AVM

Automated Valuation Model

White Paper

MPAC's AVM is an accurate real-time estimate of market value for close to 10 million residential properties in the provinces of Ontario, British Columbia, Quebec, New Brunswick, Newfoundland and Labrador, Nova Scotia, the City of Winnipeg, the City of Calgary and the City of Edmonton.

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MUNICIPAL PROPERTY ASSESSMENT CORPORATION

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About MPAC

The Municipal Property Assessment Corporation (MPAC) is an independent, not-for-profit corporation funded by all Ontario municipalities, accountable to the Province, municipalities and property taxpayers through its 13-member Board of Directors.

Our role is to accurately assess and classify all properties in Ontario in compliance with the *Assessment Act* and regulations set by the Government of Ontario. We are the largest assessment jurisdiction in North America, assessing and classifying more than five million properties with an estimated total value of $2.96 trillion.

MPAC's province-wide Assessment Updates of property values have met international standards of accuracy. Our assessors are trained experts in the field of valuation and apply appraisal industry standards and best practices. More than 300 of our valuation staff hold professional designations from recognized accrediting bodies. Our assessments and data are also used by banks, insurance companies and the real estate industry.

With nearly 2000 employees in offices across Ontario, we are committed to delivering property assessment excellence, providing outstanding service and earning the trust of property taxpayers as well as municipal and provincial stakeholders.

What is an Automated Valuation Model (AVM)?

Automated valuation models (AVMs) are algorithms that can provide real estate property valuations by applying mathematical models to a database with corresponding property information.

The International Association of Assessing Officers (IAAO), a global leader and preeminent source of standards, professional development and research in property appraisal, assessment administration and property tax policy, defines AVM as:

"An automated valuation model (AVM) is a mathematically based computer software program that produces an estimate of market value based on market analysis of location, market conditions, and real estate characteristics from information that was previously and separately collected. The distinguishing feature of an AVM is that it is an estimate of market value produced through mathematical modeling. Credibility of an AVM is dependent on the data used and the skills of the modeller producing the AVM."

Types of AVM

Retrospective AVMs tend to value all properties in a given locality. A predetermined model indicates the market value estimate and prior to release, the results are reviewed and verified for consistency and equity. In essence, retrospective AVMs only require an address (or some other unique key such as a property roll number) to be identified for quick retrieval of an AVM value and related data.

Prospective AVMs tend to value properties one at a time and commence once a subject property has been selected. This approach targets the most similar sold properties within a given boundary and can be achieved through an interactive selection or, in some cases, an automated retrieval. The downfall is that prospective AVMs require a longer turnaround time and rely heavily on the accuracy (or inaccuracy) of the selected comparables. Retrospective and prospective are the most common AVMs.

Hedonic AVMs are specified and calibrated using the multiple regression analysis (MRA) technique to determine the relationship and value of property attributes relative to the transaction price for specific market areas. The models are applied to property attributes to estimate market value at a point in time. Typically, time is directly specified in this model type to capture the price delta over the period of analysis and generally tends to be the most accurate at estimating value and offers the best fraud detection.

Repeat paired sales AVMs are based on multiple repeat sales of the same property to create house price indices aggregated at specific geographical areas such as postal based. The index is applied to past transaction prices or valuations of property to estimate market value. This model type relies on a time component and transaction price only to determine value changes over time and assumes the state and condition of property to be constant between sales. Limitations include the risk of overstating the rate of price change as a result of transaction prices reflecting significant property improvements or alterations since the first sale as well as the frequency of repeat sales.

Tax assessed value AVMs use the statistical relationship between past tax assessed values and subsequent transaction price data to create a house price to assessment index for specific market areas. The underlying assessments have a common uniform basis, valuation and valuation date. The index is applied to past tax assessed values to estimate market value. This model type is very good at isolating trends as the assessed value captures most of the value determinant.

Hybrid AVMs are a combination of the above mentioned approaches. Some AVMs also incorporate technologies such as Artificial Intelligence/Machine Learning (AI/ML) like for example fuzzy logic, forecasting or neural networks to estimate market value and some even make use of other data sources such as economic data.

MPAC's AVM

In 2001, MPAC developed an AVM using advanced statistical techniques, including supervised Machine Learning, combined with sound appraisal methodology. It is based on a retrospective approach and is a hybrid of both the hedonic and tax assessed valued models.

MPAC's AVM currently provides an accurate real-time estimate of market value for approximately 10 million residential properties (single family dwelling up to a 4-plex) in Ontario, British Columbia, Quebec, New Brunswick, Nova Scotia, Newfoundland & Labrador, the City of Winnipeg, the City of Calgary and the City of Edmonton.

In Ontario, the AVM product is based on approximately 25,000 uniquely defined neighbourhoods or geographic areas which are tracked on a continuous basis for their influence on value. These neighbourhoods have been defined to represent groups or clusters of properties that are subject to the same market influences and are used to evaluate the degree to which location influences the market area. For waterfront properties, MPAC typically looks at the entire lake or a group of similar lakes. For condominiums, each condo plan is typically considered its own neighbourhood. In addition, MPAC captures all significant site specific external influences such as a railway corridor or a waste transfer facility. Not only are these influences reflected in our AVM values, but they are also included as part of the product.

For our tax assessed valued models, indices by property type and market areas are developed from time series analyses to update assessed values or/and to adjust sale prices to the valuation date. The following four are methods of developing time series index factors:

1. Value per unit analyses
2. Re-sales analyses
3. Sales-to-Assessment Ratio (SAR) analyses
4. Specification of time variables in models

The MPAC AVM uses multiple methods to develop indices of different types to evaluate price movement over time, specifically value per unit, sales-to-assessment indices and the inclusion of time variables in its base Hedonic Price Models.

Additional Features of MPAC's AVM

To complement the AVM value, MPAC provides three additional distinctive features with this product:

1. A confidence rating which indicates how typical a property is in relation to the local housing market and neighbouring properties.
2. Statistical prediction limits that have been calculated on the estimated value representing the range of probable selling prices.
3. Three market trend indicators that reflect the market's state and performance.

How MPAC values properties

To determine a property's value, MPAC relies on the real estate market and analyzes market information from similar property types in a geographic area. The valuations are statistically derived from extensive market and time series analysis at the provincial, regional, local and neighbourhood levels. Any one of three methods may be used for this analysis: the selling price of a property (residential - direct comparison approach), the rental income a property generates (office building - income approach), or the cost to replace a property (industrial - cost approach). Each method takes into consideration the location of a property, the size and quality of buildings and features which might add to or take away from a property's value. MPAC uses direct comparison approach to derive the AVM value as well as develop the assessed values for residential properties. The underlying difference between the assessed value and the AVM value is that the AVM is not based on a static legislated valuation date, but rather a frequently updated value based on a monthly refresh, or weekly as is the case for Ontario.

MPAC receives all real property sales data on a daily basis through the land registry office, where recent sales of similar properties are analyzed and used as an indicator of the value of residential properties. MPAC analyzes every property sale transaction in Ontario and other Canadian assessment jurisdictions covered, not just the repeat paired sales.

In addition to sales, our experts regularly analyze property information through a number of sources, including on-site inspections and communication with property owners, building permits and land title documents. MPAC's sales verification process is stringent, and ensures only open-market, arms-length transactions are considered when determining property values. MPAC continually collects and updates detailed information for properties across Ontario to ensure that similar property types are valued consistently within their market area. Over 200 different factors are considered when valuing a residential property; however, five major factors account for approximately 85% of the value. These are the same five factors widely used in the

appraisal industry and are: location, living area, quality of construction, building age adjusted for any major renovations or additions, and lot dimensions.

Other key features that are considered in the valuation of residential properties include: basement area, number of bathrooms, heat type, air conditioning, and secondary structures.

Site features in urban and suburban areas such as traffic patterns, being situated on a corner lot, proximity to a golf course, hydro corridor, railway or green space can also increase or decrease the assessed value of a property.

In rural or semi-urban areas, site features such as type of access, topography, and lot services such as hydro, water and sanitary/septic services can also impact the value of a property.

Maintaining a comprehensive and current database

One of the first steps when creating our AVM product is to validate and cleanse addresses to ensure a best in class hit-rate. We use Software Evaluation and Recognition Program (SERP) certified address scrubbing software each month to improve the address accuracy of our product. This uplifts our client experience as they attempt to match their addresses to our AVM addresses in order to obtain AVM values for their properties.

Through sound private and public partnership practices, MPAC acquires similar reliable data relating to properties outside of the Province of Ontario from other Canadian Assessment Jurisdictions and stakeholders representing our National AVM product offering.

To ensure our data and models maintain the highest levels of accuracy, the following practices are put in place:

- For provinces and cities outside of Ontario, the AVM tax assessed value model component is recalibrated monthly based on a regular refresh of tax assessment and registered sales data. For Ontario, that same model component is recalibrated weekly based on a daily refresh of tax assessment and registered sales data.
- AVM hedonic price model component re-calibration frequency depends on a number of factors but primarily on the assessment cycle of the various assessment jurisdictions covered. This can vary from as frequent as annually to a four- year cycle.

Will the MPAC AVM match the Sale Price?

The sale of real property is affected by many factors, such as a buyer's desire to acquire a particular property and a seller's willingness to reduce the sale price in order to achieve a sale. This could result in similar properties selling for different amounts. MPAC establishes a reliable estimate of value which is typically in the middle range of selling prices for similar properties. Another reason the AVM value and price might not be the same is that the market may have changed between the AVM date of valuation and the date the property was purchased. An individual sale does not by itself determine market price – AVM methodology considers all valid sales in the market and determines the most probable selling price at a specified point in time.

AVM quality measures

MPAC's AVM product has been reviewed and verified before release and is independent of the transaction under consideration. The AVM value is subject to rigorous quality assurance programs targeting data integrity and statistical validity to confirm its accuracy. The AVM product has the added benefit of public scrutiny through informal Requests for Reconsideration (RfR) and Assessment Review Board (ARB) appeals to further validate accuracy levels.

The overall level of appraisal must pass IAAO Standards on Ratio Studies. A separate validation process is conducted quarterly to ensure product standards are being achieved, named the AVM Quarterly Report. Outliers, suspect property and sales data are looped back to each of our suppliers for verification where required. We stratify the data and look at Market, Submarket and Neighbourhood and/or Forward Sortation Area (FSA) geographical areas.

Performance is reviewed weekly and monthly through a variety of reports relating to the hit rate on the online system as well as monthly performance reports with large clients. We continually work with our clients to maximize the hit-rate in terms of address matching and market value accuracy as well as an effective mortgage value fraud screen.

Fraud detection benefits include:

- Unbiased AVM value can detect potential price inflation or property flips.
- Detect property existence or misrepresentation such as a commercial property or condominium parking or locker unit.
- Detect active building permit activity to red flag the state and condition of the property.

Testimonials

Genworth

"MPAC has increased our underwriting productivity and customer service by providing quick and accurate property valuations."

Genworth Financial Canada

CANADA GUARANTY

"Canada Guaranty utilizes MPAC's AVM model data in its adjudication decision engine. This provides Canada Guaranty with access to accurate home valuation data, allowing for faster and more informed adjudication decisions, which ultimately enhances the customer experience."

Canada Guaranty

"When used by lenders with attention to MPAC's confidence score and sensitive to provincial differences, the MPAC model's performance is quite impressive."

Boxwood Means, LLC.

Delivery Channels

Web Services

This solution integrates MPAC's business processes seamlessly with your company's computer applications and creates a gateway whereby property information can be queried. A request is submitted to the Application Programming Interface (API) gateway, exposing the interfaces, allowing you access to MPAC's extensive database. The API service responds immediately by instantly providing AVM reports in the format requested.

propertyline™

propertyline™ is MPAC's secure e-commerce solution, which enables users to obtain accurate, real-time property information for more than five million properties in Ontario and almost 10 million properties Canada-wide. The following reports are available through propertyline:

AVM Basic Report

This report includes:

- AVM real-time value
- Valuation date

AVM Enhanced Report

This report offers detailed information on a single property including:

- AVM real-time value
- Valuation date
- Upper & lower AVM value

- Confidence rating
- Year built
- Key property characteristics

AVM Comparable Report

This report offers all of the detailed property information included in the AVM Enhanced Report for a subject property and up to three comparable properties sold recently within the subject neighbourhood.

AVM Market Sales Report

This report offers all of the detailed property information included in the AVM Enhanced Report for a subject property and up to 12 comparable properties sold recently within the subject neighbourhood.

Historical AVM Report

Is similar in content to the AVM Enhanced Report, but is enhanced by point-in-time valuation that reflects historical property and neighbourhood characteristics. This report offers the following historical information as per the date selected by the user:

- Historical Market Value (AVM)
- Valuation Date
- Upper & lower AVM value
- Confidence Rating
- Year built
- Key property characteristics

Custom Portfolio Analysis

By utilizing MPAC's AVMs, financial institutions can easily monitor and calculate the market value of their residential portfolios throughout the year. This form of stress testing can be extremely valuable during times of market volatility.

Want to Know More?

Visit propertyline™ for a full description of these and other detailed property reports available.

Contact Us

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If you have accessibility needs, please let us know how we can best accommodate you.

References

'*Standard on Automated Valuation Models (AVMs)*' Published 2003 by International Association of Assessing Officers 130 East Randolph, Suite 850, Chicago, IL 60601-6217