Course 311 – Real Property Modeling Concepts

Course Description

This course presents a detailed study of the mass appraisal process as applied to residential and income-producing properties. Topics covered include a comparison of single-property appraisal and mass appraisal, the major steps in the mass appraisal process, data requirements, market analysis, the use of sales ratio studies, the cost approach, the sales comparison approach, gross and net income analysis, capitalization rate development, model specification and calibration, valuation review techniques, and maintenance.

Objectives

On completion of Chapter 1, the student will know how to:
- Identify the major steps in the mass appraisal process.
- Define market analysis, property analysis, and comparative data required in the mass appraisal process.
- Express the concept of highest and best use of the site and the improvements.
- Describe modern price theory.
- Explain the difference between model specification and model calibration.
- Describe how supply and demand interact to determine price.
- Differentiate between the basic and expanded model structure.
- Recognize and distinguish between additive, multiplicative, and hybrid model structures.

On completion of Chapter 2, the student will know how to:
- Determine which data items are required for accurate valuation models.
- List several sources of data used in the cost approach to valuation of residential properties.
- Examine income and expense data for income-producing properties.
- Explain several sources of sales data and their relative advantages and disadvantages.
- Examine types of leases applicable for income-producing properties.
- Distinguish between qualitative and quantitative data and provide examples of each.
- Describe objective versus subjective data and give examples of each.
- Express how binary and scalar variables are created and explain their relative advantages and disadvantages in mass appraisal models.
- Define and give examples of reciprocal transformations.
- Define and give examples of exponential transformations.
- Describe how data are affected when raised to exponents of (a) zero, (b) one, (c) greater than one, (d) less than one but greater than zero, and (e) less than zero.
- Define logarithmic transformations and give examples of their use.
- Describe and give examples of multiplicative and quotient transformations.

On completion of Chapter 3, the student will know how to:
- Stratify properties by property type, location, or other criteria utilizing three different methods.
- Determine appropriate units of comparison for market analysis.
- Develop graphs and charts based upon one variable analysis.
- Divide data into percentiles and quartiles.
- Develop common measures of central tendency.
- Develop common measures of dispersion.
- Conduct two-variable analysis using cross-tabulations, scatter diagrams, or box plots.
- Understand three and four variable analysis by using contingency tables or "breakdowns" and
- 3-D charts.
- Develop methods of testing variables utilizing confidence intervals, t-tests, and hypothesis tests.

On completion of Chapter 4, the student will know how to:
- List several uses of ratio studies.
- Define and compute the median, mean, and weighted mean.
- Define, compute, and interpret the coefficient of dispersion (COD) and coefficient of variation (COV).
- List the IAAO standards for the COD for residential property.
- Define, compute, and interpret the price related differential (PRD).
- Define and graphically illustrate assessment regressivity and progressivity.
- Interpret a box plot.
- Interpret a scatter diagram.

On completion of Chapter 5, the student will be able to:
- Describe how building cost components represent the supply side of the market.
- Explain how depreciation represents the demand side of the market.
- Discuss how accurate land values are crucial to the cost approach.
- Explain the structure of residential and commercial cost models, including the role of stratification and typical characteristics in developing base specifications.
- Describe the formula driven cost model.
- Write the formula for a hybrid (generic) cost model, including depreciation and land values.
- Construct depreciation schedules.
- Calibrate cost models to the market.

On completion of Chapter 6, the student will know how to:
- Write the basic formula for an additive, multiplicative, or hybrid model.
- Classify a given model as additive, multiplicative, or hybrid.
- Apply an additive, multiplicative, or hybrid model to a given subject parcel.
- Explain which calibration methods are appropriate for additive, multiplicative, and hybrid model structures.
- Distinguish between simple and multiple regression analysis (MRA).
- List the requirements of effective MRA models.
- Explain the coefficient of determination (R-square) and distinguish between R-square and adjusted R-square.
- Explain the standard error of estimate (SEE).
- Explain how a COV can be extracted from MRA output.
- Interpret t-values and F-values associated with individual regression variables.
- Describe the beta-value associated with an individual regression variable.
- Describe the mechanics and purpose of stepwise MRA.
- Define a regression residual and know the numeric value of the average residual.
- Explain the mechanics and purpose of constrained MRA.
- Explain the basic assumptions made in MRA.

- Describe the mechanics of feedback and its advantages and disadvantages relative to MRA.
- Discuss comparable sales models and their use in mass appraisal.
- Describe Euclidean and Minkowski (city block) distance metrics used in comparable sales models.
- Describe the operation, advantages, and limitations of Location Value Response Surface Analysis (LVRSA).

On completion of Chapter 7, the student will know how to:
- Explain the two general approaches to the development of market rents and gross income multipliers (GIMs).
- List the steps to determine market rents by stratification.
- Name three factors to consider in evaluating the reliability of per unit rents or GIMs developed through stratification.
- List five theoretical factors that affect GIMs.
- Calculate measures of central tendency and dispersion for per unit rents and GIMs.
- Write the structure of additive models used to estimate per unit gross income or GIMs.
- List the dependent variable and typical independent variables in a gross income model.
- List the dependent variable and typical independent variables in a GIM model.
- Apply a gross income or GIM model developed through regression analysis to a subject property.
- Explain the advantages and limitations of gross income versus net income models.
- List important points in the screening of expense data.
- Explain two general approaches to the development of expense ratios.
- Calculate a median and trimmed mean expense ratio or overall capitalization rate (OAR).
- List important factors to consider in determining the reliability of expense ratios or OARs developed through stratification.
- Write the structure of a simple additive expense ratio model.
- Define the key regression statistics to use in evaluating the output from an expense ratio or OAR model.
- Apply the regression output from an expense ratio or OAR model to a subject parcel.
- Define the relationship between OAR and net income multiplier.
- List theoretical factors and property characteristics that affect OARs.
- Explain three approaches to developing vacancy and collection loss ratios.

On completion of Chapter 8, the student will know how to:
- Explain the importance of the review of values in the appraisal process.
- Describe what a plot study is and how it contributes to value review.
- Discuss an office review and explain how it contributes to value review.
- Explain a field review and how it contributes to value review.
- Detail other methods of reviewing values.
- Explain the three aspects of value acceptability.
- Name and describe the three common value update strategies.

Timetable

Topic	Time Requirement	Day Covered
Chapter 1		
Overview of Mass Appraisal	5 minutes	Monday AM
Mass Appraisal Process	20 minutes	Monday AM
Economics of Real Estate Markets	15 minutes	Monday AM
Mass Appraisal Models	20 minutes	Monday AM
Chapter 2		
Overview of Data Collection and Management	5 minutes	Monday AM
Required Property Characteristics	20 minutes	Monday AM
Data Collection	20 minutes	Monday AM
Analyzing Income and Expense Data	20 minutes	Monday AM
Types of Leases	5 minutes	Monday AM
Types of Data	10 minutes	Monday AM
Data Transformations	110 minutes	Monday AM/PM
Chapter 3		
Overview of Market Analysis	5 minutes	Monday PM
Stratification of Properties	30 minutes	Monday PM
Units of Comparison	5 minutes	Monday PM
Exploratory Data Analysis	200 minutes	Monday PM/Tuesday AM
Statistical Tests	120 minutes	Tuesday AM
Chapter 4		
Overview and Purpose of Ratio Studies	5 minutes	Tuesday AM
Sales Ratio Statistics	110 minutes	Tuesday AM/PM
Uniformity Between Property Groups	65 minutes	Tuesday PM
Chapter 5		
Overview of the Cost Approach	5 minutes	Tuesday PM
General Considerations	15 minutes	Tuesday PM
Structuring Cost Models	20 minutes	Tuesday PM

Topic	Time Requirement	Day Covered
Estimating Replacement Cost New (RCN)	15 minutes	Tuesday PM
Formula-Driven Cost Models	25 minutes	Tuesday PM
Building Depreciation Schedules	20 minutes	Wednesday AM
Market Calibration of Cost Models	20 minutes	Wednesday AM
Chapter 6		
Overview of the Sales Comparison Approach	5 minutes	Wednesday AM
Structure of Sales Comparison Models	120 minutes	Wednesday AM
Multiple Regression Analysis (MRA)	160 minutes	Wednesday AM/PM
Multiplicative MRA	80 minutes	Wednesday PM
Adaptive Estimation Procedure (AEP)	30 minutes	Wednesday PM
Automated Comparable Sales	30 minutes	Wednesday PM
Location Value Response Surface Analysis (LVRSA)	15 minutes	Wednesday PM
Chapter 7		
Overview of the Income Approach	5 minutes	Thursday AM
Form of Gross Income Models	5 minutes	Thursday AM
Estimating Market Rents	100 minutes	Thursday AM
Gross Income Multipliers (GIM)	70 minutes	Thursday AM
Form of Net Income Models	5 minutes	Thursday AM
Estimating Expense Ratios	110 minutes	Thursday AM/PM
Vacancy and Collection Losses	20 minutes	Thursday AM/PM
Net Incomed Multipliers and Overall Rates	45 minutes	Thursday AM/PM
Chapter 8		
Overview of Value Review	5 minutes	Thursday AM/PM
Office Review of Values	30 minutes	Thursday AM/PM
Field Review of Values	20 minutes	Thursday AM/PM
Aspects of Value Acceptability	20 minutes	Thursday AM/PM
Update Strategies	15 minutes	Thursday AM/PM