



THE UNIVERSITY OF HULL

Business School

Module Handbook 2007/08

56198

Multivariate Analysis

Level: 7

Semester(s): 2

Credits: 10

European Credit Transfer Scheme 5.0

Module Leader: Dr. Keshab Bhattarai

Jan 28 - June 02, 2008

**This handbook is available in alternative
formats on request from the department**

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Students are advised to read this handbook alongside the Business School's study skills handbook (available at <http://www.hull.ac.uk/hubs/informationfor/students/current.html>) and to pay particular attention to the section on plagiarism in both handbooks.

1. Welcome note and introduction

Successful business decisions must rely on knowledge received by processing information in systematic and scientific manner. Vast amount of information that is available from various business transactions or planning need to be distilled accurately and objectively for analysis of preferences, responses and actions of consumers, producers in various business conditions. Multivariate analysis aims to introduce important and popular techniques developed over years for condensing and summarising the vast amount of data in a sensible manner. First this module will introduce to the major concepts in time series analysis including the data generating process of them, smoothing techniques, autoregressive methods of forecasting. Then it will introduce to the standard dependent and interdependent multivariate techniques including multiple regression, analysis of variance, canonical correlation, discriminant and conjoint analyses, structural equation modelling, factor analysis, cluster analysis, correspondence and multidimensional scaling. This module is offered for post-graduate students as a part of the MRES/PhD research programme in the Business School,

2. Disability

If you have a disability it is imperative that you contact the Business School Disability Officers. In Hull this is Graeme Reid, g.c.reid@hull.ac.uk, Wharfe building, room 106. In Scarborough this is Paul Cross, p.cross@hull.ac.uk, room CH4. If you are a distance taught student you should contact your local administrative contact for advice. You should also contact your module leader, especially if you require particular help for your disability e.g. large print handouts on coloured papers/use of a microphone.

When you have made us aware of your disability the module leader will make every effort to meet your needs, wherever possible.

Students with a disability are also reminded to ensure that they have registered with the University Disability Office.

3. Key contacts

Research office (Hull)	MBA Office	01482 463646	businessresearch@hull.ac.uk
Module Tutors	Office No. & Location	Telephone	E-mail
Dr. Keshab Bhattarai	Wharfe 125	463207	K.R.Bhattarai@hull.ac.uk
Dr. Liang Han	Wharfe 118	463272	I.han@hull.ac.uk

4. Postal address

The postal address of the Business School in Hull is:

The Business School,
University of Hull, Hull, HU6 7RX

5. Using your University email address

Any of the staff listed above may try to contact you via your University email address. As a result **all** students should check their University email address on a regular basis. Failure to do so will mean you miss out on important information.

6. Teaching sessions

May 7, 2008

I. Time Series Analysis

- Systematic Patterns
 - Trend
 - Seasonality
 - Cycle
- Random Noise

Moving Average Smoothing

- Single Moving Average
 - Theory (Appendix 1)
 - Example 2 and Exercise 2
- Weighted Moving Average
 - Theory
 - Example 3 and Exercise 3
- Centre Moving Average
 - Theory
 - Example 4 and Exercise 4

2. Exponential Smoothing

- Single Exponential Smoothing
 - Theory (Appendix 2)
 - Example 5 and Exercise 5
- Double Exponential Smoothing and Triple Exponential Smoothing

- Theory (Appendix 3)

May 8, 2008

II. Multivariate Analysis Dependent Analysis:

Multiple regression - Metric Variables

Time series Modelling.

Analysis of Variance and Multivariate analysis of variance (MANOVA)

Conjoint analysis - categorical dependent variables

Discriminant analysis - categorical dependent variables

Canonical correlations

Structural equation modelling

Interdependent Analysis

Factor analysis

Cluster analysis

Multidimensional scaling

Correspondence analysis.

This module is offered for 2008 academic year intensively on 7th and 8th of May in computer Suite 2 in Derwent Building. Sessions start early at 9:30 and end at 4:30.

7. Student support

If you require additional module support outside of lecture/seminar/tutorial times you may make an appointment to see your tutor during their published office hours which will be displayed each week on their office door.

Enquiries of a general educational nature, which may range over a number of modules, should be addressed to the programme leader of your registered degree.

If you are experiencing any other problems please see your personal supervisor who may direct you to a specialist University service.

8. Attendance

The University has an Attendance Policy, which requires all students to attend all timetabled sessions for their programme of study. An attendance register will be kept for tutorial sessions (and lectures, in the case of first year undergraduates on the Hull campus) and students with unauthorised absence will be subject to School and University disciplinary procedures. Students who need to be absent for a genuine reason should obtain a leave of absence form from the appropriate support office. Students who are unwell for a period of more than a few days should obtain a medical certificate from their doctor and notify the relevant support office.

You are reminded that unauthorised absence may affect your course progress and if applicable any government funding. As a result it is important that you have read and understood the section entitled 'General Attendance' in your Business School Programme Handbook.

9. Blackboard

Resources supporting your independent learning will be provided through the Blackboard 6 learning environment. It is essential that you become familiar with Blackboard and specifically the Economic Modelling area. You are advised to check regularly (twice a week) for announcements and new material.

10. Personal development planning

This module will provide a solid foundation and confidence among students in building simple models of microeconomic behaviour and of the economy as a whole using diagrams, equations and real world data. On the one hand, it will develop transferable analytical, numerical and quantitative skills to analyse real world situations, on the other hand, it will develop strategic thinking using game theory to analyse economic decisions of the public and private sectors.

11. Study programme

The module aims to cover the following topics:

Topic	Lecturer
1. Time Series Analysis	LH
Components of time series	
Smoothing technique	
Stationarity	
Time series modelling	KB
2. Multivariate analysis	KB
Multiple regression analysis	
Analysis of variance	
Conjoint analysis	
Cannonical correlation	
Discrimination analysis	
Structural equation modelling	
Factor analysis	
Cluster Analysis	
Correspondence analysis	
Multidimensional scaling	

Note: This list is a provisional guide and the lecturers reserve the right to make changes to this programme. Details of lecture, questions, reading list and assessment will be provided in the lecture plans.

12. Coursework submission - dates and times

The table below provides details of the **final date** and time by which work must be submitted. Students may hand in work at any time prior to these deadlines, and are encouraged not to wait until the final deadline.

Date	Time	Topic/Title	Location
June 2, 2008	3 PM	Exercises in Multivariate Analysis	Research Office- Derwent

13. Assessment task and assessment criteria for coursework

Knowledge and skills obtained in the module is assessed by a written assignment that involves applying various multivariate analysis techniques for studying various aspects of business situation. Among others it involves models with dependent and interdependent techniques: multiple regression ANOVA, discriminant analysis, structural equation modelling, time series analysis, principle component analysis and factor analysis. Students are required to compute models, analyse results, explain them briefly how these are helpful in condensing the data and in getting useful inferences for a given problem at hand.

14. Coursework submission - procedure

You are required to submit assignments in 2 forms, an electronic copy and a paper copy. The electronic submission will be made using Turnitin which is an internet based service. The electronic copy will be screened for poor academic practice and used to archive your submission.

Make your electronic submission using the Turnitin system at <http://www.submit.ac.uk> by logging in using your University e-mail address and (Turnitin) password. You must already be registered on the system and have a student user profile. Before making your first submission you must enrol in the Turnitin class **which corresponds to this module**, the Class ID and enrolment password are indicated below, together with the code names for the module assignments.

Class ID	Password	Assignment
66398	yutc	Application of Multivariate Analysis in Business

Please note

The specified deadline applies to the submission of **both** the electronic and paper copy of the assignment.

The electronic submission must include all of the files corresponding with the printed submission. Normally this will be a single file created using Microsoft Word but where other applications, such as spreadsheets or specialist computer programmes are used, the appropriate material must be submitted in additional files.

Particular attention is drawn to the fact that submitting electronic and paper copies which are different will result in a penalty. To avoid problems, it is recommended that you submit electronically the file(s) you used to produce your paper copy.

If you are unfamiliar with Turnitin you are advised to consult the Turnitin Blackboard site and work through the PowerPoint presentation "Making a Coursework Submission to Turnitin". The presentation will show you how to use the system and experiment with Turnitin by logging in and enrolling in the Test Submission class.

When a document is submitted to Turnitin, the system will produce a receipt on the screen and send a copy to your e-mail address. You **MUST** print a copy of the first page of the receipt for each file submitted and attach them to your printed submission, as proof of your electronic submission. Due to time lags in the e-mail system at busy times, it is recommended that you print the receipt from the screen at the time when you make the submission.

You are strongly advised to make your electronic submission well ahead of the deadline (we suggest 3 hours) to ensure that you have time to produce the required documentation. A paper submission made before the deadline but without Turnitin receipts will be treated as a late submission. Turnitin receipts submitted after the printed copy will not be accepted. Failure to make effective use of the Turnitin system will not be accepted as grounds for an extension, or mitigation.

A Business School coursework submission sheet must be attached to the paper copy of your coursework and must be completed legibly and in full. Coursework must be submitted by the date and time stipulated. Deadlines will be strictly adhered to. Students submitting **either** copy late, and who do not have mitigating circumstances approved by the Mitigating Circumstances Panel, will be awarded the pass mark for work submitted up to 24 hours late or 0 for work submitted more than 24 hours late. See section 18 for details of the Mitigating Circumstances procedure.

15. Group work: Optional if it comes from the group of students.

16. Overlong assignments

All coursework assessments will specify a target word length, this target does not include footnotes, bibliographies, diagrams and appendices (unless clearly specified in the assessment briefing). Any assessments which are 10% or more over the target word length will be subject to the following penalty.

10 - 20% over the word limit - a 20 mark reduction
21% or more over the word limit - a mark of zero

It is important that you ensure you are aware of the length of your assignment and that this does not exceed the word limit by more than 10%. You can check the length of your assignment using the 'Word Count' function, available under the 'Review' tab of Microsoft Word 2007.

17. Plagiarism and Unfair Means

All work which is submitted for assessment must be your own work and appropriately referenced. The use of unfair means is a very serious offence and will be penalised accordingly. Being found guilty of unfair means may have a serious effect upon your academic progression, it may also result in a University Warning or it may result in your expulsion from the University.

It is important that you have read and thoroughly understood the section on 'Unfair Means and Plagiarism' in your Business School Programme Handbook and that you have read and

understood the University Code of Practice on the Use of Unfair Means which is published on the University website.

If you are unsure about referencing or plagiarism please refer to the Business School Study Skills Handbook or seek advice from your module or programme leader or the University Study Advice Centre. Students should do this before commencing work on assignments. Students undertaking Dissertations and Independent Study work should bear in mind that their supervisors are not responsible for checking their work for plagiarism or unfair means before they are submitted.

Please be aware that plagiarism and unfair means practices are not permitted in any form of assessed work whether this be coursework, open book examinations or closed book examinations.

The plagiarism declaration on the coursework submission sheet is your personal statement that the work which you are submitting for assessment is your own.

All coursework submitted will be routinely scrutinised using the Turnitin system which will provide academic staff with information on the similarity between the work you have submitted and a wide range of published material and work submitted by other students.

You will have the opportunity to use Turnitin with drafts of your work to increase your awareness of good academic practice and learn in practical ways how to improve your academic literacy skills.

18. Ethical Practice

Please ensure that you acquaint yourself with the 'Ethical Procedures for Research and Teaching in HUBS' section found in your Programme Handbook and that when you collect and use data in your assignments you do so ethically.

19. Examinations

This module is assessed only by course works and there is no final exam.

20. Mitigating circumstances and Absence with Good Cause

If you have any mitigating circumstances (for example, illness, legal, or personal problems) and you believe that these will, or have already, affected your academic performance or should they stop you completing an assessment then you are advised to complete a Mitigating Circumstances Form (available from the support offices). It is very important to submit this form **within seven days of the affected** examination or assessment deadline and to provide as much independent corroborating documentary evidence as possible to support your case e.g. medical note, police case note.

Please note that IT problems (printers or computers) will not be accepted as a mitigating circumstance. All students are strongly urged to back up their work regularly onto your server space and secondary storage devices as they go along.

21. Assessment Grading

You will be notified via your University email when provisional grades and feedback are available for collection. Please note that whilst you are able to ask for further clarification on feedback provided you can **not** appeal your grade on the basis of academic judgement.

Please be assured assessments are marked anonymously i.e. your assessor will not know the students identity. Additionally all work is subject to sample second marking and moderation, and each module assessment is reviewed by an independent academic External Examiner to the University. In this way the University assures itself of the standards applied.

22. Module specification

Module rationale:

All researchers in social science subjects need to be familiar with the basic techniques used in multivariate analysis in order to be able to understand the large number of articles, and reports that use these techniques to analyse data. Moreover, researchers need to be able to assess if multivariate techniques are applicable to their own research agenda.

Aims and distinctive features:

This module provides an introduction to multivariate techniques to enable students to understand the literature that uses these techniques and to be able to assess if these techniques can usefully be applied to their own research. The module also provides the basis from which students can develop expertise in those areas of multivariate techniques that are useful for their research.

Learning outcomes:

Understand the main multivariate techniques used in social science research.

Understand what the results from these techniques mean.

Understand the limitations and problems of using these techniques.

Assess the usefulness of these techniques for the students' research.

Acquire the capability to develop expertise in those multivariate techniques that are useful for their own research.

Learning and teaching strategy:

The following teaching & learning strategies are used within this module:

Workshop in which an author will discuss how these techniques were used in a recently published paper.

Lectures will outline the basic approaches used in multivariate data analysis.

Seminars in which students will discuss and evaluate the use of these techniques in published papers.

Assessment strategy:

The following assessment strategies are used within this module:

The module will be assessed by series of short evaluations of the use of the main types of multivariate data analysis techniques used in journal articles in the subject area of the research of the student. In these assessment student will demonstrate that they understand the meaning of the findings presented in the papers and that they can evaluate the strengths and weakness of the approaches that are taken in the articles. These assessments will test all of the learning outcomes.

Alternative reassessment strategy:

The reassessment method for this module has been declared to differ from the original assessment mechanism as follows: The reassessment method for this module has been declared to differ from the original assessment mechanism as follows: Candidates failing this module will be reassessed in the failed element/s only, unless it is specifically requested otherwise, according to School policy and criteria.

Arrangements for revision and private study:

The lectures will provide guidance on the basic materials covered in the module. The module handbook will provide guidance as regards the contents of the module and indicative reading. There is an expectation that students will engage in substantial independent study in preparation for the lectures/seminars and assessments.

Module constraints:

Students must have completed the following modules (or their equivalents) before taking this module. Quantitative Data Analysis; Computing with SPSS; and Quantitative Research in Business and Management

Indicative Module Content

Main techniques used in multivariate analysis - factor analysis; multiple regression; categorical regression; cluster analysis; discriminant analysis; canonical correlation analysis; structural equation analysis.

Data requirements for multivariate analysis.

Formulating testable hypotheses for multivariate analysis.

Understanding the results from these types of analysis.

Limitations of these types of analysis.

23. Reading and resources list

Main Text

Hair JF, WC Black, BJ Babin, RE Anderson and RL Tatham (2006) Multivariate Data Analysis, Sixth Edition, Pearson International.

Software: Minitab 14, SPSS 15, GiveWin PcGive, Excel, GAMS/MPSGE as necessary.

Recommended Texts

Easterby-Smith M. and Thorpe R. (2002), Management Research: An Introduction, Sage

Diamantopoulos, A. and Sigauw, J. (2000) Introduction to Lisrel: A Guide for the Uninitiated, Sage

Stockburger, D. Multivariate Statistics Concepts, Models and Applications (Free web based book with simple examples of the use of multivariate techniques)

www.psychstat.smsu.edu/multibook/stathome/mlt00.htm South West Missouri State University (1998)

Research Methods in the Social Sciences: An Internet Resource List

www.library.miami.edu/netguides/psymeth.html

Pre-requisite reading

Core text(s)

Hair JF, WC Black, BJ Babin, RE Anderson and RL Tatham (2006) Multivariate Data Analysis, Sixth Edition, Pearson International.

Equivalent reading

Anderson TW (1984) An Introduction to Multivariate Statistical Analysis, Wiley, New York.
Kendall Maurice (1975) Multivariate Analysis, Charles Griffin and Company Ltd. London and High Wycombe.
Everitt Brian S (1993) Cluster Analysis, Edward Arnold, London.
Koop Gary (2008) Introduction to Econometrics, Wiley, Glasgow, ISBN: 978-0-470-03270-1.
Morrison DF (1967) Multivariate Statistical Methods, McGraw-Hill, New York.
Stock & Watson (2007) , Introduction to Econometrics, ISBN: 0321442539
Wooldridge J.M. (2006) Introductory Econometrics: A Modern Approach.

Specific software:

Doornik J A and D.F. Hendry ((2003) PC-Give Volumes I-III, GiveWin Timberlake Consultants Limited, London ; <http://www.oxmetrics.net>.; GAMS corporation at www.gams.com.

Further reading

Multivariate Analysis

Anderson T.W. (1996) R.A. Fisher and Multivariate Analysis, *Statistical Science*, 11:1:20-34.

Bartlett M.S. (1947) Multivariate Analysis, Supplement to the *Journal of the Royal Statistical Society*, 9:2:176-197.

Beyer A, REA Farmer, J Henry and M. Marcellino (2005) Factor Analysis in a New Keynesian Model, European Central Bank, Working Paper Series, no. 510, August

Chung KC, Tan SS. Holdsworth DK (2008) Insolvency Predication Model Using Multivariate Discriminat Analysis and Artificial Neuroal Network for the Finance Industry in New Zealand, *International Journal of Business Management*, 3:1:19-28.

Finnerty JE (1976) Insiders' Activity and Inside Information: A Multivariate Analysis, the *Journal of Financial and Quantitative Analysis*, 11:2:205-215.

Gatty R (1966) Multivariate analysis for marketing research: An Evaluation, *Applied Statistics*, 15:3:157-172.

Gudmundsson G. (1977) Multivariate analysis of economic variables, *Applied Statistics*, 26:1:48-59.

Hirschberg JG, E Maasoumi and DJ Slottje (2001) Clusters of Attributes and Well-Being in the USA, *Journal of Applied Econometrics*, 16:3:445-460.

King LJ (1970) Discriminant Analysis: A Review of Recent Theoretical Contributions and Applications, *Economic Geography*, 46: Supplement:367-378.

Luzzi GF, YFluckiger and S Weber (2006) A cluster analysis of multidimensional poverty in Switzerland, Haute Ecole de Gestion de Geneve.

Maasoumi E (1986) The measurement and decomposition of multi-dimensional inequality, *Econometrica*, 54:4:991-997.

Pinches GE and K A Mingo (1973) A Multivariate Analysis of Industrail Bond Ratings, *Journal of Finance*, 28:1:1-18.

Proudfoot MJ (1937) City Retail Structure, *Economic Geography*, 13:4:425-428.

Rao C R (1972) Recent Trends of Research Work in Multivariate Analysis, *Biometrics- Special Multivariate Issue*, 28:1:3-22.

Rayner A C (1970) The Use of Multivariate Analysis in Development Theory: A Critique of the Approach Adopted by Adelman and Morris, *Quarterly Journal of Economics*, 84:4:639-647.

Rider P R (1936) Annual Survey of Statistical Technique: Developments in the Analysis of Multivariate Data - Part I, *Econometrica*, 4:3:264-268.

Schervish MJ (1987) A Review of Multivariate Analysis, *Statistical Science*, 2:4:396-413.

Sorensen CK and JMP Gutierrez (2006) Euro Area Banking Sector Integration Using Hierarchical Cluster Analysis Techniques, European Central Bank, Working Paper Series, no. 626, May.

Stevens DL (1973) Financial Characteristics of Merged Firms: A Multivariate Analysis, *Journal of Financial and Quantitative Analysis*, 8:2:149-158.

Thomas BAM (1961) Some Industrial Applications of Multivariate Analysis, *Applied Statistics*, 10:1:1-8.

Wishart J (1955) Multivariate Analysis, *Applied Statistics*, 4:2:103-116.

Readings in Time Series Analysis

1. Dickey D.A. and W.A. Fuller (1979) Distribution of the Estimator for Autoregressive Time Series with a Unit Root, *Journal of the American Statistical Association*, June.
2. Engle R E and C.W.J. Granger (1987) Co-integration and Error Correction: Representation, Estimation and Testing. *Econometrica*, vol. 55, No. 2, pp. 251-276.
3. Heckman J. J., (1979), Sample Selection Bias as a Specification Error, *Econometrica*, Vol. 47, No. 1, pp153-161.
4. Hendry D.F. (1997) The Econometrics of Macroeconomic Forecasting , *The Economic Journal*, Vol. 107, No. 444., pp. 1330-1357
5. Pedroni, P. (1999): "Critical values for cointegration tests in heterogeneous panels with multiple regressors", *Oxford Bulletin of Economics and Statistics*, 61, p.653-670.
6. Pesaran, M.H. and R. Smith (1995): "Estimating long-run relationships from dynamic heterogeneous panels", *Journal of Econometrics*, 68, p.79-113
7. Phillips P.C.B. (1987) Time Series Regression with an Unit Root, *Econometrica*, vol. 55, No. 2, 277-301.
8. Johansen Soren (1988) Statistical analysis of cointegration vectors, *Journal of Economic Dynamics and Control*, 12:231-254, North Holland.
9. Johansen Soren (1988) Estimation and Hypothesis Testing of Cointegration Vectors in Gaussian Vector Autoregressive Models, *Econometrica*, 59:6, 1551-1580.
10. Lancaster T (1979) Econometric Methods for Duration of Unemployment, *Econometrica*, 47:4:939-56.

Specific software:

Doornik J A and D.F. Hendry ((2003) PC-Give Volumes I-III, GiveWin Timberlake Consultants Limited, London ; <http://www.oxmetrics.net>.; GAMS corporation at www.gams.com.

Koopman SJ, AC Harvey, JA Doornik and N Shephard (2000) Structural Time Series Analyser, Modeller and Predictor, Timberlake Consultant Ltd, London.

Bhattarai's web page: <http://www.hull.ac.uk/php/ecskrb> and particularly see following books if you have further interest in modelling:

- Bhattarai K. (2008) Economic Theory and Models: Derivations, Computations and Applications for Policy Analyses, Serials Publications, New Delhi, ISBN: 978-81-8387-141-9.
- Bhattarai K. (2008) Static and Dynamic Applied General Equilibrium Models Tax and Trade Policy Models of the UK Economy, Serials Publications, New Delhi, ISBN: 978-81-8387-138-9.
- Bhattarai K. (2007) Models of Economic and Political Growth in Nepal, Serials Publications, New Delhi, ISBN: 978-81-8387-109-9.

Brief Instructions to the use of software

- MINITAB available at the university network in applications folder. Trial version of it can be downloaded freely at <http://www.minitab.com/Downloads/>.
- SPSS 15: It is available to academics of Hull University from the Computing Centre of Hull University at £5. It is available in the university network.
- **Excel** Spreadsheets are very user friendly and could be used for algebraic calculations and statistical analyses for many kinds of economic models. First prepare an analytical solution by hand then use Excel formula to compute _ See Solow.xls and Ramsey.xls. Excel has constrained optimiser routine at tool/goal seek and solver command. Koop G (2000) Analysis of Economic Data, Wiley, UK is a good text for excel applications.
- **OX-GiveWin-PcGive-STAMP** (www.oxmetrics.net) is a very good econometric software for analysing time series and cross section data. This software is available in all labs in the network of the university by sequence of clicks Start/applications/economics/Givewin. Following steps are required to access this software.
 - a. save the data in a standard **excel file**.
 - b. start give win at start/applications/economics/**givewin**.
 - c. open the data file using **file/open datafile** command.
 - d. choose **PcGive module** for econometric analysis.
 - e. select the package such as **descriptive statistics, econometric modelling** or **panel data** models.
 - d. choose **dependent and independent** variables as asked by the menu. Choose options for output.
 - e. do the **estimation** and analyse the results, generate **graphs** of actual and **predicted** series.

Consult manuals by Doornik J A and D.F. Hendry ((2003) PC-Give Volume I-III, GiveWin Timberlake Consultants Limited, London or by visiting the web <http://www.oxmetrics.net>.

A **Batch file** can be written in OX for more complicated calculations using a text editor such as pfe32.exe. Such file contains instructions for computer to compute several tasks in a given sequence.
- **GAMS** is good particularly in solving a general equilibrium model with many linear or non-linear equations on continuous or discrete variables. It comes with a number of solvers that are useful for numerical analysis. For economic modelling it can solve very large scale models using detailed structure of consumption, production and trade arrangements on unilateral, bilateral or multilateral basis in the global economy where the optimal choices of consumers and producers are constrained by resources and production technology or arrangements for trade. It is a user friendly software. Any GAMS programme involves declaration of set, parameters, variables, equations, initialisation of variables and setting their lower or upper bounds and solving the model using Newton or other methods for linear or non-linear optimisation and reporting the results in tables or graphs (e.g. ISLM.gms). GAMS/MPSTGE program is good for large scale standard general equilibrium models. GAMS programme is located at N:\special\ec\gams\gams in the university network and can be used by going through following steps.
First, create a directory called models in G:drive G:\> md Models then G:\> cd Models. Then write or copy a GAMS program file in that directory such as G:\models\islm.gms .
Type P:\APSS\gams\gams islm.gms to run a GAMS program of a model in the network. The results of the model computations can be seen in the list file called ISLM.LST.

The check whether the results are consistent with the economic theory underlying the model such as ISLM-ASAD analysis for evaluating the impacts of expansionary fiscal and monetary policies. Use knowledge of growth theory to explain results of the Solow growth model from Solow.gms. Consult GAMS and GAMS/MPSGE User Manuals, GAMS Development Corporation, 1217 Potomac Street, Washington D.C or www.gams.com. Bhattarai (2006) Research Methods For Economists, Business School, University of Hull.

Journal list

The following Journals are appropriate to the module and will contain further articles which you may find helpful:

American Economic Review; Journal of Economic Perspectives, Economic Journal; Journal of Economic Literature; Applied Economics; Applied Financial Economics, Applied Economic Letters, Applied Financial Economic Letters, Economica, International Economic Review, Journal of Political Economy, Review of Economic Studies, Oxford Economic Papers, Journal of European Economic Association.

Have a look at Blackwell, Francis and Taylors, Cambridge University and Sage Journals. Econlit and JOSTOR databases.

Websites

You will find these Web sites helpful for the module and are advised to consult them regularly. You may discover other Websites which are also helpful.

<http://www.prenhall.com/hair>
<http://www.helsinki.fi/WebEc/>;
www.bb6.hull.ac.uk;
<http://www.hull.ac.uk/php/ecskrb/>
<http://www.hull.ac.uk/php/ecskrb/Kathman.html>
http://www.hull.ac.uk/php/ecskrb/Hull_Conference_07.html
<http://www.feweb.vu.nl/econometriclinks/>
<http://www.helsinki.fi/WebEc/WebEc.html>
<http://www.res.org.uk/>;
<http://www.eswc2005.com>
<http://www.eea-esem.com/EEA-ESEM/2006/Prog/>
<http://www.vanderbilt.edu/AEA/>
<http://www.ecomod.net/conferences.htm>
<http://www.iioa.org/conferences.htm>

<http://gemini.econ.umd.edu/conference/> ;
<http://www.iaes.org/>
<http://www2.warwick.ac.uk/fac/soc/economics/staff/faculty/wooders/peking04/>
<http://www.econometricsociety.org>
<http://ius.unicas.it/mc2005/index.php?pageid=8>
<http://www.oswego.edu/~economic/econsoftware.htm>
<http://www.isid.ac.in/~sames06/>
<http://www.conferencealerts.com/econ.htm>

Other Sources:

The range of references and resources available throughout the University Library is increasing constantly on a daily basis. The list above should be thought of as an opening into the literature. You are strongly encouraged to browse through the stock and to pay particular attention to the New Periodicals shelves.

24. Module evaluation

This module will be evaluated by means of the Business School module evaluation questionnaire (MEQ), which all students are required to complete at the end of the module. The results of this formal evaluation will be forwarded to student-staff committees and programme group meetings and will be used to make alterations and improvements to the delivery and content of the module next year, if these are deemed to be necessary. Additional module evaluation techniques are also employed. Issues concerning the module

can be forwarded directly to the module leader or to staff student committees. You may also have the opportunity to make informal comments and suggestions concerning the module in tutorial sessions.

Module evaluation is an integral part of the School's annual reporting process, therefore, your input is highly valued and, as such, much appreciated.

25. Module review

This module was considered exemplary in terms of structure of exam papers and organisation of teaching last year.

26. Module changes

Wherever possible, the module timetables and content will be delivered as outlined in this module handbook. However, at times changes do have to be made. In the event of such changes occurring, every effort will be made to re-schedule the activity, or replace it with work of an equivalent nature. It is your responsibility to keep abreast of the current information which will be relayed to you in lectures, on notice boards or via blackboard.

27. Health and safety

You are responsible for your own health and safety at all times. It is vitally important that you act sensibly and safely for both indoor and outdoor activities. You are required to follow all safety instructions and guidelines as laid down in your Business School Programme Handbook.

The module staff hope that you enjoy studying this module and that it makes a valuable educational contribution to your chosen programme.

28. Notes

Assignment on Multivariate Analysis (56198)

New Store is a distributor of varieties of consumer products. It likes to conduct a survey with an aim to find out the major factors that determine its market structure including decisions of customers to buy or not to buy from this store, the categories of customers attracted to its services, their geographic locations and level of education as following:

Gender	Age	region	work	Employ	Income
Unemploy	Accomod	Education	Buy	Price	Quality
Proinfo	Adv	Popularity	Reliability	Guarantee	Brand
Stores	Cutmserv	Openhour	internet	myincome	Fincome
Nincome	Revstore	Tax	Variety	weather	

1. Preparation of data for analysis

[25]

Construct a data set with a random sample size of 105 in excel taking imaginary but tentative responses to survey questionnaire included at the end of this question. Compute descriptive statistics and plot the frequencies for each variable. Conduct tests for missing data. Compute bivariate and partial correlations and the distance measure. Use Minitab or SPSS software whichever more comfortable to you. (Minitab is available at Hull University network and Trial version of Minitab can be downloaded free <http://www.minitab.com/Downloads/>).

2. Dependent Analysis:

[25]

Show how following analytical tools could be applied to the data set constructed above.

- Multiple regression- Metric Variables
- Conjoint analysis - categorical dependent variables
- Discriminant analysis - categorical dependent variables
- Multivariate analysis of variance (MANOVA)
- Canonical correlations
- Structural equation modelling

Write brief comments on your results.

3. Interdependent Analysis

[25]

Apply following tools for multivariate interdependence analysis in analysing above data.

- Factor analysis
- Cluster analysis
- Multidimensional scaling
- Correspondence analysis.

Explain the meaning of estimates.

4. Time series analysis.

- Seasonally adjust the variables contained in retail_monthely.xls. Plot seasonally regressed series along with unadjusted series.
- Use ARMA (p, d, q) to model any of these two series and interpret significance of coefficients.
- Determine stationarity of variables using unit root and cointegration tests.
- Estimate and use a VAR model for forecasting and impulse response analyses.
- Estimate a GARCH Model for volatility analysis.

5. Optional question:

[25]

General equilibrium modelling is more sophisticated multivariate analysis. Discuss.

[Bonus marks up to 20 percent]

Assignment should be written in 3000 words and review of some literature to support explanation of each component is expected.

k. Internet sales

1	2	3	4	5	6	7	8	9	10
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l. My Income

1	2	3	4	5	6	7	8	9	10
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m. Family income

1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	----

n. National income

1	2	3	4	5	6	7	8	9	10
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o. Revenue of the store

1	2	3	4	5	6	7	8	9	10
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p. Size of the store

1	2	3	4	5	6	7	8	9	10
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q. Tax

1	2	3	4	5	6	7	8	9	10
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r. Variety in the store

1	2	3	4	5	6	7	8	9	10
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s. Popularity among peers

1	2	3	4	5	6	7	8	9	10
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t. Availability of credit

1	2	3	4	5	6	7	8	9	10
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u. After sale service

1	2	3	4	5	6	7	8	9	10
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v. Weather

1	2	3	4	5	6	7	8	9	10
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w. growth of regional economy

1	2	3	4	5	6	7	8	9	10
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x. growth of national economy

1	2	3	4	5	6	7	8	9	10
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y. productivity of worker

1	2	3	4	5	6	7	8	9	10
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z. unspecified factors

	2	3	4	5	6	7	8	9	10
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