

Valuing our World

Potential Roles for AVMs & CAMA

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AVM, CAMA, & Valuation Model Defined

- AVM—Automated valuation model
- CAMA—Computer-assisted mass appraisal system—incorporates one or more AVMs, a market data base, & a property attribute data base
- Valuation model—a mathematical representation of how property attributes influence market values

Mass Appraisal Defined

Valuation of *all* properties in a group or area on the basis of *market* evidence usually using:

- A common valuation date & other standard assumptions (rights valued; use & stewardship assumptions)
- Standardized data sets
- Valuation models developed through statistical analysis of market data & property attribute data
- Quality testing

When is Mass Appraisal Appropriate?

- When there is a need for economy (low cost per property)
- When the value at risk is low or controllable
- When there is a need for objectivity & consistency
- When the time available is short

Focus of CAMA & AVMs

- CAMA systems & AVMs can estimate:
 - Capital values—based on sales prices, offers, etc.
 - Annual rental values—based on rents, operating expenses
 - Overall capitalization rates
 - Property price trends
- Types of properties that are valued:
 - Houses, apartments, etc.
 - Non-residential—ordinary retail properties, rental apartment blocks
 - Land—urban & agricultural
- Applications
 - Property taxation—CAMA
 - Mortgage underwriting, insurance—AVMs
 - Real estate marketing—Zillow

Examples of CAMA & AVM Use

- Australia—Both
- Canada—Both
- Denmark—CAMA
- Egypt—CAMA
- Finland—CAMA
- Latvia—CAMA
- Lithuania—CAMA
- Mauritius—CAMA
- Netherlands—Both
- Russia—CAMA
- South Africa—Both
- Sweden--CAMA
- United Kingdom—Both
(CAMA in Northern Ireland)
- United States—Both

Types of AVMs

- Price index models—update earlier sale price
- “Hedonic” models—like the MRA models used in property taxation
- Tax assessed value models—update earlier appraised value for property tax purposes
- Hybrid models—procedures for blending or “cascading” several different models or approaches

An unresolved issue with some AVMs is their proprietary, “black box” nature

Types of Models

- Simplest—*average value per square meter*, etc.
- *Simple—average value per square meter per neighborhood*, etc.
- Multivariate—*marginal contributions to value:*
Value = Neighborhood adjustment factor × ([Price per square meter × land area] + [Price per square meter × building area × construction quality factor × construction quality rating])

These require an AVM.

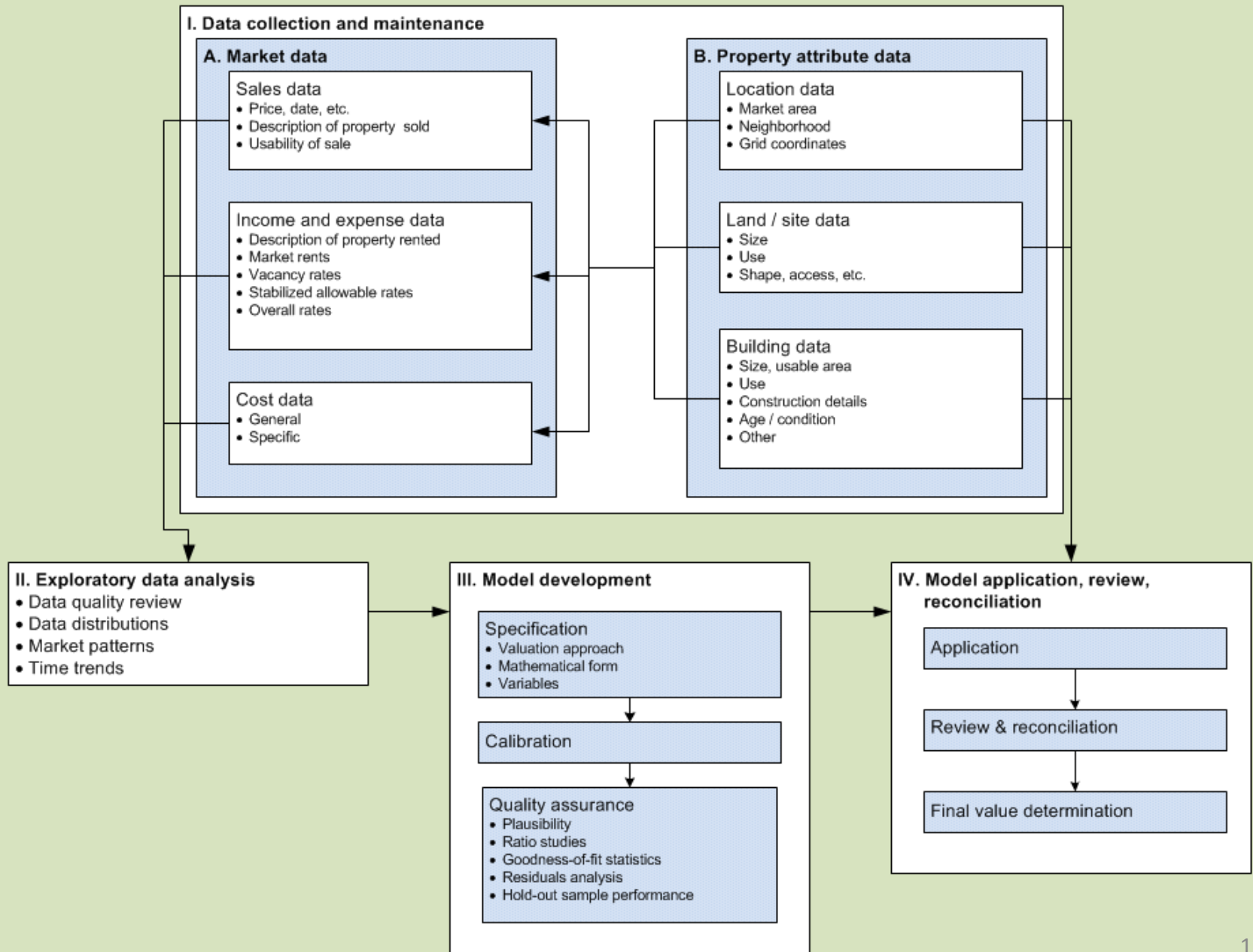
Mathematics of Multivariate Models

- Mathematical forms
 - Additive
 - Multiplicative
 - Hybrid (additive & multiplicative features)
- Calibration tools
 - Multiple regression analysis (MRA)—the mainstay of CAMA because of its transparency
 - Adaptive estimation procedure—from engineering, also known as “feedback”
 - Automated neural networks—an artificial intelligence method; frequently the basis of AVMs

Steps in Valuation Model Building

- Assemble data
- Determine markets/submarkets (stratification)
- Exploratory data analyses
 - study (“explore”) the available data
 - remove bad data and outliers
- Model specification
 - determine the type of model
 - Determine the candidate variables
- Model calibration – determine coefficients
- Model testing and refinement

Mass Appraisal System



Similarities between Mass & Conventional Single-property Appraisal

- Both begin with market analysis
- Both use the same basic valuation approaches
 - Sales comparison, income capitalization, and cost
- Both require accurate data
 - Market data
 - Property attribute data
- Both should conform to standards
- Both require judgment

Data Assembly Differences

- Conventional single-property appraisal
 - As needed by the assignment, although appraisers build data files & may have access to other databases & sources
 - Only a small number of comparables are analyzed to develop the indicators of value of the subject property
- Mass appraisal (for tax purposes)
 - Systems for comprehensively collecting & maintaining data on
 - Land parcels
 - Buildings & other improvements
 - Sales
 - Other market evidence
 - All comparables are analyzed; model applied to most properties in the group

Differences in Valuation Models

- Conventional single-property appraisal
 - Based on accepted valuation techniques
 - The algorithms used require only simple algebra & spreadsheet programs
- Mass appraisal
 - Consistent with basic valuation approaches,
 - Multivariate statistical models require computers
 - The properties or sales most comparable to each subject property can be identified

Quality Assurance

Single-property & mass appraisal

- Peer acceptance / appraisal logic

Single-property appraisal

- Client satisfaction

Mass appraisal

- Models are evaluated via:
 - Goodness-of-fit statistics
 - Variable significance
 - Performance on holdout groups
 - Ratio studies
- Case-by-case desk or field review of results by valuers

Factors Affecting Feasibility

- Property markets
 - Emerging vs. well-developed
- Land tenure systems
 - Formal vs. informal tenure
 - Title vs. deed registration
- Cadastres
 - Completeness & accuracy
 - Technological sophistication
- Transfer taxation
- Land use & building regulation
- Cultural & institutional receptiveness

Access to Market Data

- Developed real estate markets
 - Professional brokers
 - Computerized lists of properties for sale & sold, sometimes on the Web
- Formal land tenure (ownership registers)
- Mandatory disclosure of sales prices & terms
- Low transfer taxes & fees

Property Attribute Data

- Needs
 - Location features
 - Land plot features
 - Building features
- Acquisition strategies
 - Self-reporting
 - Canvasses
 - Permit tracking; change tracking via image analysis
 - For AVM vendors, property tax data acquired from consolidators

Potential Applications

- Further geographic spread
- Appraiser assistance—appraisers use AVMs in their daily practice; AVM vendors use valuers to inspect properties
- Further use in non-residential property valuation for tax purposes
- Improved use of spatial data (GIS)
- Reinforcing accuracy & uniformity in property taxation
- Marking financial assets to market—a role for non-residential AVMs?

Conclusions & Implications

- Conventional single-property appraisal & mass appraisal are not mutually exclusive—each specialty can enrich the other
- Professional standards need to embrace mass appraisal
 - IVSC
 - USPAP
 - IAAO
- Greater availability of training in mass appraisal
- Credentialing requires need reexamining
- The payoff: Greater efficiency in property markets; rewarding careers in supplying valuation services