Spatio-Temporal Methods for Mass Appraisal

April 23, 24, 25 • 2013

The Mason Inn
4352 Mason Pond Drive
Fairfax, VA 22030

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International Property Tax Institute • 4950 Yonge Street, Suite 2308 • Toronto, Ontario, Canada M2N 6K1
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Spatio-Temporal Methods for Mass Appraisal

Three one-day seminars
April 23, 24 and 25, 2013
The Mason Inn
4352 Mason Pond Drive
Fairfax, Virginia

Introduction
The International Property Tax Institute is offering three one-day seminars dealing with Spatio-Temporal Methods for Mass Appraisal. Presented in three separate sessions, each with a different learning goal. Each session will be composed of two parts. The first will be the development of the material for that session; the “lecture”. The second segment will be a live demonstration of the concepts using a variety of commercial “off-the-shelf” programs. Participants may register for one or all of these seminars.

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<tr>
<th>The Seminars</th>
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<tr>
<td>Seminar 1: Introduction to Geostatistics and Spatial Valuation Models</td>
<td>April 23, 2013</td>
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Target Audience and Organizations
Although technical in nature, emphasis will be placed on the practical utility of each method discussed, benefiting those who are practicing market modelers wishing to gain an understanding of the spatio-temporal methods; individuals with a mathematical background planning on entering the field; managers who are in a position to influence how the market values are developed in their jurisdiction or organization and policy makers who are considering switching from a cost-based valuation process to one derived directly from the market. All government organizations including assessment authorities and private firms engaged in mass appraisal of real property; property tax regulatory agencies and academics with an interest in real world application of advanced spatial modeling methods will find this series of seminars invaluable.

“Take-Home Value”
For individuals currently using the direct market comparison methods for valuation, the seminars will provide a set of tools and the understanding of current and new concepts that will provide for improved accuracy of assessments. For those individuals entering the field, the seminars will provide a ‘quick start guide’ to market modeling. Decision makers and policy makers will discover that the tools and methods do exist to provide superior value estimates as compared to traditional market adjusted cost approach methods.

Faculty
Dr. Richard A. Borst: Instruction and software demonstration. Rich has nearly 40 years’ experience in the mass appraisal industry. His roles have included managing a CAMA software development team, to managing North America’s largest mass appraisal firm. He is a frequent national and international conference speaker and a published author of several papers relevant to the seminar series. He has hands on experience in developing the valuation models for over several million properties including a number of the taxing authorities in England, and the Municipality of Whittlesea, Australia, Allegheny County, PA, Cobb County, Georgia and Butler and Montgomery Counties in Ohio. His presentation style is lively, but informative with a goal of keeping the audience engaged in the topic. He plans to expand the preparatory work for the seminar series into a first of its kind book on Spatio-Temporal methods for mass appraisal.

Jerome (Jerry) German: Seminar Moderator. Jerry most recently served as the Chief Assessor and Director of the Real Estate Division of the Lucas County Auditor’s Office in Toledo, Ohio for 28 years. He previously held the position of Commercial and Industrial CAMA Supervisor with the Cuyahoga County Auditor’s Office in Cleveland, Ohio. He and his staff of 75 employees made Lucas County a leader in the development, implementation and integration of computer assisted mass appraisal systems (CAMA) and geographic information systems (GIS) for property tax purposes.
Spatio-Temporal Methods for Mass Appraisal

Seminar 1: Introduction to Geostatistics and Spatial Valuation Models

Introduction

Seminar 1 will introduce the fundamentals of geostatistics and spatial valuation models. Topics include an exploration of residuals from a spatially unaware model, an overview of exploratory data analysis, classical modeling and its deficiencies and examples of situations to highlight the programs not treated by classical methods.

Part 2 of the seminar focuses on laying the foundation for spatial statistics including measures of spatial autocorrelation, the variogram cloud, the semivariogram and spatial interpolation methods with emphasis on kriging. This session will also present the most commonly used spatially aware valuation models, the spatial hedonic model, the spatial error model and the comparable sales model.

Program Agenda—April 23, 2013 • 9:00-5:00 pm
Instructor: Dr. Richard Borst
Chair/Moderator: Jerome German

<table>
<thead>
<tr>
<th>Part 1: Introduction to Spatial Methods</th>
<th>Part 2: Spatial Valuation Models</th>
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<tr>
<td>Motivating the issue-Residual errors from a spatially unaware model Introduction to the data – eastwest, grid, jur1, jur2 Exploratory Data Analysis – classical methods Univariate Descriptions • Categorical variables • Continuous Variables Bivariate Descriptions • The scattergram • Measures of bivariate relation Graphical Methods • Histogram • Box Plot The issue with Classical statistics Model structures and terminology Previous Methods for Modeling Location Foundations of spatial statistics Definitions Measures of spatial autocorrelation The Variogram Cloud Semivariogram Interpolation Methods Discussion of Kriging</td>
<td>The spatial hedonic model Structure • Model calibration • Examining the results The spatial error model Structure • Model calibration • Examining the results The comparable sales Model Structure • Model calibration MRA base model Comparable Sales Selection and Adjustment Examining the results Lab Tools • ArcMap with Geostatistical Wizard • SpaceStat • Spatialest The Instructor replicates the lecture material results in live demonstration mode.</td>
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Spatio-Temporal Methods for Mass Appraisal

Seminar 2: Geographically Weighted Regression/Market Segmentation
April 24, 2013

Introduction
Seminar 2 is comprised of two topics. The first describes a scientific method for achieving optimal market segmentation. Market segmentation is a popular method of accounting for differences in housing stock and market influences within a larger geographic area. Geographically Weighted Regression (GWR) is introduced and its use in the segmentation process is explained. A segmentation strategy is based on the concept of valuing a “market basket home”, a standardized home across the entire jurisdiction of interest. That Market Basket Value (MBV) is used to identify the market influences in the jurisdiction. Areas of similar influence are grouped into clusters and models are built for each cluster. Multidimensional Cluster Analysis is used to form specific clusters. The number of clusters and their configuration is varied systematically to find the optimum number. Optimality is defined as occurring when a number of measures achieve their best values across the system of clusters. The measures include overall Coefficient of Dispersion (COD), the minimum value of the Akaike Information Criterion (AIC) and the Bayesian Information Criterion (BIC). The second topic describes several methods for accounting for the date of sale (time trends) in a mass appraisal model. Residual errors from a temporally unaware model are examined to motivate the topic. Methods explored are the straight line (increase/decrease) monthly/quarterly dummy variables, linear splines, Fourier expansions and Time Weighted Regression (TWR).

Program Agenda—April 24, 2013 • 9:00-5:00 pm
Instructor: Richard Borst
Chair/Moderator: Jerome German

Part 1: Geographically Weighted Regression Market Segmentation

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<td>Model Calibration Example</td>
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<td>Choosing variables</td>
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<td>Executing the model</td>
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<td>Examining the results</td>
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<td>Market Segmentation</td>
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<td>Why market segments?</td>
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<td>The market basket value approach</td>
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<td>Segmentation</td>
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<td>Optimal segmentation</td>
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Number of segments
Measures of “best fit”

- Traditional Ratio Studies
- Akaike Information Criterion (AIC)
- Moran’s I

Part 2: Temporal Methods

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<td>Motivating the Issue – a temporally unaware Model</td>
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<td>Examining trends in the data</td>
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<td>Reviewing the residual errors</td>
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<td>Methods for Modeling the Effects of Time</td>
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<td>Straight line methods – not appropriate</td>
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<td>Monthly, quarterly dummies</td>
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<tr>
<td>Example</td>
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<td>Critique</td>
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<td>Linear splines</td>
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<td>Definition</td>
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<td>Fourier Expansions</td>
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<td>Critique</td>
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<td>Time Weighted Regression</td>
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Lab
Tools
- SpaceStat
- Excel
Exercises – replicate lecture results

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April 25, 2013

Introduction

Seminar 3 addresses two special topics. The first topic is the Spatio-temporal model that provides simultaneously a time varying spatial model and a spatially varying time trend model. This methodology provides a number of outputs that allow for a better understanding of the changing spatial and temporal influences on value within a given jurisdiction. The second topic is the use of the advanced spatial methods described in Session 1 to help inform a strategy of recollection of data where it will have the most impact on improving assessment equity. New concepts introduced are a spatially continuous COD computation that does not rely on the existence of predefined neighborhoods and a means of measuring the impact on COD of recollection of data in specific areas.

Program Agenda—April 25, 2013  •  8:00-3:30 pm
Instructor:  Dr. Richard Borst
Chair/Moderator:  Jerome German

Part 1: The Spatio-Temporal Model

- Combining spatial and temporal kernels
- Interpreting the model results

Part 2: Spatial Measures of Assessment Accuracy

- Issues with aggregate measures of error
- Local indicator of appraisal accuracy—’LIAA’

Part 3: Advanced Use of Spatial Analysis for Management of Data Recollection

- Process initiates by Computing LIAA
- Fundamental Drivers that affect LIAA are identified and a model is developed to explain LIAA
- The models are reconfigured to illustrate where scarce resources are best deployed to improve assessment accuracy
SEMINAR INFORMATION AND REGISTRATION

Seminar Fees
(Fee includes materials, coffee breaks and lunches and applicable taxes)

- $365.00 /pp per seminar
- $695.00 /pp for seminar 1 and 2
- $895.00 /pp for all three seminars

Refund Policy: All cancellations must be made in writing. Cancellations received 15 days prior to the event will be charged a 25% administration fee. No refund for cancellations received after this deadline. Substitutes welcome.

Hotel Information:
The Mason Inn, 4352 Mason Pond Drive, Fairfax Virginia 22030 (less than 20 miles from Washington Dulles International and Washington National Airport).
A block of rooms has been booked at the rate of $138.00 single or double occupancy (room only) plus applicable taxes. Contact the hotel directly (prior to March 22, 2013) at: 877-296-6695. Please request the IPTI Group Rate.

REGISTRATION FORM:
Please use one form per registration and forward completed registration noting payment method to the International Property Tax Institute, 4950 Yonge Street, Suite 2308, Toronto, Ontario M2N 6K1 Attn: Conference Division. If paying by IPTI’s on-line payment please submit payment and fax completed registration form to: 416-644-5152 or email to lkonet@ipti.org. To pay on-line please go to: http://www.ipti.org/event/spatio-temporal-methods-for-mass-appraisal/

Delegate Name on Badge: ___________________________ / ___________________________
First Name Last Name

Organization Name: ___________________________ Title: ___________________________

Email: ___________________________ City: ___________________________
Country: ___________________________

PAYMENT INFORMATION (indicate Seminar(s) you wish to attend and payment method below)

I wish to attend:  
- Seminar 1 on April 23, 2013  
- Seminar 2 on April 24, 2013  
- Seminar 3 on April 25, 2013  
- All Three Seminars

Payment by cheque ☐  IPTI’s On-Line Payment ☐

Total Fee Remitted: $ ___________ US