RMIT BUSINESS - SCHOOL OF MARKETING

PROPERTY GROUP

PR220 — Property Data Analysis 2

SUBJECT GUIDE
Semesters 1 & 2 - 1999

Faculty	RMIT Business
School	Marketing
Group	Property
Course	167004 - Bachelor of Business - Property
	Second year core unit for all streams in Property
Syllabus Number	PR220
Subject Lecturer	John Flaherty Telephone 9925 5546 Email john.flaherty@rmit.edu.au
Mode	Internal - Full year
Credit Points	12
Contact Hours	1 x 2 hour class per week (Full time and Part time)
Non-Contact Hours	4 hours per week minimum
Pre-requisites	PR101 Property 1 PR120 Property Data Analysis 1 PR110 Valuation Principles An accredited introductory course in Microsoft Excel or equivalent spreadsheet application
Co-requisite	Nil
Timetable / Location	Wednesdays - Building 108.8.27
Subject Website location	http://www.bf.rmit.edu.au/Property/subjects/pr220/guide.htm

Subject Description:

The aim of this subject is to enable students develop quantitative skills and techniques for application in a business environment with specific reference to the property field. Students should be cognisant of specific problems in their field of study and be able to identify and apply the appropriate technique to analyse these problems. Emphasis will be placed on the use of computer based methods of analysis and students will be expected to use several of Excel's built-in statistical and mathematical functions in the development of most of the techniques introduced. In addition, students are expected to master array formula and the Solver add-in.

The first semester is devoted almost completely to developing a foundation for the regression model. This will require an understanding of descrepitve statistics and probability theory. The multivariate regression model will gradually be introduced and the appropriateness of its use in a variety of applied situations will be examined. Second semester will focus on the use of selected multivariate and forecasting models, linear programming, and network analysis and how they may be applied in a property environment.

The emphasis throughout the course will be to present the various techniques in a manner suitable for students who have completed an introductory course in statistics. While this course is designed specifically for property students **it is essentially a course in quantitative techniques and their application in a property context**.

For each area of study there will be practice exercises to develop students skills and enhance their understanding of the subject. **Selected exercises will be chosen for class discussion,**

however, students are strongly encouraged to work through all the set problems. Working systematically through the set exercises is an essential pre-requisite to understanding the concepts introduced.

There is no short cut to building a good quantitative foundation. The most effective method is to master each of the topic areas as they are presented during the year. This subject builds on the material covered in the first year data analysis subject. Also, most of the later topics build on earlier topics. Students who **work consistently throughout the year** will comfortably and gradually master the concepts. As with all quantitative subjects, concentrated effort in the week before the examination is unlikely to result in a high mark, but when it is combined with a consistent effort throughout the year the probability of achieving a high mark in PR220 is very close to one.

There is a general misconception among some students that if they focus on **answers** they will acquire an understanding of the material, or at least sufficient to get them through the subject. This is a very dangerous strategy and one that will result in serious gaps in your understanding, placing you at a serious disadvantage at times when the answer to your specific question is not available. Such a situation may arise during an examination or if in your professional career you are trying to solve a problem that no one has previously encountered.

Applying the knowledge and skills you have acquired in the subject to **work out solutions** will provide you with a rich and rewarding learning experience that will benefit you throughout your professional career.

In this subject students are exposed to a number of very powerful techniques. Understanding the foundations of these techniques is an important prerequisite for their **correct** use. With recent advances in desktop technology most of these techniques are available to anyone carrying out data analysis, regardless of their background knowledge and experience. Without an appreciation for the underlying theory supporting these techniques they are frequently used inappropriately and the analyis carried out cannot meaningfully contribute to the decision environment. A major goal of this subject is to provide students with **an appreciation for the underlying theory**.

If you are having difficulty with any aspect of the material presented, whether it is lecture material or one of the set problems, ask your lecturer for guidance and preferably during class when all students will have an opportunity to benefit from these discussions.

Consistent and dedicated effort will provide long lasting rewards.

Objectives:

At the end of the course, students should be able to:

- Understand and appropriately use descriptive statistics
- Develop statistical models and understand the role of theory in developing models
- Develop an understanding for the role statistics plays:
  - in describing characteristics of populations
  - in the analysis of managerial and business problems
  - in the investigatory process used for carrying out research of applied problems
- Appreciate the potential (and limitations) of statistics for practical applications to:
  - mass valuations
  - identifying demand and supply characteristics for different classes of property
  - testing of existing theories (e.g. the bid rent curve)
- Understand and develop optimisation models for application to property and investment problems
- Use a variety of forecasting models as an aid to improving decision making
- Use modern spreadsheet analysis to estimate models and generate meaningful results

- Use spreadsheet model interrogation techniques to carry out various types of scenario analysis.
- Apply theoretical models in developing solutions to real world problems.
- Recognise the positive contribution of quantitative techniques in the analysis of a variety of common business problems.

Graduate Attribute Contribution:

The subject described in this manuscript attempts to foster the attainment of various attributes described in the document : *Graduate Attributes of the Bachelor of Business (Property) Degree*. The latter is an official departmental document that describes - as its title suggests - the desirable attributes of graduates of the undergraduate property degree at RMIT. Reproduced below is a subset of various graduate attributes that the present subject specifically seeks to cultivate in students.

- **The ability to communicate .....**

  The ability to speak in front of people is extremely important in the business environment. The lecturer in this unit is committed to providing an interactive learning and teaching environment that enhances the capacity of students to communicate orally. The class based system used in this subject provides students with an opportunity to raise issues and discuss concepts introduced during lecture and discussion periods.

- **The ability to work individually .....**

  The ability to work autonomously with little direction is a valued attribute in the business environment. In this unit there are some self directed study tasks that cover material not presented explicitly by the instructor. For instance, students are required to examine readings (not previously discussed by the lecturer) in preparation for tutorials and assignments which is designed to assimilate and enhance their understanding of the subject material.

- **The ability to work as part of a team .....**

  Notwithstanding the ability of a person to work individually, it is also a valued attribute that s/he can work as part of a team. The Group Assignments mentioned under the heading: Structure and Assessment (see above) provides an avenue through which this ability may be nurtured as well as assessed. This is because the group assignment is designed to encourage a process of 'collegiate' learning. This is the synergetic learning that often arises when dialogue among close colleagues (including the lecturer who will act as consultant) focuses on a common academic endeavour. In addition, students are strongly encouraged to form study groups to discuss concepts introduced, to develop networks as well as gain access to a range of resources and ideas.

- **The ability to understand the broad .... context within which property decisions are made.**

  Sound real-estate decision making does not take place in a vacuum. Rather, it demands a fairly astute appreciation of the broader socio-political and economic context within which such a real estate decision must be made. Much of the material presented in all modules of this unit compels students to think in this broader context as well as to integrate their knowledge accumulated to date in such diverse areas as : finance, valuations, economics, quantitative methods and world financial markets.

- **To be employable and creative**

  The property graduate will be more employable in the real estate sector and for that matter the wider business community if s/he is able to facilitate decision making in either domain through the creative application of contemporary theoretical tools and methodologies. Throughout this unit, students will be exposed to a variety of contemporary theoretical tools, methodologies and models (e.g. quantification of risk, characteristics of populations of interest, evaluation of the interrelationships between economic variables, portfolio analysis, forecasting methodologies, optimisation techniques etc.) that may be creatively used to facilitate business decision making either in the real estate sector or the general business community.

- **To be professional as well as ethical**

  Generally speaking, a business person that is both ethical and professional (i.e. accountable, responsible, caring and courteous) will be valued by company clients, company superiors (senior management) and subordinates (workers).

This subject enables students to work individually and as part of a team providing opportunities to contribute to the learning of colleagues as well as benefiting through this environment. Group assignments require all members of the group to make a declaration stating that the work submitted reflects the efforts of each member of the group and that each have met the criteria established by the group, that is, each group member is expected to have contributed a fair share to the group's submission and could defend the arguments and analysis embodied in the assignment.

If a group member's contribution is judged to be unsatisfactory by other members of the group the members may, in consultation with their tutor, exclude that member's name from the submitted assignment.

- **Ability to prepare detailed real estate strategies .....**

  It is essential that students graduating with a Property degree be able to prepare detailed strategies that deal with the financing, management and evaluation of investment proposals (i.e. feasibility and project analysis). Is important also that graduands have some level of mastery of the most up to date quantitative tools and be able to use state of the art computer technology to support objective analysis and investigation of applied problems. Virtually all the course material presented in this subject is highly relevant to the attainment of these specific graduate attributes.

Consistency of Subject with RMIT's Teaching and Learning Strategy

The subject described in this manuscript is consistent with various aspects of the document: *RMIT University Teaching and Learning Strategy 1998 - 2000*. The latter is an official institute document that describes the various :

- goals
- operational priorities
- sub strategies
- performance information indicators

of the university's current teaching and learning strategy.

Listed in boldface immediately below are three goals enunciated in the university's teaching and learning strategy. After each of these goals, find a brief indication of how each of these goals are met by this subject.

- **To graduate students of world class standing who demonstrate leadership by contributing creatively, critically and responsibly to their professions and to the community.**

The subject involves creative as well as critical assessment of current literature in the area of modelling. The group assignments enable students to apply the principles of quantitative analysis, introduced in the subject, to the analysis of real world problems in the areas of valuation and feasibility analysis. It is held that the experience of having to challenge ideas, methodologies and computations that appear in leading textbooks and current business periodicals is one way to foster the goal highlighted immediately above.

- **Maximise learning for all students by creating student centred environments in all subjects and courses**

The group assignments encourages a student centred learning environment that is best described as *collegiate learning* .

- **To equip students for employment, further learning and active citizenship through the provision of soundly based relevant and forward looking curricula.**

The subject material presented in this subject includes up to date methodologies in quantitative analysis and introduces students to a structured understanding of decision making in a property oriented environment. Computer based techniques of analysis and an awareness of the resources available through the Internet equip students to be adaptive and employable in a dynamic and rapidly changing business environment.

Structure:

For full-time and part-time students there will be one 2 hour lecture/class per week throughout the year.

Full-time Wednesday 10.30 am – 12.25 PM and 12.30 – 2.30 PM

Part-time Wednesday 7.35 PM - 9.25 PM

The average student could expect to spend at least 4 hours per week on work out of class, though this will vary substantially for individual students due to their background and skills. Lectures are an essential part of the subject and while **attendance** is not compulsory it is **strongly recommended**. Students are also encouraged to complete the tutorial exercises set and where necessary discuss them during class. Students are reminded that **tutorial exercises are** designed to complement the material presented in lectures and are therefore **essential to understand the concepts** introduced. Students should ideally work through all the set exercises and raise any issues requiring further clarification in class.

Excel Based Computer Workshops Semester One

All students are required to attend 3 consecutive Excel workshops during **first semester**. The purpose of these workshops is to ensure that sudents' spreadsheet skills are of a standard enabling them to complete the requirements for this subject. Students must register for these workshops in advance and they will be allocated a place based on a *first come first serve* basis. Information on registration for these workshops is provided is a separate handout and details of times, location and the allocation of places will be posted on the Property Group notice board on Level 14.

Special Classes to Cover Advanced Material Semester Two

Throughout second semester a special class will be held to cover more advanced material. It is recommended that all students attend these classes. The material will be presented at a higer level and classes will move at a faster pace than in the regular sessions. Students who are not sufficiently challenged by the material presented in the regular classes are strongly encouraged to attend these sessions. While attendance at these sessions, and study of the material presented, is a matter of personal choice for each student, the material covered in these classes will form part of the end of year examination. This section of the examination paper will be titled **Part B**. Sudents should be aware that it will not be possible to achieve the award of distinction or better in PR220 unless they attempt Part B of the examination paper.

Students who elect not to cover the more advanced material will be marked out of all the available marks up to a credit only. The award of distinction or higher is available only to those students who attempt Part B of the end of year examination paper.

Assessment:

The assessment for PR220 is:

(i) Two assignments set during the year contributing a total of 20%.

(ii) A mid semester test in **first semester** contributing a total of 10%

(iii) A mid-year examination accounting for 20% of course marks.

(iv) Final examination at the end of the year contributing 50% to the course marks.

Students are required to achieve a satisfactory performance in each piece of assessment in the year in which they are enrolled for the subject. All assessment must be completed and students must obtain at least 50% of the marks available in the final examination. In addition, students must achieve a minimum of 50% in aggregate, in both the mid-year and final examinations, to become eligible for a pass in PR220.

Reports on final assessment are available to students who apply in writing to the Head of Department controlling the subject, within one month of the official notification of results. The report will be limited to providing a breakdown of marks. Detailed information on assessment policies and procedures including appeals against assessment is available from the departmental office in Building 108, Level 14, in the Faculty of Business.

Assignments

The assignments are to be completed by students working in groups, the recommended group size is three. The first assignment will contribute 10% to the marks available for PR220 and will be distributed in class nearing the end of first semester. The second assignment will contribute 10% to the course marks and be distributed in class about the middle of second semester. Assignments require the use of Excel or an equivalent software application. It is assumed that all students have completed an introduction to Excel (or equivalent) and have mastered the material covered in the Excel workshops during first semester.

Unless prior arrangements are made and approval granted assignments submitted after the due date will be corrected but will not carry any marks for assessment purposes. Due dates for assignments will be as stated in the assignment handouts.

The gradings which apply are the standard grades for the University, being:

Grading	Keycode	Score
Fail	NN-N	0 to 49%
Pass	PA-P	50 to 59%
Credit	CR-C	60 to 69%
* Distinction	DI-D	70 to 80%
* High Distinction	HD-H	80 to 100%

* Distinction and High Distinction are available only to those students who attempt Part B on the final exam.

Plagiarism Warning:

Students may be tempted from time to time to misrepresent the words and works of others as their own. Student submissions which do not properly acknowledge the works of others will be graded at zero. Plagiarism is regarded as a form of cheating and is subject to University regulations.

Review:

In accordance with the provisions of the Freedom of Information Act 1983, access to completed and marked examination scripts is available to students after examination results are released. Reports on final assessment are also available to students. For either of these actions **students are required to apply in writing** to the Head of the Department controlling the subject within one month of the official notification of results.

Detailed information on assessment policies and procedures, including appeals against assessment, is available from the office of the Property Group. This office is located on Level 14 of Tivoli Building.

Student Evaluation of Subject:

At the end of the academic programme, students are invited to provide formal feedback to the lecturer - in the form of a questionnaire - on a variety of aspects associated with the subject offering (e.g. adequacy of lecturing, rigour of assessment programme, clarity and relevance of texts, attainment of subject aims and objectives) The primary purpose of this feedback - which is provided anonymously - is to provide guidance on how the subject offering may be improved for future offerings.

Textbook: J. Flaherty, R. Lombardo, P. Morgan, B. DeSilva & D. Wilson, ***A Spreadsheet Approach to Quantitative Methods***, 1999.

References: Bails, D.G. & Peppers L.C., ***BUSINESS FLUCTUATIONS: Forecasting Techniques and Applications***, 1982, Prentice-Hall Inc.

Hair, Jr., J.F., Anderson, R.E., Tatham, R.L., & Black, W., ***Multivariate Data Analysis***, Fifth Edition, 1998, Prentice Hall.

J.E. Hanke & A.G. Reitsch, ***Understanding Business Statistics***, 2nd edition, Richard D. Irwin, 1994.

D.E. Lewis, D.T. O'Brien, and D. Thampapillai, ***Statistics For Business and Economics***, Harcourt Brace Jovanovich, 1990.

Makridakis, S., Wheelwright, S.C. & McGee, V.E. ***FORECASTING: Methods and Applications***, Second edition, Willey 1983.

Render, B. & Stair, Jr., R.M. ***Quantitative Analysis For Management***, Sixth Edition, 1997, Prentice Hall.

P. Waxman, ***Business Mathematics and Statistics***, Fourth edition 1998, Prentice Hall.

Additional Resources: Students are encouraged to use the Internet as an information and educational resource. Several useful links may be found at the Web site for this subject (see above). These include links to introductory business statistics and a statistics dictionary. Extensive use will be made of Microsoft Excel during the course and students are encouraged to develop their skills in this area.

TIMETABLE FOR 1999

	Week No.	Week Beginning	Topic No	Topic Description
Semester 1	1	1st March	1	Review of Introductory Concepts
	2	8th March	2	Basic Concepts in Statistics
	3	15th March	3	Moments about the mean
	4	22nd March	4	Introduction to Probability
	5	29th March	5	Probability Distributions
		1st — 7th April		**Student Vacation**
	6	12th April	7	Nonparametric Statistics
	7	19th April	8	Mathematical Expectation
	8	26th April	8	Simple Regression
	9	3rd May	8	Statistical Inference in Regression
	10	10th May	9	Estimating The Capital Asset Pricing Model
	11	17th May	9	The Multiple Regression Model
	12	24th May	10	Data Problems - Multicollinearity
	13	31st May	-	**Revision**
Semester 2	1	19th July	11	Autocorrelation & Heteroscedasticity
	2	26th July	12	Functional Form of Regression model
	3	2nd August	13	Time Series – Classical Decomposition
	4	9th August	13	Time Series – Exponential Smoothing
	5	16th August	13	Time Series – Error Stats & Autocorrelation
	6	23rd August	14	Multivariate Analysis
	7	30th August	15	LP – Graphical Analysis
	8	6th Sept	15	LP – Simplex Algorithm
	9	13th Sept	15	LP – Applications in Property
	10	20th Sept	16	Networks – Introduction
		27th Sept — 1st Oct		**Student Vacation**
	11	4th October	16	Networks – Critical Path
	12	11th October	16	Networks – Project Crashing
	13	18th October		**Revision**

This timetable is intended as a guide to PR220 and is subject to change during the year. As far as possible efforts will be made to stay close to this outline, however some topics may be changed or not offered in the current year to fit in with students' requirements and progress throughout the year.

Note Generally it is not necessary to read all the references provided in the detailed topic guide following, however, if you find the prescribed text inadequate you should use some of the other references to supplement your reading. Students who need to revise or improve their basic statistical and mathematical skills are encouraged to read the text by ***Waxman*** as early as possible.

Tutorial Exercises: **Semester 1**

Week No.	Week Beginning	Topic No	Tutorial exercises from (FLMSW) Flaherty, Lombardo, Morgan, deSilva & Wilson
1	1st March		----------
2	8th March	2	**Review of Introductory Statistics** Chapter 4: Q's 1, 2, 3 & 4
3	15th March	3	**Moments about the Mean** Chapter 4: Q's 5, 6, 7, & 10
4	22nd March	4	**Introduction to Probability** Chapter 5: Q's 1, 2, 3, 4 & 5.
5	29th March	4	**Introduction to Probability** Chapter 5: Q's 8, 9, 13 & 18
6	5th April	5	**Probability Distributions** Chapter 6: Q's 1, 2, 3, 4 & 5
7	12th April	6	**Nonparametric Statistics** Chapter 8: Q's 1 – 5 & 9
8	27th April	7	**Mathematical Expectation** Chapter 5: 17, 18 & 19
9	4th May	8	**Simple Regression** Chapter 10: Q's 1 – 6
10	11th May	8	**Inference in Regression** Chapter 10: Q's 7, 8, 12 – 16
11	18th May	8	**Estimating The CAPM** Chapter 10: Q. 17
12	25th May	9	**Multiple Regression** Chapter 11: Q's 1, 3, 6, 8 & 10
13	1st June	-	**Revision**

A detailed exercise sheet for **Semester 2** will be distributed at the start of second semester.

Detailed Topic Guide

Topic 1 Overview of PR220 and Review of Introductory Concepts

- Measures of central tendency
- Graphical representation
- Statistical distributions
- Simple regression and correlation

Flaherty	Chapter 2, Sections 2.1 - 2.3
Hanke & Reitsch	Chapter 1
Lewis, et al	Chapters 1
Sandy	Chapter 3

Topic 2 Basic Concepts in Statistics

- The role of statistics
- Descriptive and Inferential statistics
- Measures of Central tendency

Flaherty	Chapter 4, Sections 4.1 - 4.3
Hanke & Reitsch	Chapter 4
Lewis, et al	Chapters 2 and 3
Waxman	Chapters 8 — 15

Topic 3 Moments about the Mean

- The mean and Standard deviation
- Measures of Relative standing
- Skewness and Kurtosis
- Summary statistics using Excel

Flaherty	Chapter 4, Sections 4.4 - 4.6
Hanke & Reitsch	Chapter 4, pp. 104 - 117
Sandy	Chapter 3
Waxman	Chapters 10 & 11

Topic 4 Introduction to Probability

- Outcomes, Events and Sample spaces
- Mutually exclusive & collectively exhaustive
- Independent events
- Joint and Conditional events
- Probability laws
- Bayes' theorem

Flaherty	Chapter 5 Sections 5.2 – 5.5
Hanke & Reitsch	pp. 129 - 143
Lewis, et al	Chapter 4
Sandy	Chapter 4
Waxman	Chapter 13

Topic 5 Probability Distributions

- Discrete and Continuous Random variables
- The Normal Distribution
- Standardised distributions
- The Chi-square Distribution
- The t - Distribution
- The F - Distribution
- The Central Limit Theorem

Flaherty	Chapter 6 Sections 6.1, 6.2, 6.4, 6.7 –6.10
Hanke & Reitsch	pp. 143 - 146
Lewis, et al	Chapters 5 & 6.
Sandy	Chapter 5 - 5.1 & 5.2
Render & Stair Jr.	pp. 69 - 98

Topic 6 Noparametric Statistics

- Measurement scales and parametric methods
- Contingency tables
- Noparametric tests

Flaherty	Chapter 8
Hanke & Reitsch	Chapter 11
Sandy	Chapter 17

Topic 7 Mathematical Expectation

- The concept of Expected value
- The Variance–Covariance matrix
- Risk: Variance-Covariance interaction
- Foundations of Modern Portfolio Theory

Flaherty	Chapter 5 Sections 5.6 – 5.8
Hanke & Reitsch	pp. 143 - 146
Lewis, et al	Chapters 5 & 6.
Sandy	Chapter 5 - 5.1 & 5.2
Render & Stair Jr.	pp. 69 - 98

Topic 8 Simple Regression

- Simple regression
- Regression and Correlation
- Determination of OLS estimators
- An example of land valuation
- Matrix approach to Bivariate Regression
- Presentation of results

Flaherty	Chapter 10 Sections 10.1 – 10.3
Hanke & Reitsch	pp. 550 - 571, 611 - 612
Lewis, et al	Chapter 11
Sandy	Chapter 13 - 13.1
Waxman	Chapter 15

Topic 8 Statistical Inference in Regression

- Interpretation of regression coefficients
- Standard error of the estimate, S_e
- Coefficient of determination, R^2
- t-test on regression coefficients
- F-test on the regression model
- Hypothesis tests for regression coefficients

Flaherty Chapter 10 Sections 10.4 & 10.7
Hanke & Reitsch pp. 571 - 602
Lewis, et al Chapter 12
Sandy Chapter 13

Topic 8 Estimating the Capital Asset Pricing Model

Flaherty Chapter 10 Section 10.6

Topic 9 Multiple Regression Analysis

- The General Linear Model
- Interpretaion of the coefficients in the general model
- Testing hypotheses about the coefficients
- Applications of Multiple Regression Analysis

Flaherty Chapter 11 Sections 11.1 – 11.4
Hanke & Reitsch pp. 613 - 615, 622 - 644
Hair et al Chapter 3
Lewis, et al pp. 256 - 259 and Ch 12
Sandy Chapter 14

Topic 9 Data Problems – Multicollinearity

- What is multicollinearity?
- Why is it a problem?
- Testing for multicollinearity
- Remedial measures to deal with multicollinearity

Flaherty Chapter 12 Section 12.1
Hanke & Reitsch pp. 615 - 622, 665 - 672
Hair et al pp. 66 - 75 & 126 - 128
Lewis, et al Chapter 14.

Topic 10 Autocorrelation and Heteroskedasticity

- The implications of autocorrelation & heteroskedasticity
- Types of data in which autocorrelation & heteroskedasticity is present
- Testing for autocorrelation & heteroskedasticity

Flaherty Chapter 12 Sections 12.2 & 12.3
Hanke & Reitsch pp. 615 - 622, 665 - 672
Hair et al pp. 66 - 75 & 126 - 128
Lewis, et al Chapter 14.