

THE UNIVERSITY OF
NEW SOUTH WALES



SCHOOL OF ECONOMICS

ECON 3206 FINANCIAL ECONOMETRICS

SESSION II, 2006

COURSE INFORMATION AND LECTURE SCHEDULE

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1. TEACHING STAFF

The **Lecturer-in-charge** is Lance Fisher (JG 137; Ph. 9385 3323, email: L.Fisher@unsw.edu.au). The Lecturer-in-charge is responsible for the overall direction and content of the course. The name and contact details of the tutor will be announced in the first lecture.

2. INFORMATION ABOUT THE COURSE

2.1 CLASS HOURS

Class time is three hours per week made up of a two hour lecture and a one hour tutorial.

2.2 LECTURE TIMES AND LOCATIONS

Lecturer: Lance Fisher
Day: Thursday
Time: 3pm-5pm
Location: Electrical Engineering 418

2.3 TUTORIAL GROUP ALLOCATIONS

There is a one hour tutorial each week. The tutorial is offered at the following times and locations. Choose between either one.

Day: Thursday
Time: 2pm-3pm
Location: Mathews 311

Day: Thursday
Time: 5pm-6pm
Location: Morvan Brown LG2

2.4 RELATIONSHIP OF THIS COURSE TO OTHER COURSES

This course is concerned with the econometric modelling of financial data and tests of assets pricing models. Asset pricing models are discussed in the course ECON3107 Financial Economics. While ECON3206 is self-contained, it also extends the class of models covered in the course ECON2209 Business Forecasting. In Business Forecasting emphasis is placed on modelling the mean or first moment of the data. Here emphasis is placed on modelling the variance or second moment of the data because a fundamental characteristic of financial data is its variance or volatility.

2.5 APPROACH TO LEARNING AND TEACHING

The philosophy underpinning this course and its Teaching and Learning Strategies (see 3.3 below) are based on “Guidelines on Learning that Inform Teaching at UNSW”. These guidelines may be viewed at : www.guidelinesonlearning.unsw.edu.au.

3. COURSE AIMS AND OUTCOMES

3.1 COURSE AIMS

This course is concerned with the econometric modelling of financial data and tests of some standard asset pricing models. It begins with a discussion of the key empirical characteristics of financial data. Next, tests of standard asset pricing models are formulated in the framework of the general linear regression model. Following this, there is a discussion of the time series methods for modelling stationary data. At this point in the course, you are in a position to learn how to model the volatility in asset return data which is evident for short (weekly or daily) holding periods. Our focus will be on the ARCH/GARCH class of volatility models. This approach is applied to modelling the time-varying risk premium on financial assets and to Value-at-Risk (VaR) calculations which many financial institutions use to assess the risk of their portfolios. The course concludes with a treatment of the time series methods for modelling non-stationary data. This will allow you to model both the long-run relationships and short-run interactions among financial time series.

Throughout the course, the techniques will be demonstrated using actual financial data using the econometric software EViews, Version 5. Eviews is menu-driven and very easy to use and is available in the Faculty of Commerce and Economics computer labs.

On completion of this course students should be able to apply modern econometric methods to model financial data and to use these models to provide input into the financial decision making process.

3.2 STUDENT LEARNING OUTCOMES

On completion of the course, students should be able to:

1. Recognize the properties that characterize financial data and why these properties are unique to financial data as opposed to other types of data such as aggregate macroeconomic data.
2. Model the mean behaviour of financial time series.
3. Model the volatility in financial data and perform Value-at-Risk calculations that are used as an input into the financial decision making process.
4. Model the long-run relationships among financial time series.
5. Be proficient at econometric modelling of financial data using the software program EViews, which is widely used in the commercial world.

The course aims to provide benefits to students in terms of:

1. Developing their ability to model the volatility in financial data as a means to a more informed assessment of the risk and return associated with different investment strategies.
2. An awareness of the empirical evidence supporting alternative models of asset price determination. Students can then assess their usefulness.

3. Developing their proficiency with the computer skills required to actually model financial data in practice. Students should be proficient in EViews by the end of the course.

3.3 TEACHING AND LEARNING STRATEGIES

The examinable content of the course comprises topics covered in lectures and tutorials.

LECTURES

The purpose of lectures is to provide a logical structure for the topics that make up the course, to emphasise the important concepts and methods of each topic, and to provide real world examples using actual financial data to which the concepts and methods are applied. A lecture note on each topic will be provided. While the lecture notes are quite detailed, they do not constitute a textbook. For a more extensive treatment, students should refer to the textbook and the other references (listed under section 7.2 below) for further details and be sure to attempt the tutorial exercises.

TUTORIALS

The object of the tutorials is to discuss various approaches to, and issues associated with the assigned exercises and topics covered in the course. At least one tutorial question each week will be devoted to the actual modelling of a financial time series, for example the ASX200, using EViews.

LEARNING STRATEGIES

An effective learning strategy (on which the course materials are based) is the following:

- (i) Prior to attending a lecture, read the relevant material from the lecture notes that will be provided and bring the notes with you to the lecture.
- (ii) Attend the lecture. Each lecture is based on the lecture notes for a particular topic. The lecture notes cover the econometric theory that is relevant and illustrates the concepts with a fully worked example estimated from real financial data in EViews.
- (iii) Attempt the tutorial exercises each week.

4. STUDENT RESPONSIBILITIES AND CONDUCT

4.1 WORKLOAD

It is expected that you will spend at least **ten hours** per week studying this course. This time should be made up of reading the lecture notes and textbook carefully, working on tutorial exercises and attending class.

Over-commitment has been a cause of failure for many students. You should take the required workload into account when planning how to balance study with employment and other activities.

4.2 ATTENDANCE

Your regular and punctual attendance at the lecture and tutorial is expected in this course. University regulations indicate that if students attend less than eighty per cent of scheduled classes they may be refused final assessment.

4.3 GENERAL CONDUCT AND BEHAVIOUR

You are expected to conduct yourself with consideration and respect for the needs of your fellow students and teaching staff. Conduct which unduly disrupts or interferes with a class, such as ringing or talking on mobile phones, is not acceptable and students may be asked to leave the class. More information on student conduct is available at: www.my.unsw.edu.au

4.4 KEEPING INFORMED

You should take note of all announcements made in lectures, tutorials or on the course web site. From time to time, the University will send important announcements to your university e-mail address without providing you with a paper copy. You will be deemed to have received this information.

5. ASSESSMENT

5.1 FORMAL REQUIREMENTS

In order to pass this course, you must obtain a total mark of at least 50 out of a maximum of 100.

5.2 ASSESSMENT DETAILS

Assessment will consist of:

Tutorial Assessment	10%
Mid-Session Examination (Week 7)	25%
Final Examination	65%
TOTAL	100%

5.3 TUTORIAL ASSESSMENT

Two times during the session, you will be asked to submit your answers to assigned tutorial exercises. You will be given at least one week's notice of this.

The tutorial assessment mark of 10 will be awarded on the basis of the spirit in which the student has attempted the exercises. It is not necessary that your answers be absolutely correct but that you have demonstrated a genuine effort in answering the assigned tutorial exercises.

Many tutorial exercises involve estimating econometric models with real financial data (that will be posted on the course's web-site, along with lecture notes and tutorial exercises).

5.4 MID-SESSION EXAMINATION

A mid-session exam will be held during WEEK 7 on Thursday September 7, 2006. It will consist of two or three questions of an analytical nature on topics covered during the first six weeks of lectures.

The purpose of the assessment is to test knowledge of the concepts introduced up to this point.

Note: There is no provision for a supplementary examination for students who are unable to attend the mid-session examination. Students who fail to attend the mid-session examination will need to apply for Special Consideration. Special consideration applications will need to be made within 3 days of the exam through NewSouth Q in the Chancellery. You should also advise the Lecturer-in-charge that you have made an application. You will need to provide full documentation of the reason for your absence from the exam (e.g. illness). Employment obligations of any kind are not acceptable reasons for absence from any examination.

Those students whose request is granted for Special Consideration for absence from the mid-session examination will have their final exam mark re-weighted (by a factor of 4/3).

5.5 FINAL EXAMINATION

The final examination will consist of four questions; one question will test material covered in Weeks 1 to 6 while the other three questions will test material covered in Weeks 8 to 14. The duration of the final exam will be three hours and will be held in the University's final examination period in November.

Further information on the content of the Final Exam will be provided towards the end of session.

The purpose of the final examination is to assess knowledge of how to model financial data using recently developed econometric methods.

5.6 SPECIAL CONSIDERATION AND SUPPLEMENTARY EXAMINATIONS

If you believe that your performance in the course, either during session or in an examination has been adversely affected by sickness or other adverse circumstances, you should apply for Special Consideration in the determination of your results.

Requests for Special Consideration must be accompanied by appropriate documentation. They should be made as soon as practicable after the problem occurs and within three working days of the assessment to which it refers. Applications made

more than three working days after the assessment component will only be considered in exceptional circumstances.

Special Consideration request forms and details of required documentation are available from NewSouth Q, program and course offices, and from the web site www.student.unsw.edu.au. The completed application form must be submitted to NewSouth Q.

Applications for Special Consideration are only accepted in the following circumstances:

1. Except in unusual circumstances, a problem involving a minimum of 3 consecutive days or a total of 5 days within the teaching period of a semester is considered sufficient grounds for an application.
2. The circumstances have to be unexpected and beyond your control. Students are expected to give priority to their university study commitments and any absence must clearly be for circumstances beyond your control. **WORK COMMITMENTS ARE NOT CONSIDERED A JUSTIFICATION.**
3. An absence from an examination should be supported by a medical certificate or other document that clearly indicates you were unable to be present.
4. A student absent from an examination or who attends an examination and wants to request special consideration is normally required to provide a medical certificate dated the same day as the examination.

Full information is available at www.student.unsw.edu.au. For more details on this matter of **SPECIAL CONSIDERATION**, see also UNSW Undergraduate Handbook 2006, pp 31-32.

Students should be aware that lodgement of a request for special consideration in the final examination does **not** guarantee the granting of a supplementary exam. Supplementary examinations will only be recommended by the School of Economics for students whose final examination performance has been affected by serious illness or other extraordinary circumstances which can be documented AND if there is evidence on the basis of performance during the session (based on the student's mid-session and tutorial mark) that the student has made satisfactory progress as deemed by the lecturer-in-charge.

The supplementary exam will be of a similar format to that of the final examination. Students who are granted a supplementary examination will be advised of the date of the supplementary exam as soon as possible, and students have the responsibility to ensure they are available to sit for the supplementary exam on the date specified. Holiday plans are not acceptable as reasons for non-availability. Students who apply for special consideration should frequently check their university e-mail for information about the supplementary examination.

6. ACADEMIC HONESTY AND PLAGIARISM

Students are reminded that the University regards academic misconduct/dishonesty as a very serious matter. Students found guilty of academic misconduct are usually excluded from the University for 2 years. Because of the circumstances in individual cases, the period of exclusion can range from one session to permanent exclusion from the University.

The following are some of the actions which have resulted in students being found guilty of academic misconduct in recent years:

1. Taking unauthorised materials into an examination.
2. Submitting work for assessment knowing it to be the work of another person.
3. Improperly obtaining prior knowledge of an examination paper and using that knowledge in the examination.
4. Failing to acknowledge the source of material in an assignment.

For more details on this matter of **ACADEMIC MISCONDUCT**, see the UNSW Undergraduate Handbook 2006, pp. 28-29.

The University regards plagiarism as a form of academic misconduct, and has very strict rules regarding plagiarism. For full information regarding policies, penalties and information to help you avoid plagiarism see:

www.my.unsw.edu.au/student/atoz/Plagiarism

Plagiarism is the presentation of the thoughts or work of another as one's own.* Examples include:

- direct duplication of the thoughts or work of another, including by copying work, or knowingly permitting it to be copied. This includes copying material, ideas or concepts from a book, article, report or other written document (whether published or unpublished), composition, artwork, design, drawing, circuitry, computer program or software, web site, Internet, other electronic resource, or another person's assignment without appropriate acknowledgement;
- paraphrasing another person's work with very minor changes keeping the meaning, form and/or progression of ideas of the original;
- 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.†

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:
correct referencing practices;

- paraphrasing, summarising, essay writing, and time management;
- 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.

* Based on that proposed to the University of Newcastle by the St James Ethics Centre. Used with kind permission from the University of Newcastle

† Adapted with kind permission from the University of Melbourne.

7. STUDENT RESOURCES

7.1 COURSE WEBSITE

The course website can be found at:

<http://vista.elearning.unsw.edu.au>

7.2 TEXTBOOK AND READINGS

Textbook

The textbook for the subject is:

Brooks, Chris (2002) *Introductory Econometrics for Finance*, Cambridge University Press.

This book is written at an introductory level and covers all the material we will discuss in class. In addition, it describes how to estimate the econometric models under discussion in the software program EViews.

Additional References

(a) Textbooks

The third edition of textbook:

Diebold, Francis X. (2004) *Elements of Forecasting*, Third Edition, Thomson and South-Western,

contains a very nice chapter on ARCH/GARCH models and it also covers all the standard time series methods we discuss. All the examples in this text are estimated with EViews. Note that this is the textbook for the course *Business Forecasting* so if you plan to do that course you may want to purchase this book in addition to, or as a substitute for, the text by Brooks.

The following books cover most of the material very well. In particular, Enders has a very nice treatment of standard ARCH/GARCH models and both Enders and Johnston and Di-Nardo have straightforward expositions of maximum likelihood estimation.

Enders, W. (2004) *Applied Econometric Time Series*, Second Edition, Wiley.

Johnston, J. and J. DiNardo (1997) *Econometric Methods*, Fourth Edition, McGraw Hill.

Pindyck, R.S. and D.L. Rubinfeld (1998) *Econometric Models and Economics Forecasts*, Fourth Edition, McGraw-Hill.

The following book treats the material at a more advanced level than the textbook. However, this book is quite difficult in places.

Mills, T.C. (1999) *The Econometric Modelling of Financial Time Series*, Second Edition, Cambridge University Press.

The following textbook by Stephen Taylor has just recently been published. It is somewhat more advanced and contains more technical detail and references to the literature than the textbook by Brooks. However, it is more accessible than the Mill's book.

Taylor, Stephen J. (2005) *Asset Price Dynamics, Volatility and Prediction*, Princeton University Press.

(a) Journal Articles

The ARCH/GARCH modeling strategy was originally developed in the following classic articles:

Bollerslev, T. (1986) "Generalized Autoregressive Conditional Heteroscedasticity", *Journal of Econometrics* Vol. 31, 307-327.

Engle, R.F. (1982) "Autoregressive Conditional Heteroscedasticity with Estimates of the Variance of United Kingdom Inflation", *Econometrica*, Vol. 50, No.4, 987-1008.

Engle, R.F., D. Lilien and R. Robins (1987) "Estimating Time Varying Risk Premia in the Term Structure: The ARCH-M Model", *Econometrica* Vol 55, 391-407.

A nice expository discussion of ARCH/GARCH type modeling and its application to value-at-risk (VaR) is:

Engle, R.F., (2001) "GARCH 101: The Use of ARCH/GARCH Models in Applied Econometrics" *Journal of Economic Perspectives* Volume 15, Number 4, Fall 2001.

This expository article by Engle is highly recommended reading.

The following article generalizes the GARCH model to include interest-rate level effects:

Brenner, R.J, R.H. Harjes and K.F. Kronner (1996) "Another Look at Models of the Short-Term Interest Rate" *Journal of Financial and Quantitative Analysis* Vol 31, 85-107

(b) Australian References

We may refer to the following articles in lectures or tutorials, which apply some of the techniques under study to Australian financial data.

Kearns, P. and A. R. Pagan (1993) "Australian Stock Market Volatility: 1875-1987", *Economic Record* Vol. 69, No 205, 163-178.

McDonald, A.D., J. Kendall and T. Ridley (1993) "GARCH-M Estimates of Variable Risk Premia for 180-day Australian Bank Bills", *Economic Record*, Vol. 69, No. 204, 10-19.

Tease, W.J. (1988) "The Expectations Theory of the Term Structure of Interest Rates in Australia", *Economic Record*, Vol. 64, No. 185, 120-127.

7.3 OTHER RESOURCES, SUPPORT AND INFORMATION

The University and the Faculty provide a wide range of support services for students, including:

- Learning and study support;
- Counselling support;
- Library training and support services;
- Disability support services;

EDUCATIONAL DEVELOPMENT UNIT

Additional learning support, tailored to the needs of FCE students, is available from the Education Development Unit (EDU) in the Faculty. The EDU offers a range of services for FCE students including: (a) academic skills workshops run throughout the session; (b) printed and on-line study skills resources e.g. referencing guide, report writing and exam preparation; (c) a drop-in resource centre containing books and audio visual material that may be borrowed; (d) a limited consultation service for students with individual or small group learning needs.

More information about the EDU services including on-line resources, workshop details and consultation request forms are available from the EDU website.

Contacts and location:

EDU Web: <http://education.fce.unsw.edu.au>

EDU Location: Room 2039, Level 2 Quadrangle Building

EDU services are free and confidential and are available to students of the Faculty of Commerce and Economics.

OTHER UNSW SUPPORT

In addition to the EDU services, the UNSW Learning Centre provides academic skills support services for students. The Learning Centre is located on Level 2 of the Library and can be contacted by Phone: 9385 3890 or through their website: www.lc.unsw.edu.au.

Students experiencing problems of an academic or personal nature are encouraged to contact the Counselling Service at UNSW. This service is free and confidential and run by professional counsellors. The Counselling Service is located on Level 2, Quadrangle East Wing, and can be contact on 9385 5418.

Those students who have a disability that requires some adjustment in their teaching and learning environment are encouraged to discuss their study needs with the Lecturer in Charge or with the Equity Officer (Disability) prior to, or at the commencement of, their course. The Equity and Diversity Unit can be contacted through 93854734 or www.equity.unsw.edu.au/disabil.html.

Students should be aware of Faculty Occupational Health and Safety policies and expectations. Information can be found at:

www2.fce.unsw.edu.au/nps/servlet/portalservice?GI_ID=SystemLoggedOutInheritableArea&maxWnd= Staff Info OHS

8. CONTINUAL COURSE IMPROVEMENT

Each year feedback is sought from students and other stakeholders about the courses offered in the School and continual improvements are made based on this feedback. UNSW's Course and Teaching Evaluation and Improvement (CATEI) Process (http://www.ltu.unsw.edu.au/ref4-5-1_catei_process.cfm) is one of the ways in which student evaluative feedback is gathered.

9. LECTURE SCHEDULE

Week 1 (Lecture July 27)

Understanding Financial Data

- (a) Descriptive Statistics
- (b) Predictability of Returns
- (c) Distribution of Returns

Brooks: Chapter 1; Sections 1.1 – 1.7

Chapter 2; Sections 2.1 – 2.3, 2.5

Weeks 2, 3 and 4 (Lectures August 3, August 10 and August 17)

Linear Regression Tests of Asset Pricing Models

- (a) Tests of the CAPM and Arbitrage Pricing Models
- (b) Diagnostics
- (c) Robust standard errors
- (d) Estimation of the Linear Regression Model by Maximum Likelihood

Brooks: Chapter 3, Sections 3.1 – 3.18,

Chapter 4, Sections 4.1, 4.3 – 4.10

Chapter 8, Appendix (covers Maximum Likelihood Estimation)

Weeks 5 and 6 (Lectures August 24 and August 31)

Time Series Methods

- (a) Stationarity
- (b) ARMA Processes
- (c) Autocorrelation Function
- (d) Forecast Function

Brooks: Chapter 5, Sections 5.1 – 5.8, 5.10, 5.12 – 5.13

Week 7 (Midsession Exam September 7 in lecture time)**Weeks 8, 9 and 10 (Lectures September 14, September 21, October 5)**

Risk and Volatility Models

- (a) ARCH/GARCH models
- (b) Testing for ARCH/GARCH effects
- (c) Estimation of ARCH/GARCH models by Maximum Likelihood
- (d) Diagnostic checking
- (e) Application of ARCH/GARCH models to Value-at-Risk (VaR) calculations

Brooks: Chapter 8, Sections 8.1 – 8.9. See the expository article by Engle (2001) listed below under additional references for application of GARCH to VaR.

Weeks 11 and 12 (Lectures October 12 and October 19)

Extensions of ARCH/GARCH models

- (a) ARCH/GARCH in Mean
- (b) Asymmetric ARCH/GARCH models
- (c) Inclusion of Exogenous Variables
- (d) Nonnormality

Brooks: Chapter 8, Sections 8.10-8.14, 8.16-8.20.

Weeks 13 and 14 (Lectures October 26 and November 2)

Modelling Long-run Relationships in Finance

- (a) Spurious regressions
- (b) Unit root processes
- (c) Bivariate cointegration
- (d) Error-correction models and causality

Brooks: Chapter 7, Sections 7.1, 7.2, 7.4 – 7.6, 7.8, 7.13 pages 420-426.