Students in this unit should read this unit outline carefully at the start of semester. It contains important information about the unit. If anything in it is unclear, please consult one of the teaching staff in the unit.

ABOUT THIS UNIT

- The aim of the unit is to impart an understanding of the conceptual and practical issues involved in modelling stationary and non-stationary time series. The approach taken is structural modelling, rather than pure time series techniques (e.g. Box Jenkins). The unit has a strong practical bias, and the emphasis on econometric theory is kept to a minimum. The pre-requisite is a familiarity with the basic linear regression model. The mathematics involved is mainly algebraic manipulation. Applications will primarily be demonstrated with Gretl and CATS for RATS.
- The need for this unit (as an independent unit) stems from the fact that many, perhaps most, of the time series that macroeconomists or analysts in business and finance are interested in are trended, often strongly so. This turns out to have important implications for econometric analysis. In particular, it may be all too easy to estimate well fitting but entirely 'spurious' (i.e. false) relationships. We begin with a general discussion of why problems arise with non-stationary data. We then proceed to look at the general properties of time series, and how non-stationarity fits into this. Then we look at the ways in which we can test for non-stationarity. We then define the notion of 'cointegration' between a set of non-stationary variables and explore the ways in which long run (cointegrating) relationships can be estimated. The key concept is the (single- or multi-equation) error correction mechanism. We introduce VAR and VECM models, their estimation and their use in applied macroeconometrics.

TEACHING STAFF

- Convenor: Roselyne Joyeux, roselyne.joyeux@mq.edu.au, Ph: 9850 8487, Rm: E4A-440.
**CONTACTING STAFF**

- The best way to get help with unit material is to post a query on the online discussion forum. The advantage of the forum is that it is continually monitored by the teaching staff in the unit, thereby maximising the chances of getting useful help quickly. In addition to being monitored by staff, the online discussion forum is available to all students, and questions posted to the forum often generate discussion that is of greater benefit than the staff response alone. Furthermore, over the semester, the accumulated postings on the forum provide a searchable list of the problems that students have encountered during the unit, and the solutions that have been found. This is beneficial to both student and staff. For these reasons, the online discussion forum will be the primary form of communication in the unit outside class times.
- The tutorial program in ECON896 provides exercises for students to work on in class, and also allows time for students to seek help with problems that they are having with the unit material. Since all tutorials are held in the computer laboratories they are an ideal venue for seeking help with problems that are related to computational aspects of the unit.
- For matters that cannot be resolved by the above means, and for any personal matters, at any time students are welcome to make an appointment to consult with teaching staff in her office. The best way to make an appointment is to email the relevant staff member, briefly describing the problem for which help is being sought, and indicating your availability over the next few days.
- Students should be aware that staff do not have time to provide individual students with extensive one-to-one assistance outside class times. The importance of regular class attendance, participation in online discussions, and private study, cannot be overstated. In particular, students who do not regularly attend class and participate in the unit will find that there is little that staff can do to provide them with meaningful help immediately prior to major assessment tasks.
- Students experiencing significant difficulties with any topic in the unit must seek assistance immediately.

**CLASSES AND TUTORIALS**

- Students are expected to attend a two-hour lecture each week. Tutorials or labs will be held for one hour weekly.
- The timetable for classes can be found on the University web site at: [http://www.timetables.mq.edu.au/](http://www.timetables.mq.edu.au/)

**TEXT**

Recommended texts for the unit are

**Patterson, Kerry**

*An Introduction to Applied Econometrics*

MacMillan Press
TECHNOLOGY USED AND REQUIRED

- The main software package used in ECON896 is RATS. This software is available for use in the E4B computer labs.
- Gretl will also be used. This software is available for use in the E4B computer labs, and may be freely downloaded for use elsewhere. The Microsoft Windows version is available at http://gretl.sourceforge.net/win32/. A Mac version is available at http://gretl.sourceforge.net/osx.html. Linux users should check their repositories or download the rpm or source from http://gretl.sourceforge.net/.
- The use of a spreadsheet will often be helpful for tasks in this unit. For students who don’t own or wish to use Microsoft Excel, a free alternative is provided by OpenOffice (http://www.openoffice.org).
- Significant use is made of online material in ECON896. The unit material has been designed for the (free) Firefox web browser (http://www.mozilla.com/en-US/firefox/upgrade.html). Other browsers may display the unit material properly, but this cannot be guaranteed.

UNIT WEB PAGE

- Course material is available on the learning management system (iLearn).

UNIT OBJECTIVES

- To introduce the basic economics, statistics and computation necessary for applied time series analysis.
- To introduce students to concepts and models of time series processes that are relevant for the analysis of macroeconomic data.
- To extend students' knowledge of time series econometrics beyond that taught in ECON835 and ECON840.

LEARNING OUTCOMES

Students who successfully complete this unit will be able to:

- Understand advanced time series concepts.
- Test for stationarity and estimate ARIMA models
- Estimate and analyse VAR and VECM models
- Test hypotheses about cointegration
- Estimate impulse response functions.
In addition to the discipline-based learning objectives, all academic programs at Macquarie seek to develop students’ generic skills in a range of areas. One of the aims of this unit is that students develop their skills in the following:

- *Foundation skills of literacy, numeracy and information technology;*
- *Critical analysis skills;*
- *Problem-solving skills;*
- *Creative thinking skills.*

### Learning and Teaching Activities

- Since the unit does not closely follow any particular textbook, it is vital that students attend all classes so that they can understand what the unit objectives and content are.
- Students should complete all tutorial exercises. Some of these will be marked and count towards the final grade.
- Students must submit an assignment.
- In addition to working on set exercises, students are encouraged to set their own exercises. Rather than working through prescribed exercises, it is often more interesting to choose a practical application of the unit material and work through it. The internet has many sources of free, up-to-date macroeconomic data which students can utilise. Staff are happy to discuss these applications with students.
- Students should attend all classes and devote considerable effort to the tutorial work and the assignment. It should be noted however, that private study is a large component of learning at university. In total, it is expected that the average student would spend around 12 hours per week working on ECON896.

**Approximate Schedule of Topics**

Depending on the students’ backgrounds more or less time will be spent on each topic.

1. **Introduction:**
   Spurious regressions. Properties of the OLS estimators of single equation parameters.

2. **Stationarity, Integration and ARIMA Models**

3. **Testing for order of integration**
   Dickey Fuller, Augmented Dickey Fuller and Phillips-Perron tests. Tests for unit roots in the presence of structural breaks.

4. **Cointegration**

5. **Testing for Cointegration**
   OLS and Super-consistency. Two-stage versus one-stage estimation. Examples.
6. **VAR and VECM**  
VAR models, Granger causality, VECM, definition and estimation.

7. **Testing for Cointegration in a VAR model**  

8. **Test of Restrictions and Identification of the Cointegrating Vectors**

9. **Impulse response functions**

10. **Panel cointegration if time permits**

**RESEARCH AND PRACTICE**

- This unit uses research by Macquarie University researchers (references will be given in the lectures, tutorials and assignment).
- This unit uses research from external sources (references will be given in the lectures, tutorials and assignment).
- This unit gives you practice in applying research findings in your tutorials and assignment.

**RELATIONSHIP BETWEEN ASSESSMENT AND LEARNING OUTCOMES**

The modes of assessment are designed to ensure that students become familiar with the econometric tools necessary to develop, estimate and evaluate their own models. The assignment will also ensure that you are proficient with the softwares and can interpret the relevant computer outputs.

The components of assessment in this unit are as follows:

1. **Assignment**  
   50%  
   The Assignment is due in Week 11, Friday May 25, by 12 pm in lecture or in the ECON896 box provided in BESS. Students are strongly recommended to keep a photocopy of their assignment to insure against loss. The assignment should be typed with the main tables, charts and results presented throughout the assignment to highlight your responses to the assignment questions. All other computer output should be put into labelled and referenced appendices. Since this assignment requires extensive empirical work based on estimating complicated econometric models word limit does not apply. A student can be expected to spend 20 hours on the assignment spread around the semester. Some of the work will be done during the practicals.

2. **Tutorials**  
   30%

3. **Class Test**  
   20%
The Class test will be held in class in week 13.

**ACADEMIC HONESTY**

The nature of scholarly endeavour, dependent as it is on the work of others, binds all members of the University community to abide by the principles of academic honesty. Its fundamental principle is that all staff and students act with integrity in the creation, development, application and use of ideas and information. This means that:

- all academic work claimed as original is the work of the author making the claim
- all academic collaborations are acknowledged
- academic work is not falsified in any way
- when the ideas of others are used, these ideas are acknowledged appropriately.

Further information on the academic honesty can be found in the Macquarie University Academic Honesty Policy at [http://www.mq.edu.au/policy/docs/academic_honesty/policy.html](http://www.mq.edu.au/policy/docs/academic_honesty/policy.html)

**GRADES**

Macquarie University uses the following grades in coursework units of study:

HD - High Distinction  
D - Distinction  
CR - Credit  
P - Pass  
F - Fail

Grade descriptors and other information concerning grading are contained in the Macquarie University Grading Policy which is available at: [http://www.mq.edu.au/policy/docs/grading/policy.html](http://www.mq.edu.au/policy/docs/grading/policy.html)
**GRADING APPEALS AND FINAL EXAMINATION SCRIPT VIEWING**

If, at the conclusion of the unit, you have performed below expectations, and are considering lodging an appeal of grade and/or viewing your final exam script please refer to the following website which provides information about these processes and the cut off dates in the first instance. Please read the instructions provided concerning what constitutes a valid grounds for appeal before appealing your grade.

http://www.businessandeconomics.mq.edu.au/new_and_current_students/undergraduate_current_students/how_do_i/grade_appeals

**SPECIAL CONSIDERATION**

The University is committed to equity and fairness in all aspects of its learning and teaching. In stating this commitment, the University recognises that there may be circumstances where a student is prevented by unavoidable disruption from performing in accordance with their ability. A special consideration policy exists to support students who experience serious and unavoidable disruption such that they do not reach their usual demonstrated performance level. The policy is available at: http://www.mq.edu.au/policy/docs/special_consideration/policy.html

**STUDENT SUPPORT SERVICES**

Macquarie University provides a range of Academic Support Services. Details of these and other services for students can be accessed at http://www.student.mq.edu.au.

[Individual Unit Convenors may wish to add Unit/ Faculty specific support eg BESS, Room, PAL, E4B Consultation Room.]

**IT CONDITIONS OF USE**

Access to all student computing facilities within the Faculty of Business and Economics is restricted to authorised coursework for approved units. Student ID cards must be displayed in the locations provided at all times.

Students are expected to act responsibly when using University IT facilities. The following regulations apply to the use of computing facilities and online services:

- Accessing inappropriate web sites or downloading inappropriate material is not permitted. Material that is not related to coursework for approved units is deemed inappropriate.
- Downloading copyright material without permission from the copyright owner is illegal, and strictly prohibited. Students detected undertaking such activities will face disciplinary action, which may result in criminal proceedings.
Non-compliance with these conditions may result in disciplinary action without further notice.

Students must use their Macquarie University email addresses to communicate with staff as it is University policy that the University issued email account is used for official University communication.