

AP 344
Statistical and Computer Applications in Valuation
3 Credits

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AP 344 Version: 3



Statistical and Computer Applications in Valuation

Calendar Description

This course teaches the fundamentals of exploratory data analysis and real property valuation. Practical uses of statistical and computer applications in determining and analyzing real estate value are explored. This is done by examining case studies and doing hands on computer work on student owned laptops, using the statistical package, SPSS.

Rationale

This is a required course for Real Estate Appraisal and Assessment students. Modern methods of property valuation for appraisal and assessment purposes have developed into computer assisted mass appraisal (CAMA) systems. Students learn the fundamentals of mass appraisal in this course with hands on computer work.

Prerequisites

MA 201

Co-Requisites

None

Course Learning Outcomes

Upon successful completion of this course, students will be able to

Lesson No. 1

1. define a "variable" and its properties.
2. do simple mathematical summations.
3. calculate and explain the difference between absolute and percentage changes in variables.
4. arrange data in groups and differentiate the features of grouped and ungrouped data.
5. determine the absolute and relative frequencies of data.
6. draw and interpret line graphs and histograms.
7. calculate and explain the differences between various measures of central tendency: the mean, the median and the mode.

8. calculate and interpret the various measures of dispersion: the standard deviation, the variance, the coefficient of variation, coefficient of dispersion, and the range.
9. explain the term "correlation" and be able to describe a linear correlation coefficient.
10. explain how to use a multivariate regression equation to obtain the predicted value of a dependent variable.

Lesson No. 2

1. carry out basic procedures for a database including opening and saving, producing reports, and printing reports.
2. examine data using descriptive statistics.
3. examine data using graphic analysis, including histograms, scatter plots, and box plots.
4. examine data using cross tabulation tables.
5. evaluate the correlation between variables.
6. identify variables as multiplicative or additive in basic form.
7. identify whether variables are continuous or discrete.
8. determine the need for and type of transformations of variables, and carry out basic transformations.

Lesson No. 3

1. explain the importance of exploratory data analysis in real estate applications.
2. describe the "Four R's" and the function of each in exploratory data analysis.
3. differentiate between variable types and describes the possibilities and limitations for each in data analysis and model building.
4. use summary statistics to reduce the uncertainty in data.
5. use graphic analysis, including scatter plots, box plots, and histograms, to reveal data characteristics and trends.
6. use transformations to re-express data into formats that better facilitate analysis.
7. recognize non-linear data relationships and explain how logarithmic transformations can be used to account for this.
8. analyze residuals in order to review and assess model quality.

Lesson No. 4

1. identify the main steps of an appraisal assignment leading to selecting the correct market segment.
2. explain the two fundamental components (subject/market) of the process of identifying the correct market segment.
3. recognize the four "dimensional aspects" of the valuation solution, how these help and determine margins for the data frame and the most likely dataset to be used in the analysis.
4. discern the relevance and differences between the subject neighbourhood, the relevant district, and market segment.
5. distinguish a "sufficient" dataset from a data frame, and identify aspects or characteristics which may require additional research.
6. apply statistical and graphical methods to depict and quantify aspects of asset characteristics.

7. determine when circumstances dictate reconsideration of a dataset.
8. explain how experimental method principles of control, randomization, replication, and blocking apply to valuation.
9. apply two basic analytical tools, grouped-pair comparison and simple regression, in valuation situations requiring property characterization.

Lesson No. 5

1. critically analyze a real estate situation to determine the potential for a statistical or computer-based solution.
2. apply techniques learned throughout the course in finding innovative and creative solutions to client issues.
3. discuss the advantages and disadvantages of different computer and statistical applications in a variety of real estate situations.
4. evaluate statistical results in terms of their accuracy, relevance, and helpfulness in solving client issues.
5. explain technical results in clear language that a non-expert layperson could comprehend.

Lesson No. 6

1. develop a simple linear regression model for selling price of real estate against one other variable.
2. develop a simple additive multiple regression model for determining the value of the same set of properties.
3. examine the statistics of the models above to determine the usefulness of the models in estimating sale price.
4. interpret the various measures of regression results: the coefficient of determination (R^2), standard error of the estimate (SEE), coefficient of variation (COV), correlation coefficient (r), t-statistic, F-value, VIF, and Tolerance.
5. explain multicollinearity, its implications in regression analysis, and two methods for detecting and avoiding it.
6. describe the initial steps in model application, including calculating and analyzing the model's predicted values and residuals.

Lesson No. 7

1. describe the nine steps for building a multiple regression analysis model.
2. define a general linear regression model for predicting selling prices.
3. examine a database of variables and evaluate their suitability for use in the regression model.
4. apply a variety of transformation techniques to create variables that are appropriate for use in the regression model.
5. specify and calibrate an additive linear multiple regression model.
6. create and use a regression equation to predict the selling price of a property.
7. test and evaluate the regression model using a variety of statistical methods.

Lesson No. 8

1. optimize raw data for modelling use by eliminating data not of interest, identifying and eliminating duplicate cases, and ensuring all data is well understood and documented.
2. critically evaluate outliers in deciding whether or not to exclude them from the model, considering both the pros and cons of this decision.
3. examine the variables in the database for model usefulness, using descriptive statistics, scatter plots, box plots, and correlations.
4. transform variables for use in the model, including linearizing, recoding binary variables, mathematical transformations, and string transformations (converting descriptive words to numbers that can be used in a model).
5. review variables for inclusion in an additive multiple regression model, excluding inappropriate variables on the basis of number of observations, variable type, relationship to the dependent variable, and multicollinearity.
6. specify a final group of variables for inclusion in a model, using stepwise regression.
7. separate a database into model and test components and explain the reasons for doing so.
8. calibrate an additive multiple regression model, analyzing the variable coefficients for reasonableness.
9. create a ratio variable for testing the performance of the model and apply statistical tools to examine the model quality.
10. test the model's uniformity in valuing property characteristics and make adjustments as necessary.
11. formulate a conclusion on the appropriateness of the model based on testing outcomes.

Lesson No. 9

1. describe what an appraisal valuation model (AVM) is and how AVMs are used in public and private sector property appraisals.
2. explain the impact of AVMs on the appraisal industry, in particular residential appraisal.
3. explain the benefits and limitations of various AVM systems.
4. describe various approaches to evaluation of AVMs.
5. explain how AVMs can be applied in a range of valuation and consulting assignments.
6. discuss the issues faced by members of the professional appraisal and assessment community in meeting professional practice standards with respect to AVMs.

Lesson No. 10

1. describe the basic components of a geographic information system,
2. discuss the evolution of GIS applications and common users.
3. explain how data is stored and accessed in a GIS, from a user perspective.
4. describe a variety of real estate applications that can benefit from the use of GIS.

Resource Materials

Required Text(s):

UBC Real Estate Division. (2007). *Statistical and Computer Applications in Valuation course workbook*. (BUSI 344). Vancouver, BC: Real Estate Division, Sauder School of Business, University of British Columbia.

SPSS software disk.

Reference Text(s):

UBC Real Estate Division. (2003). *Real Property Assessment*. Vancouver, BC: UBC Real Estate Division.

Conduct of Course

Since AP344 is course BUSI 344 in the diploma program in Urban Land Economics at the University of British Columbia, contents of the course workbook are followed.

AP344 is one of the five courses required in the certificate program in Real Property Assessment at the University of British Columbia Real Estate Division.

AP344 is an applied statistical lecture and computer lab course in which students use a statistical software called SPSS and work on their own laptops. The course evaluation consists of chapter multiple choice assignments, two projects that apply the basics of computer mass appraisal to the appraisal and assessment industries and a final exam.

The final exam is developed by the University of British Columbia Real Estate Division. Graded final exams and grades earned in the course are forwarded to the University of British Columbia. A supplemental exam is available to students who do not receive a passing grade.

Classroom participation concerning class material is expected and is beneficial to all students. Practice classroom courtesy so that class discussion periods can be conducted in an orderly fashion. If you must enter the classroom after class has begun, please do so as quietly as possible. If you have a continuing disagreement with the instructor on a particular graded exercise or exam question, please see the instructor after class or during office hours.

Studying for the course: it is critical that each student read the assigned material for each class and keep up to date with all lectures, computer work and assignments.

Student counseling: students who are experiencing difficulty with the course should immediately consult the instructor during office hours or by appointment.

Course withdrawal: students should familiarize themselves with the school's course withdrawal policy and procedures that are explained in the student handbook/calendar. It is important to note that students who simply discontinue attending class without officially withdrawing from the course receive a grade based upon the total points they have accumulated. Ordinarily, the result is a failing grade.

Canceled classes: on occasion classes may be canceled due to inclement weather, instructor illness, or for some other reason. These classes are rescheduled if possible. Please check and carefully read the cancellation notices posted on classroom doorways (i.e. date, time and course).

Cheating: any student observed plagiarizing materials or cheating on written assignments/projects, chapter quizzes or the final exam are dealt with according to the procedure stipulated in the student handbook/calendar.

Evaluation Procedures

Multiple Choice Assignments		10% (in total)
Projects/Written Assignments:		
	No. 1	20%
	No. 2	20%
Final Examination		50%
Total		100%

A minimum grade of 60% (D) is required in each of the projects/assignments and the final examination.

Grade Equivalents and Course Pass Requirements

A minimum grade of D (50%) (1.00) is required to pass this course.

Letter	F	D	D+	C-	C	C+	B-	B	B+	A-	A	A+
Percent Range	0-49	50-52	53-56	57-59	60-64	65-69	70-74	75-79	80-84	85-89	90-94	95-100
Points	0.00	1.00	1.30	1.70	2.00	2.30	2.70	3.00	3.30	3.70	4.00	4.00

Students must maintain a cumulative grade of C (GPA - Grade Point Average of 2.00) in order to qualify to graduate.

Attendance

Regular attendance is essential for success in any course. Absence for any reason does not relieve a student of the responsibility of completing course work and assignments to the satisfaction of the instructor. Poor attendance may result in the termination of a student from a course(s).

If you do not meet the established attendance requirements, your instructor will recommend that the Registrar withdraw your from the course. A failing grade of RW (Required to Withdraw) will appear on your transcript.

In cases of repeated absences due to illness, the student may be requested to submit a medical certificate.

Instructors have the authority to require attendance at classes.

Course Units/Topics

- LESSON NO. 1 - Statistical Foundations for Real Estate Analysis
- LESSON NO. 2 - Statistical Software Applications for Real Estate Analysis
- LESSON NO. 3 - Exploratory Data Analysis
- LESSON NO. 4 - Market Identification and Characterization of Model Building
- LESSON NO. 5 - Valuation Case Studies
- LESSON NO. 6 - Basics of Model Building
- LESSON NO. 7 - Model Building using Multiple Regression Analysis
- LESSON NO. 8 - Comprehensive Model Building – Data Screening and Testing
- LESSON NO. 9 - Automated Valuation Models (AVM's)
- LESSON NO. 10 - Geographic Information Systems (GIS)



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