plagiarism, as set out in the University Undergraduate and Postgraduate Handbooks, and are encouraged to seek advice from academic staff whenever necessary to ensure they avoid plagiarism in all its forms.

The Learning Centre website is the central University online resource for staff and student information on plagiarism and academic honesty. It can be located at:

www.lc.unsw.edu.au/plagiarism

The Learning Centre also provides substantial educational written materials, workshops, and tutorials to aid students, for example, in:

1. correct referencing practices;
2. paraphrasing, summarising, essay writing, and time management;
3. appropriate use of, and attribution for, a range of materials including text, images, formulae and concepts.

Individual assistance is available on request from The Learning Centre.

Students are also reminded that careful time management is an important part of study and one of the identified causes of plagiarism is poor time management. Students should allow sufficient time for research, drafting, and the proper referencing of sources in preparing all assessment items.

Course Content

Units should be done in the corresponding course week, i.e. the course is a 12-week course with one Unit being achieved in each week.

Week 2	Unit 1	Introduction to Quantitative Methods
Week 3	Unit 2	Probability and Microsoft Excel Skills
Week 4	Unit 3	The Normal Distribution

² Adapted with kind permission from the University of Melbourne.

Week 5	Unit 4	Hypothesis Testing
Week 6	Unit 5	Simple Linear Regression
Week 7	Unit 6	Multiple Regression <i>Case study: "Modelling Tourism Demand"</i>
Week 8	Unit 7	OLS Asymptotics and Other Issues <i>Case Study: "UK Air Passenger Demand"</i>
Week 9	Unit 8	Time Series Analysis 1 <i>Case Study: "Forecasting Air Transport Demand"</i>
Week 10	Unit 9	Time Series Analysis 2 <i>Case Study: "Relationship Between Forward Freight Agreements and the Fuel Oil Index"</i>
Week 11	Unit 10	Panel Models <i>Case Study: "Airline Business Model and Airport Revenue" and "Effects of Open Sky Policy on Competition and Air Travel Cost"</i>
Week 12	Unit 11	Discrete Choice Models <i>Case Study: "Discrete Choice Modelling for Transportation"</i>
Week 13	Unit 12	Spectral Analysis and Research Ethics <i>Case Study: "Modelling Tourism Flows"</i>

The 12 units follow the outline above. The unit headings give a reasonable indication of the content of the unit. Units vary slightly in length and in terms of effort. Reading material is generally labelled "essential" or "reference". The former is self-explanatory and the latter can be studied in the course or simply kept as a reference for later reading.

This course introduces the basic statistical concepts and their application to aviation and transport analysis in the first 4 Units. These Units have considerable content that forms the basis for the following Units. You may find that you return to these introductory Units throughout the course.

Given the understanding of the preceding concepts, students will be well-positioned to learn about the simple linear regression, correlation vs causality, interpretation of the estimates, and tests of model significance in Unit 5. The regression model is the cornerstone of the majority of empirical research in aviation and transport literature.

Unit 6 introduces the multiple regression model. The estimation and interpretation of coefficient estimates are discussed, along with the concept of ceterus paribus, model significance and specification tests. A case study examining the empirics of research papers modelling tourism demand is included.

Unit 7 will cover the idea of large sample theory and consistency in model estimates. Other issues such as logarithmic functional forms, dummy and interaction variables, adjusted R-squared, confidence intervals and heteroskedasticity are discussed. A case study based examining the empirics of a research paper modelling UK passenger demand is included.

Unit 8 introduces time series analysis and issues in estimation. Discussion of OLS asymptotics and consistency in estimates will follow. This unit will also cover issues specific to time series models, such as using lags of exogenous variables, time differencing, serial correlation, seasonality, and time trends. A case study examining the empirics of a research paper forecasting air transport demand is included.

Unit 9 will cover the ARMA and ARIMA class models and their applicability in the forecasting time series data, such as demand, tourism flows, and expenditure. A discussion of model selection and forecasting will then follow. The case study for this unit is examining the relationship between forward freight agreements and the fuel oil index.

Unit 10 will discuss the modelling issues associated with panel data and the problems these will pose for estimation. Students will learn about the fixed-effects and random-effects models, and their wide applicability in social science research. A case study examining the empirics of a research paper analysing Airline business model and airport revenue is included.

Discrete choice models are covered Unit 11, beginning with a discussion of utility theory and functions, followed by an introduction of the logit and probit class of models and a demonstration of their application using real tourism demand data. The focus of the case study will be the application of discrete choice modelling for transportation.

Unit 12 will introduce spectral analysis and its applications in the field of aviation and tourism economics. In particular, alternative methods of dealing with seasonality, time trends, and missing data are discussed. A case study based upon the application of spectral analysis on modelling tourism flows will be covered. An overview of the various empirical methods covered throughout the semester and a discussion of research ethics conclude the course.

Each unit includes readings. The readings are offered either as links, or as a separate pdf file.

Online Resources

Most of the necessary background reading material can be sourced through the library's extensive journal databases online. Suggested reading material directs students to useful websites, but self-directed research beyond the recommended reading is an important part of the learning process. Wider reading adds a variety of opinions, richer content to the subject, and the opportunity to contrast theoretical and practitioner views of the industry.

Instructions for using the databases are available on the UNSW library website <http://library.unsw.edu.au/HowDoI/databases.html> The page includes a direct link to the 'Sirius' database homepage. Industry journals Air Transport World and Airline Business can both be accessed using the UNSW Library electronic access.

Textbooks

There are no set textbooks for this subject. All relevant readings and references are contained or listed as links in the Unit reading.

Report Writing

Report writing standards and requirements are very varied in the University environment and within industry and Government. It is not expected that students will be perfect in this area. The standards in this course are similar to the author's experience in producing action-orientated papers for a Company Board's approval. The standards for referencing etc are not important as long as you do use quotes where appropriate and acknowledging of others ideas.

Continual Course Improvement

Periodically, student evaluative feedback on the course is gathered, using among other means, UNSW's Course and Teaching Evaluation and Improvement (CATEI) Process. Student feedback is taken seriously, and continual improvements are made to the course based in part on such feedback. Significant changes to the course will be communicated to subsequent cohorts of students taking the course

Administrative Matters

The course will be administered through UNSW Blackboard. This site can be accessed from <http://telt.unsw.edu.au>

You then enter your student id and zPass. The course material is there plus any additional material that the author puts there.

Your assessments should be uploaded on to the website and all questions directed through the mail system. The Facilitator will use the course site to make announcements and to mark the assignments and answer questions.

Students should be familiar with the information contained in <https://my.unsw.edu.au> regarding expectations of students, assignment submission, examination procedures, equity and diversity and other policies that affect you. A Postgraduate Aviation Student Guide can be obtained from the School of Aviation which is also available on UNSW Blackboard. Please contact Jamie Lim at: jamie.lim@unsw.edu.au for any administrative enquiries.