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LESSON 9

Appraisal Valuation Models (AVMs)

Note: Selected readings can be found under "Online Readings" on your Course Resources website

Assigned Reading

1. UBC Real Estate Division. 2014. *BUSI 344 Course Workbook.* Vancouver, BC: UBC Real Estate Division. Lesson 9: Appraisal Valuation Models (AVMs)

Recommended Reading

1. Bradford, J. and Linne, M. 2011. "Appraisal Myopia: Solutions for an Industry in Crisis – What Every Chief Appraiser Should Know". White Paper from *www.bradfordsoftware.com*. July 25, 2011.
   A series of recommendations aimed mainly at residential appraisers, with a theme that appraisers need to "re-invent" themselves to deal with the crisis of downward spiralling fees and increasing competition from automated products such as AVMs.

2. Hollas, D.R.; Rutherford, R.C.; Thomson, T.A. 2010. "Zillow's Estimates of Single-Family Housing Values". *Appraisal Journal*. 78(1). pp.26-32.
   Analyzes the accuracy of automated value estimates from the free Zillow online valuation website. Includes a template for testing the accuracy of AVMs.

3. Canning, G. 2002. *What Makes AVMs Work?* Vancouver: UBC Real Estate Division.

4. Canning, G. 2002. "Automated Valuation Models (AVMs)". *Canadian Appraiser*. Spring, 2002. pp. 35-37.

5. Mitham, P. 2000. "Appraisal System Goes Online". *Business in Vancouver*. November 28-December 4, 2000, Issue 579.

6. Bradford, J. 2001. "What Business Are You In". *Appraisal Buzz* Electronic Mail Newsletter. August 27, 2001.

7. Fryer, T.G. 2002. "AVMs – A Cause For Alarm, and Thus for Resistance". *Appraisal Buzz* Electronic Mail Newsletter. January 14, 2002.

8. Robbins, M.L. 2001. *The TAUREAN Residential Valuation System – An Overview*. A paper from Taurean Residential Valuation Systems, Brookfield, WI, USA.

9. Bergsman, S. 2006. "Friend or Foe: Commandeering AVMs for Your Use". *Valuation Insights & Perspectives*. Appraisal Institute. 2nd Quarter, 2006.

10. McDonald, J.F. 2006. "Market Value Websites: How Good Are They?". *Journal of Real Estate Literature*. 14(2). pp.223-230.
    This article explains a sensitivity analysis on price estimates from Zillow.com. The author modified a house's features to see how it affects the hedonic model results.

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11. Kane, S. and Linne, M. 2004. *Practical Applications in Appraisal Valuation Modelling*. Appraisal Institute. Chapter 8: Modeling Applications.

12. Hoch, S.J. 2001. "Chapter 5: Combining Models with Intuition to Improve Decisions". *Wharton on Making Decisions*. Chichester, England: Wiley.

Learning Objectives

After completing this lesson, the student should be able to:

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. outline 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; and

6. discuss the issues faced by members of the professional appraisal and assessment community in meeting professional practice standards with respect to AVMs.

Instructor's Comments

Ask any appraisal professional to describe an Appraisal Valuation Model (AVM) and you're likely to get a variety of responses:

> "It's a black box that mortgage underwriters use for low-risk lending, not an appraisal".
>
> "An Automated Valuation Model[1]..something that only assessors use".
>
> "An AVM is valuation tool that appraisers can use to process large volumes of real estate data with the appraiser still applying judgment and expertise in the estimate of market value".
>
> "An AVM is a diagnostic tool that appraisers can use to support adjustments or conduct market analysis".
>
> "AVMs will never replace appraisers!"

Now consider a few contemporary examples of AVMs in the real estate marketplace.

In July 2009, Mary Jane Yakas made history by filing the first known lawsuit by an individual against a major US bank for improper use of an AVM. In her petition to the US District Court of Northern California, Ms. Yakas alleged that the Chase Manhattan Bank relied on an AVM rather than an appraisal to cancel the owner's

[1] You will note that the acronym "AVM" may refer to an Appraisal Valuation Model or to an Automated Valuation Model. The difference between these two will be discussed later in this lesson.

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Home Equity Line of Credit or HELOC. The lawsuit was filed as a "class action suit" on behalf of other similarly impacted owners.

The language in the Bank's HELOC contract expressly stated that the Bank would "refuse to make additional extensions of credit, or reduce your Credit Limit if [t]he value of the Property [securing the line] declines significantly below its original appraised value for purposes of this Credit Account." Under a subsequent clause in the contract the Bank stipulated that "any time as we may reasonably require while you have the right to take Advances on your Credit Account, we may obtain an appraisal on the Property. You agree that you will cooperate with us in obtaining such an appraisal."

In January 2010, the Bank's request to dismiss the Class Action Suit was denied. In his decision, the Judge referred to the Bank's appraisal as a "mystery AVM whose particulars are totally a secret." The lawsuit was subsequently moved to the State of Illinois and is awaiting a jury trial. Legal documents relating to this case are available at Appraiser Law: *appraiserlaw.com/AVMCaseDocuments.aspx*.

On a somewhat different but related note, consider the following lead article which appeared in the October 16, 2006 edition of the Orange County Register:[2]

> *LONG BEACH: The co-founder of Zillow.com walked into the lion's den Tuesday, telling a Realtors convention that his Web site won't do to real estate agents what his old Web site Expedia.com did to travel agents.*
>
> *Murmurs filled the room when Zillow.com President and cofounder Lloyd Frink denied that Expedia replaced travel agents, explaining that tens of thousands of them now work in call centers.*
>
> *But even that won't happen to real estate agents, he vowed.*
>
> *"We realized we can't replace the Realtor with someone over the phone," Frink told the opening session at the California Association of Realtors conference at the Long Beach Convention Center.*
>
> *Expedia revolutionized the travel industry when it gave consumers tools for booking reservations that formerly were controlled by travel agents. Frink is the site's former senior vice president.*
>
> *Zillow.com's database provides information on 67 million U.S. homes, including sales history, property tax assessments, satellite or aerial views and "Zestimates" of its value. The 8-month-old site has rapidly become one of the nation's most popular online sources of real estate data.*

As of January 2012 Zillow has moved closer to the model of offering a complete range of real estate services to home buyers. Zillow's website now claims to offer the following services:

- Learn about neighbourhoods of interest
- Determine the market value of your home
- Obtain mortgage quotes
- Search homes for sale using the same filters as Multiple Listing Services
- Use the "Make me Move" feature to obtain informal offers on your home (similar to an MLS listing)
- Create a "Sale by Owner" listing that you can broadcast to Yahoo, Facebook, Craigslist, etc.

Zillow is aiming to create a real estate portal with a full range of free services for technology savvy real estate participants. Their AVM component, or Zestimate, was one of the first services to be launched.

[2] Collins, J. Orange County Register: *www.ocregister.com/ocregister/money/homepage/article_1322090.php*

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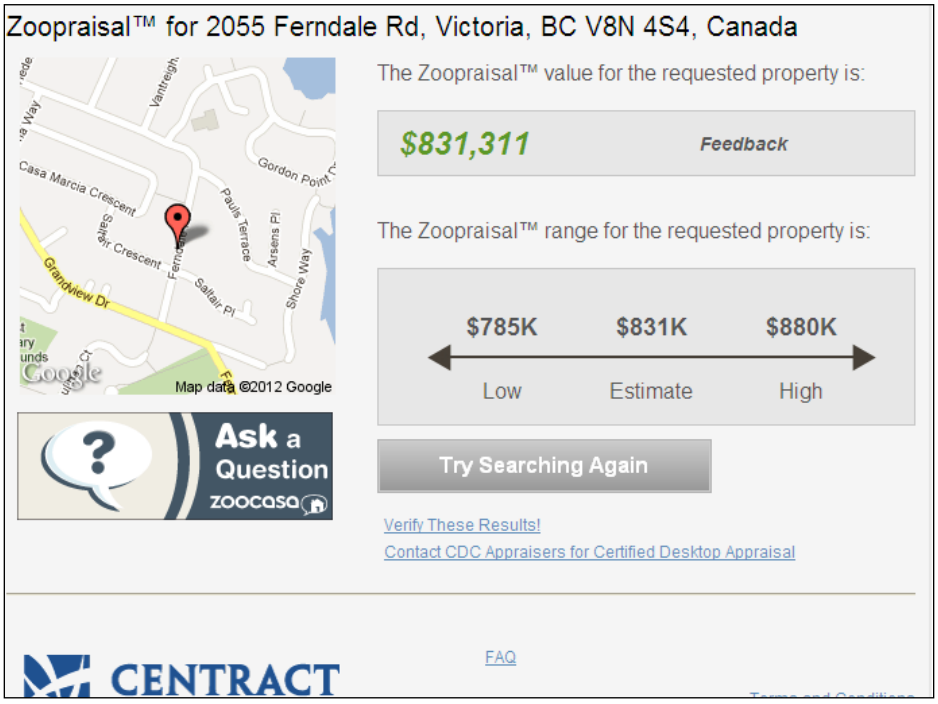
A Canadian residential real estate portal, Zoocasa, now offers parallel services to Zillow with their free valuation service *Zoopraisal*. A Zoopraisal looks very similar to a Zestimate. The interesting aspect of a Zoopraisal is that the program first "guesses" the size, bedrooms, baths, and lot size for your property based on the norms for the neighbourhoods. Owners can then modify the details to reflect actual property data. Zoopraisal also provides a value range for owners.



The Zoopraisal required eight seconds to enter and select data with a further three seconds to generate a value.[3]

Canadian lenders have embraced AVMs for years and now homeowners and investors have access to free and fast valuation advice. Appraisers continue to struggle to find their niche in contemporary real estate markets, providing services that their clients' demand – in particular in the residential area. Now consider the impact of the Zestimate and Zoopraisal – if homeowners, investors, and lenders see AVM reports as "rough and ready" real estate appraisals that are "good enough", what does this mean for the valuation profession in Canada? Are appraisers sufficiently aware of this threat and developing strategies to combat it, both individually and collectively? These are the questions this lesson will explore.

History and Evolution of AVMs

In this lesson we will delve deeper into AVMs and gain an understanding of:

- why they are feared and often dismissed by the appraisal industry;
- the difference between the AVM as an Automated Appraisal Model and an Appraisal Valuation Model;
- different types of AVMs, including advantages and disadvantages;
- the differences between public and private sector AVMs;
- how standards of professional appraisal practice have addressed the advent of AVMs; and
- the barriers to widespread adoption of AVMs by appraisal professionals.

[3] Zoocasa has licensed Centract's AVM to generate home value estimates. Centract is a Brookfield Residential Property Services Company which specializes in "technology-based mortgage services and products to financial institutions, corporations, and other mortgage originators."

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We will also examine some real-life examples of AVMs in use, in both the assessment and appraisal worlds to illustrate the evolving impact of this tool on the valuation community. The case studies will help you understand the success of AVMs in meeting client expectations for fast and, accurate valuations, that are without bias, and used to support "real-time" real estate decisions.

In a lesson dealing with the evolution of AVMs, it is important to understand the structural change that has been sweeping through the real estate industry in the past few decades. These changes are impacting real estate salespeople, mortgage brokers, and the particular focus of this course, valuation professionals (appraisers and assessors). George Dell, MAI, describes the historical evolution of the appraiser as someone who took small amounts of data (e.g., three comparables) and added "value" through analysis. Essentially, the appraiser's task was to select representative data and spend time refining and verifying the "comps" before using judgement to reconcile the adjusted value estimate to the property being appraised.[4] As lenders pushed for standardization and simplicity of reporting, Dell observes that the appraiser increasingly became a form-filler.

Recommended Reading: "Appraisal Myopia"

Bradford and Linne expand on this theme in their "Appraisal Myopia" article, suggesting the residential appraisal industry must evolve or continue a rapid decline. Very important reading for anyone either working in this area or contemplating it – see this article on the "Online Readings" webpage.

Today, technology has shifted the appraisal business environment. Widely available electronic data, such as MLS sales and zoning and land-use maps, formerly proprietary, are becoming increasingly easy to obtain. As in the case of Zillow and competing sites such as eappraisal.com, a wide range of free services are now available.. Appraisers have lost their unique niche in performing the "value added" process of research, processing, and interpretation of real estate information for valuation purposes.

The Canadian lending industry, following the experience in the USA, has taken advantage of declining information barriers to implement new risk management practices. Observers within and external to the appraisal industry have predicted that, in order to survive, appraisers will continue to tighten their focus on the services that truly provide value to their customers; in many cases, appraisers are increasingly finding it beneficial to specialize.

At the beginning of this lesson you may be skeptical about the role AVMs will play in your current or future role in real estate, whether private or public sector; on the other hand, you may choose to spend your career specialized in this area. Whatever your viewpoint may be, the fact is that AVMs will likely continue to impact the real estate valuation and consulting fields in new and unforeseen ways, and are therefore worthy of a closer look.

Keep in mind that this lesson is intended only to provide an overview of AVMs, introducing the subject so that interested students will have a head start to finding out more on their own.

The evolution of AVMs has followed two distinct paths: public sector property assessment applications and a separate private sector focus on residential lending risk analysis. Assessors were early adopters of electronic data processing technology and began experimenting with AVMs in the early 1960s. Keep in mind that assessors do not generally use the term AVM, but commonly use the term CAMA or computer-assisted mass appraisal. Specific CAMA systems, whether vendor developed or designed and built in-house, are somewhat analogous to different types of AVMs. For example, the CAMA system that an assessment jurisdiction may use will generally include multiple types of AVMs to provide for the unique requirements of residential, commercial, utility, and other specialized property valuations.

[4] Dell, George. "AVMs: The Myth and the Reality; the Problem and the Solution". *Valuation Insights & Perspectives*. Third Quarter, 2004. Appraisal Institute. p.12.

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The development of AVMs in the private sector is really the story of the use of technology to automate the residential lending process. Vicky Cassens Zillioux, in an April 2005 presentation to the European Real Estate Conference,[5] described a prolonged period of low interest rates and related huge increase in lending activity, along with the Internet, as the key stimulants for the development of AVMs. According to Cassens Zillioux, the temporary decline of real estate markets in the mid-90s provided lenders with the opportunity to develop tools to speed up the underwriting process, leading to the forerunner of residential AVMs, Automated Underwriting tools or AUs. The AUs were developed by lenders to address the huge competitive pressure for faster and cheaper lending decisions. The key elements of the AUs were rule-based algorithms that provided risk scores for each loan or pool of loans, known as FICO scores in both US and Canadian lending markets. While the AUs solved part of the supply pipeline issue for the lending industry, it was evident that the creation and transmittal of appraisal reports was the next bottleneck to be addressed.

During the development of AUs, limited private sector development of AVMs proceeded in a parallel fashion but was essentially rooted in the academic world. In the 1980s, Carl Case and Robert Schiller developed the Case-Schiller Index or CSI, the forerunner of the modern residential AVM, for secondary loan markets. The AVM was based on a repeat sales approach or sales index and was generally intended for property loan portfolio reviews. It was during this timeframe that the exponential growth in server technology, personal computing power, and the Internet began to eliminate the barriers to cost effective analysis of real estate information. Two very different US firms, TRW (now First American Real Estate Services) and HNC Software (specialists in statistical modeling and neural networks) ramped AVMs up to the next level in the mid-90s with models relying on property and neighbourhood specific attributes.[6] Concurrently, the market signalled general acceptance of AVMs, at least for secondary markets, when the largest USA vendors of mortgage capital, Freddie Mac and Fannie Mae[7] adopted AVMs as a quality control tool for evaluation of pools of mortgage loans. The day of AVM had arrived and there was no turning back.

There is no clear information on the present level of AVM use in North America. Michael Parris of Standard & Poor's reported in 2004 that since the arrival of AVMs in 1990s the number of first lien transactions rated by S&P involving AVMs has been relatively low. In contrast, he notes that in the secondary lending market (e.g., pooled or syndicated loans, commercial mortgage-backed securities) about 94% of transactions rated by Standard & Poor's were supported by AVMs. In the opinion of S&P, the contrast in AVM usage rates between these two lending markets is explained by the historical acceptance of write-off ratios in the secondary lending community, regardless of the valuation method.[8] However, this trend appears to be changing and Jim Kirchmeyer, President of Real-Info Corporation, estimates that AVMs are now commonly used to support most of the 10 to 12 million home equity loans (e.g., line of credit or second mortgage based on existing property owner home equity) approved annually in the USA.[9] Another example of the widespread use of AVMs is offered by Mark Linne, a leading US valuation profession with recognized expertise in the field of AVMs. Linne suggests that at the present time, in the state of California, over 70% of all residential mortgages are subject to AVM reports at some level. Canadian statistics are difficult to obtain, but anecdotal information from Canadian AVM vendors indicates similar trends with less than 20% of mortgages subject to conventional appraisal reports. The spread of AVMs has not been limited to the United States and Canada. In the United Kingdom and various European nations, AVMs have widespread acceptance. In a paper presented to the November 29, 2005 valuation

[5] Cassens Zillioux, Victoria. "Automated Valuation Models: Past, Present and Future". Paper presented to the European Real Estate Conference, Dublin, April 2005.

[6] Miller, Norman and Markosyan, Sergey. "The Academic Roots and Evolution of Real Estate Appraisal". *Appraisal Journal*. April 2003. p.173.

[7] Prior to being placed under conservatorship in 2008, Fannie Mae (or Federal National Mortgage Association, 1938) and Freddie Mac (or the Federal Home Mortgage Corporation, 1970)) were public corporations with federal charters from the US Congress. These companies were the largest single sources of mortgage underwriting funds in the USA. Both companies operated by buying mortgages and then packaging mortgages into securities for re-sale to investors (syndication of debt).

[8] Parris, Michael. "U.S. RMBS Automated Valuation Models Are Becoming More Accurate". *Ratings Direct*. October14, 2004

[9] October Seminars. "AVM Nation: A Matter of Confidence" (Transcript of E-Radio Technology Series). April 29, 2004. p.12.

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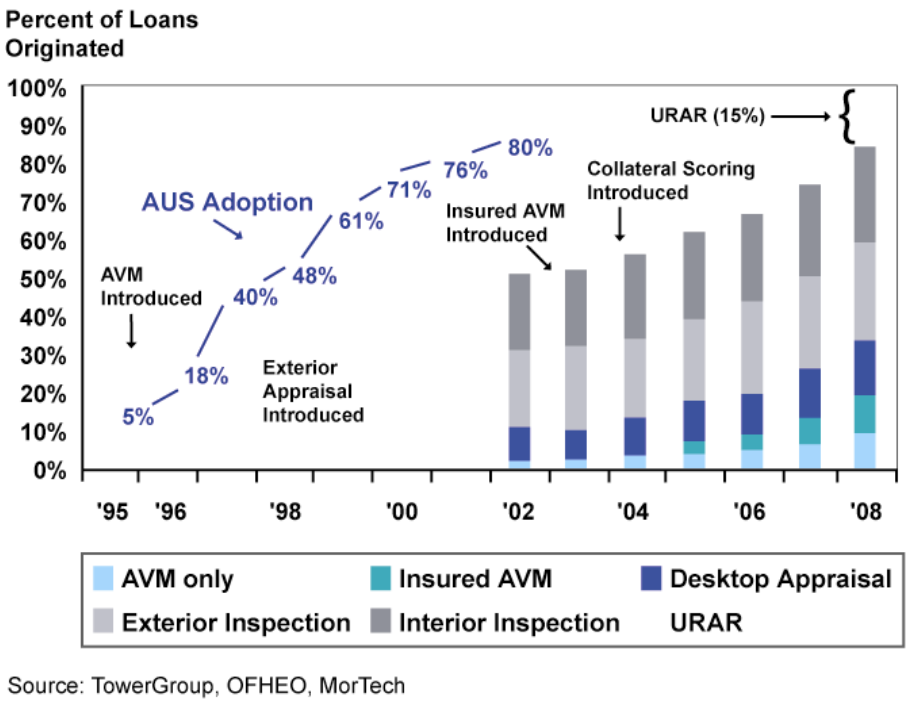
conference of the Royal Institute of Chartered Surveyors (RICS), Paul Creffield of Rightmove PLC claimed that 60-70% of mortgage lenders were either using or testing an AVM.[10]

Figure 9.1 shows a graph produced by the Tower Group (a global financial services consulting firm) for the US Office of Federal Housing Enterprise Oversight, illustrating the respective growth of AUs and AVMs in US lending markets. While this figure contains a considerable amount of information, focus on the three lowest components of each "bar", representing various forms of AVMs. The graph predicts a steadily increasing role for AVMs to support residential loans, growing to about 40% of all loans by the year 2008. Note that in this forecast a considerable role remains for various types of conventional appraisal reports (URAR is the Uniform Residential Appraisal Report prescribed by Freddie Mac).

Figure 9.1: AVM Growth



Source: TowerGroup, OFHEO, MorTech

According to a variety of valuation and lending community experts (to whom we'll refer to during the lesson), the growth of public and private sector AVMs has been driven by the following factors:

- increasing competitive pressures to deliver real estate intelligence faster and cheaper;
- structural changes in the banking industry (mentioned by Cassens Zillioux);
- huge volumes of electronic real estate data are now readily available – clients are questioning traditional appraisal approaches that ignore most of the data and focus only on small samples;
- the neutral bias inherent in most automated valuation systems (i.e., similar probability of delivering a positive or negative value outcomes) versus human bias; and
- the belief by some consumers of appraisal services that removing appraisers from the valuation equation reduces human error and potential fraud.

[10] Creffield, Paul*: www.rics.org/NR/rdonlyres/BC774028-260E-480D-AC9E-41499ADF5702/0/PaulCreffield.pdf*

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Point to Ponder

More mortgage loans in Canada and the USA are now underwritten relying on Automated Valuation Models than by conventional appraisals. Will this trend continue? What are the implications for appraisers? What are the potential ramifications for the lending industry?

What is an AVM?

There is no generally accepted definition for an AVM. A series of definitions are presented below from professional assessment and valuation bodies, as well as opinions from valuation professionals.

Webster's defines automatic as "self-acting, mechanical, not voluntary". Automation, then, is the automatic control of processes by electronic apparatus. Hence, AVMs are self-descriptive: the appraisal process as automated. The practice notes of the Canadian Standards describe an AVM as "a *computer program that analyses data using an automated process. For example, AVMs may use regression, adaptive estimation, neural network, expert reasoning and artificial intelligence programs*."[11]

Of course, some would suggest a corollary to automated is "appraiser not needed". However, another perspective emerging in appraisal literature is "appraiser re-defined" or the continuing evolution of automated valuation models within the appraisal industry. To understand these divergent views, it is helpful to understand the openness of the appraisal process to automation. Linne et al noted that predictions of AVMs replacing the appraisal profession are founded in a lack of understanding of the forces driving change in the profession: technology and changing clients' needs.[12] The authors define two types of AVMs: those strictly statistical based and those designed and operated by valuation professionals, or "real estate models". The statistical AVMs fill a specific client need, mainly as a risk analysis tool for the lending industry, with the AVM output one factor among several lenders use to rate the loan risk. Presumably, if the loan-to-value ratio is not high, the statistical AVM may be a suitable risk assessment tool. The other types of AVMs described by the authors are "Real Estate Models" or "Appraisal Valuation Models". These are designed and used by appraisal professionals to improve the accuracy and speed of valuation and real estate consulting assignments. The authors provide examples of where Appraisal Valuation Models can be used to account for multiple property characteristics simultaneously through multi-variate analysis. The authors contend that an appraiser adds value to an AVM by using his/her judgement to select relevant data and determine the relationships between property characteristics, human behaviour, and value. Bradford and Linne's 2011 article provides a case study for integrating statistical analysis into the appraisal process as a value-added technique and an approach to differentiate "human" or expert appraisals from AVM reports.

A significant amount of residential financing involves high ratio mortgages, non-standard housing, or areas in transition. Will an AVM produce acceptable outcomes for these situations? If so, how would a user understand the risks of using AVMs versus conventional appraisals?

[11] 2012 Canadian Uniform Standards of Professional Appraisal Practice, Practice Notes Section 12.38.1.

[12] Linne, Mark; Kammer, Thomas; Schneller, Larry; and Kane, Steven. "Appraisers and Statistics: Adaptation or Extinction". *Appraisal Journal*. Fall 1996. p.18.

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Consider the following AVM definitions.

The Collateral Risk Management Consortium, a national US lending community organization, provides this definition for an AVM:[13]

> *An automated valuation model (AVM) is the generic term for any electronic analytic algorithm, process or model that is intended to estimate the value of an individual property, without human assistance (other than the initial entry of the data). Specific to this report, the term applies to models designed to value single-family residential properties (which typically includes single family residential, condominiums, planned unit developments (PUD) and sometimes cooperatives).*

IAAO Standard on Automated Valuation Models:[14]

> *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 modeler producing the AVM.*

Appraisal Institute Advisory Opinion #18 (AO#18):[15]

> *An AVM is a computer software program that analyzes data using an automated process. For example, AVMs may use regression, adaptive estimation, neural networks, expert reasoning, and artificial intelligence programs.*

Appraisal Institute of Canada Position Paper (excerpt):[16]

> *Automated valuation models (AVMs) are computer programs that provide real estate market analysis and estimates of value. AVMs are no different than any other tool used by Professional Appraisers and other professionals to do their analysis and generate supportable opinions of value….AVMs do not replace Professional Appraisers, although they may compete for some of the appraisers' business much as appraisers compete with each other.*

The *Dictionary of Real Estate Appraisal*, 4th Edition, provides the following definitions:

Automated Valuation Model (AVM)

1. *Computer software that uses property database information to pull relevant comparable information and assign a value or range of value to a particular property.*
2. *A computer software program that analyzes data using an automated process. For example, AVMs may use regression, adaptive estimation, neural network, expert reasoning, and artificial intelligence programs. Note that the output of an AVM is not, by itself, an appraisal. An AVM's output may become a basis for appraisal, appraisal review, or appraisal consulting opinions and conclusions if the appraiser believes the output to be credible and reliable for use in a specific assignment. (USPAP, 2002 ed.) See also appraisal valuation model (AVM).*

Appraisal Valuation Model (AVM: An electronic tool used in algorithm-assisted valuation decision making). See also automated valuation model (AVM).

[13] Collateral Risk Management Consortium. "The CRC Guide to Automatic Valuation Model (AVM) Performance Testing". 2003. p.4.

[14] International Association of Assessing Officers. "Standard on Automated Valuation Models". September 2003. p.5.

[15] Appraisal Foundation. "Uniform Standards of Professional Appraisal Practice, AO-18". 2006. Lines 16-17.

[16] Appraisal Institute of Canada. "Position Document: Automated Valuation Models". April 2002. p.2.

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What have we learned so far about AVMs?

- AVMs have a wide variety of public and private sector real estate analysis applications.
- The growth of AVMs has largely been as a result of technological change and competitive pressures in the lending industry.
- There is no generally accepted definition for AVMs, although a common emphasis in definitions is use of computerized models.
- AVMs pose practice issues for valuation and assessment licensing bodies; for example, is the output of an AVM an appraisal or simply information to assist in real estate decisions?
- When an appraiser designs, develops, and applies an AVM as a valuation tool, we refer to the AVM as an "Appraisal Valuation Model". When the AVM is a completely automated model that produces an outcome for lending risk assessment or other purposes without appraiser intervention it is commonly referred to as an "Automated Valuation Model".

So why do AVMs appear here as a specialized valuation service? Is the AVM a specialized or niche valuation, an appraisal tool, *unsafe at any speed* or an industry killer?[17] In the following pages, we explore automated valuations as a business opportunity and the challenges the profession faces in adopting AVMs in the information age. Rather than fight or ignore AVMs, some appraisers may find ways to exploit the new technology and incorporate AVMs into their mainstream business. This lesson hopes to shed a little light on that path.

AVM = Appraisal Valuation Model	**AVM = Automated Valuation Model**
• Designed, developed, and applied by an appraiser • Valuation tool	• Completely automated • Outcome for lending risk assessment • No appraiser intervention

Traditional Appraisal Processes are Costly

Property appraisals are used by decision makers to make decisions, often to facilitate transactions of real estate in the private sector. Some appraisals are institutionalized; for example, property valuation appraisals are the primary basis for apportioning the incidence of municipal taxes.

Although residential appraisals are only one cost of many in real estate transactions, their unit cost is significant for high volume lenders in a competitive market where consumers are increasingly shopping for the lowest cost loans. Property appraisals, for the most part, remain centred on the information processing of individual experts. The appraisal industry has adopted automation to a certain extent, but with a focus on gaining efficiency in existing traditional appraisal practices and data management, rather than the "re-invention" of appraisal as a fully or partially automated process.

Another issue with property appraisals, as noted by Bradford and Linne (2011), is that the residential form report has changed very little over 25 or more years. The demands from lenders, Appraisal Management Companies (AMCs),[18] and regulators (USA) have restricted appraisers' innovation in reporting and analyzing market data. In other words, appraisers have not adapted well to changing times, new concepts, and new technology. One example of this resistance to change is the continued requirement in Canada for a cost approach in form appraisal reports.[19] Lenders certainly need to understand whether the economic life of a house subject to mortgage

[17] Wilson, Deane. "AVMs: Unsafe at any Speed". Valuation 2000 Papers and Proceedings. Appraisal Institute. p.245.

[18] An Appraisal Management Company or AMC is an entity that acts as a clearinghouse or broker for lenders, placing the bank's appraisal work with individual appraisers, relieving the bank of the burden in dealing directly with a large number of appraisers.

[19] The cost approach was abandoned in 2005 in the US residential forms created for Freddie Mac and Fannie Mae.

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financing will be more or less than the amortization period of the loan, but a detailed cost approach is not generally required since virtually all housing is purchased and sold on the basis of direct comparison.

The last decade has seen an explosion in the electronic availability of real estate data. Simultaneously, rapid advances in information processing technology are forever changing the way and the speed with which decisions are made. Also, the Internet has made access to and the distribution of information relatively inexpensive. It should not surprise anyone, then, that some entrepreneurs would see opportunities to automate mortgage risk assessment, consumer access to property information, and the valuation process to save costs and induce profits.

Furthermore, over the last decade, the mortgage marketplace has become extremely competitive. After the collapse of many savings and loans companies in the United States in the 1980s, this period saw the establishment of new lending regulations, smaller profit margins by mortgage lenders, increased regulation of appraisers, and the relentless advancement of computer technology as Moore's Law continues to hold.[20] There was also a shift in lender emphasis of risk management from asset security centred to borrower credit-worthiness. The environment was right for AVM development to burst on the scene. Some characterize AVMs as an anticipated evolutionary change, arguing that no significant deviation from the norm has occurred within the appraisal industry in over 60 years.

The 2008 collapse of the US housing market has been scrutinized by all stakeholders and been subject to US Congressional hearings. Most of the blame for the market collapse has been attributed to high risk or sub-prime syndicated residential mortgage backed securities (RMBS). Did AVMs play a central role in floating these loans? Apparently not, according to 2011 testimony given to Congress by Corelogic, a major US property data information storage and analysis entity. Corelogic's Chief Economist Brendan Keane stated that securitization of debt is a good thing provided that it is accompanied by uniformity of underwriting standards and securitized assets, standardization of securitization processes, and granular, loan-level understanding of the credit risks associated with whole loan portfolios and residential mortgage-backed securitizations (RMBS). In Keane's opinion, the best way to evaluate RMBS portfolios is through objective automated tools, such as AVMs.

In November 2010 Freddie Mac, the Government Sponsored Enterprise described earlier in this lesson, published a best practices document entitled *Components of an Effective Appraisal Management Process*. The main focus of this paper is recommendations for the appropriate use and governance of Appraisal Management Companies. However, the document suggests utilizing *automated valuation models (AVMs) and other risk assessment tools in the appraisal review process to verify appraisal information, provide additional sales data and flag potentially inflated values*.

Would you agree that stakeholders in the financial services industries (e.g., appraisers, bankers, mortgage underwriters) have traditionally resisted changes in business practices and new technology? Consider the business model for the typical appraisal firm (small proprietorships) and the traditional education stream for appraisers. How have these forces influenced the frame of reference or views of fee appraisers about technological change? How might this differ in the property tax assessment community, with its large staffs and budgets?

[20] "Moore's Law" is the 1965 observation by Gordon Moore, co-founder of Intel, that microchip technology is advancing at a pace whereby computing power will double every year or at least every 18 months.

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Canadian AVM Experience

In 1996, Canada Mortgage and Housing (CMHC) introduced emili, an Automated Underwriting system for the CMHC mortgage insurance program and the business environment for Canadian appraisers was forever changed. The History of CMHC website notes that the time required for mortgage approvals suddenly shrank from "days to seconds". The immediate impact of emili was a decline in conventional residential appraisal for high ratio loans requiring insurance. The emili AVM has continued to evolve. In the 2000 CMHC Annual Report, CMHC describes how the use of web technology allowed them to improve service levels by offering access to emili for processing mortgage loan insurance applications seven days a week with 99.1% availability. A complementary web based feature for automated registration of lender insurance claims, emiliCLAIMS, was introduced in 2003. Note that the chief mortgage insurance competitor to CMHC, Genworth Financial Canada (former business unit of GE Capital), offers a similar automated risk analysis tool.

To many appraisers, particularly those in the residential sector, automated models such as emili are synonymous with the perceived degradation of the fee appraisal industry. Initially, a large number of appraisers predicted the early demise of emili. It was widely believed that statistical valuation models could not keep pace with the market or deal with the specific defects of individual housing, and consequently properties could be substantially over-valued. However, as the Appraisal Institute of Canada states in the position paper on AVMs, not only is emili still in use but additional Automated Underwriting tools and related AVMs have been developed for use in the residential lending industry.

While the CMHC emili AU is not officially considered an AVM, its initial success has encouraged other firms to introduce Canadian AVMs. MPAC (Municipal Property Assessment Corporation) and reavs (Real Estate Automated Valuation System) became the first large scale public and private sector AVM providers in Canada respectively. In addition, two other Canadian firms, Macdonald Dettwiler Corporation or MDA,[21] and Teranet Enterprises have become prominent in the development of real estate information systems (title registry systems in BC and Ontario) and AVMs in North America and Europe. MDA is better known in the US through its subsidiary DataQuick and the Home Value Explorer AVM. MDA has been very successful in marketing this residential AVM through a distribution agreement with federal mortgage lender Freddie Mac. Teranet began the development of risk analysis tools for the lending industry in the mid-90s and in 2005 increased their product line with the acquisition of reavs.

Commercial property AVMs are coming to the market from the academic realm at a much slower pace than residential AVMs. At the time of lesson publication, commercial property AVMs have appeared only in some US markets (e.g., New England states and California). The smaller numbers of commercial properties, in relation to residential property volumes, low transaction numbers, and unique nature have posed significant problems for AVM developers. However, assuming continued pressure for faster, more efficient real estate tools, and sufficient applications of time and money, there will be technological solutions to common types of commercial real estate in larger markets. Examples of properties that may be suitable for AVMs are strata or multi-tenant industrial properties, rental apartments, and small to medium office properties. Once viable commercial AVMs have been developed in the USA, it is likely that commercial AVMs in Canada will follow, similar to the spread of residential AVMs from the USA to Canada. Keep in mind that these are not isolated trends and the appraisal industry is not the only profession facing these types of competitive pressures. Real estate salespeople and mortgage brokers have faced a number of similar challenges over the past decade with web-based low fee realty and brokerage services. In general, any profession that relies upon the collection and processing of information to provide a commercial service is in jeopardy of being replaced or transformed by technological change.

[21] MDA is a Canadian firm with an international presence, specializing in management and analysis of land and property information for the financial services and defence sectors.

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Appraisal Process as Modelling

The purpose of any appraisal is to arrive at an estimate of property (or an interest in property) worth or market value. This largely occurs by the analysis of sales data, and it is the interpretation of that data that ultimately yields market value. Bonbright (1937) said it quite clearly:

> *All of the various methods of valuation known to the appraiser make use of inferences from either or both of two sets of data; first, data as to the values that have already been placed upon property by other people; second, data as to the advantages that the property in question may be expected to confer upon an owner, present or prospective.*

The management and interpretation of this data can be modeled.

A model may be thought of as a representation that captures the essence of reality. The acceptance and deciphering of these two sets of data that Bonbright references can be structured into a model. After all, traditional appraisal techniques like the cost, income, and direct comparison are all models. However, when that data is in an electronic format and abundant, modern computer technology can be applied through a model. A properly structured and data supplied AVM can generate an acceptable estimate of market value for a given property, for a specific group of users.

A key distinction among types of models is whether they are empirical or theoretical in nature. Theoretical models are heavily based on known relationships and mechanistic understanding. Cost, income, and traditional direct comparison approaches are example of theoretical models. Empirical models are based solely on data and are used to predict, not explain, a system. A graph of sale price over time is an example of an empirical model. AVMs are data hungry, rely on mathematical relationships for outputs, and are used to predict economic conditions. As a result, AVMs fall into a special class of empirical models, referred to econometric models.

The economic basis for AVM models suggests that appraisers with a deep knowledge of appraisal theory and well-honed intuition of real estate markets may be in a position to play a crucial role in AVM development. In these cases, appraisers can draw on their experience and training to identify the market factors that best represent the behaviour of market participants – for example, the identification of the market variables that are most significant in contributing to a property value (e.g., rent, design, size, age, and location). As we shall soon see when we examine the major types of AVMs currently operating, this type of consultant role, or even a primary entrepreneurial role if the appraiser initiates and manages the AVM development, requires a solid background in statistics. However, statistics has not been a historic focus of professional appraisal training programs, so there is a relatively small contingent of working appraisers who can easily fit into this role. As Bradford and Linne (2011) point out, appraisers continue to produce residential reports with the traditional three comparables rather than considering the additional insights from regression analysis of a larger population of data. It is not surprising that many AVM developers or primary consultants have an academic background in math or statistics and/or obtained their skills in large Bay Street or Wall Street financial services firms, or through the property assessment environment, where automation flourished early.

Based on the foregoing discussion, what risks do you feel the appraisal profession is facing with its evolution? Are appraisers falling behind other social and physical sciences in the general application of statistics?

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Stephen Hoch of the Wharton Business School tells us that "because of their complementary strengths and weaknesses, humans and machines are more powerful together than either one alone".[22] In this piece of highly recommended reading, Hoch argues that information-driven forecasting systems (like AVMs) work best when responsibilities are divided between computers and humans. This point of view is supported by appraisal professionals who are advocates of "Appraisal Assisted AVMs" or AAVMs. Mark Yellen, President of Appraisal.Com argues that a market exists for the AAVM where borrower risk is low and the anticipated property value falls within a wide range of values that the lender has decided is acceptable as compared to the borrower's income.[23] Yellen's thesis is that the lender has no objective criteria or expertise to evaluate the output of an AVM and the follow-up generally occurs after a mortgage is in default. The appraiser can fulfill this role, provide the additional intelligence to confirm whether AVM output falls within a reasonable range, and complete an inspection if required. The AAVM, as described by Yellen, works in a very similar fashion to an AVM with one key difference; instead of a fully automated process with no appraiser intervention, the AAVM requires appraiser judgement to set data parameters for a comparable search and reconciliation process. The output is then reviewed by the appraiser with a recommendation transmitted electronically to the client.

One can extend this thinking to the use of an AAVM for underwriting of RMBS or other forms of syndicated mortgage loans. We will examine the AAVM concept later in this lesson in the "Evaluating AVMs" section.

Herein lies what we believe to be an opportunity for the largest group of practising appraisers to work with AVMs. However, we currently see a limited number of private sector AVMs that allow this integration between human/expert intuition and computer automation to take place.[24] Realistically, at this time, appraisers or appraisal firms that see a market niche for AAVMs in their business plans may have to develop a home-grown AAVM that serves a local market or an automated model serving as a valuation tool for applications such as location analysis, rent analysis, or bulk appraisal work.

One example of bulk appraisal work using an early form of AAVM was the Province of British Columbia's restricted sale of the fee interest in 4,500+ waterfront lots existing lessees in the early 1990s. The appraisal industry was challenged by the scope, target dates, and requirement to deliver credible and understandable approaches to valuation of entire subdivisions of Crown-leased lots on various lakes and tidal areas throughout the province. In this case the appraisers first assigned ratings to each recreational lot in relation to benchmarks. Sales analysis was undertaken to understand the impact of variables such as the amount of water frontage, lot depth, vegetative cover and type. Benchmark lots were valued and a non-automated appraisal model applied to value the remaining lots in each subdivision. A final scan was undertaken to ensure equity and logical value outcomes.

The main barriers for appraisers to overcome in developing an AAVM or AVM (whichever term you prefer) are the requirements for substantial investments in time, money, and technological and modeling expertise. Many appraisal firms are small partnerships or single proprietorships and lack the critical mass to make large investments in technological research and development. Another issue is the very limited amount of AVM software available commercially since this type of product is still in its development infancy. In general, the older generation of appraisers has a distrust of statistical methods. The distrust is not necessarily from a lack of education but possibly due to years of experience with appraiser misuse of these techniques.

[22] Hoch, Stephen J. 2001. "Chapter 5: Combining Models With Intuition to Improve Decisions". *Wharton on Decision Making*. Chichester, England: Wiley. This chapter can be downloaded from "Online Readings" on the BUSI 344 webpage.

[23] Yellen, Mark. "The AAVM: Putting the Appraiser in Automated Valuation Models". *Valuation Insights & Perspectives*. Appraisal Institute. 3rd Quarter, 2002.

[24] One shining example is the Taurean AVM, which is spotlighted as a case study in the "Online Readings" on the BUSI 344 webpage.

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Rather than invest resources in expanding from residential to commercial property AVMs, the information management industry in the USA has focused on the broader requirements of commercial property owners, brokers, and lenders, among others. An example of this market-driven approach is the automated products developed by CoSTAR, a NASDAQ-listed company founded in 1987. CoSTAR, according to their literature, is the largest single source of commercial real estate information in the USA.[25] One automated report produced by CoSTAR, referred to as the CoSTAR Property Professional, provides much of the information about a property that one would typically find in a conventional real estate appraisal, with the exception of an opinion of value. For example, this report includes full details on property characteristics (e.g., lot size and dimensions, building size, rentable area, amenities, current vacancy, asking rents, rents recently concluded, building sales, assessments). With a little more effort from CoSTAR, it is easy to imagine how the report could include estimates of market value or a value range. The message here is that firms specializing in management of electronic knowledge bases, such as CoSTAR, are designing and producing products that meet client needs.

> Appraisers would be wise to evaluate the products from CoSTAR in relation to the traditional appraisal reports they have been producing (which have not changed significantly for years) and ask themselves which document provides the intelligence that clients desire.

Types of AVMs

Before we can better understand opportunities for appraisers in the field of appraisal automation, it is important to briefly map out the considerable variation in AVMs. An AVM is a computer dependent program that models specific real estate data to produce either a range or a single point estimate of value. Therefore, a simple spreadsheet template that automates some routines of the appraisal process can perceivably be classified as an AVM. At the other end of the spectrum are assessment CAMA systems and large private sector AVMs with professed national coverage and Internet access. There is a lot of territory in between, and its description could fill a book.

Currently, most private sector AVMs are restricted to predicting prices of single family residential homes in larger urban areas because this property group displays the most homogeneous characteristics and their markets are sufficiently active to provide the needed volume of sales data. Some of the largest, busiest, and well-funded AVMs are operated by government agencies entrusted with delivering government housing programs. In Canada, CMHC's automated underwriting system emili has an AVM component. In the United States, the Federal National Mortgage Association and the Federal Home Loan and Mortgage Corporation rely on automated valuation models for evaluation of secondary loan markets.

There are some AVMs that will value a restricted range of commercial real estate. However, as we learned earlier, a key barrier to expanded commercial AVM growth in this industry sector is that IC&I real estate is often too heterogeneous for broad-based AVM development at this time. The exceptions are larger centers where sufficient volumes of rental apartments, light industrial property, general retail, and office buildings provide the opportunity to develop the databases required for AVMs.

While developing an AVM for commercial valuation work is a serious challenge at present, the barriers are lowering with constantly improving databases and advances in spatial location analysis (Geographic Information Systems). Commercial property investors and lenders, similar to residential lenders, view transaction cost and time delays for appraisals as areas for improvement. Reducing those costs and shortening the delivery time for commercial appraisals should be powerful incentives to bring experienced AVM developers into this market, especially since they would already be starting with residential AVM modeling experience. While the penetration of AVMs into commercial property valuation is not expected to be rapid, it is expected to evolve over the next few years.

[25] *www.costar.com/corporate*

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> Consider the future of commercial property AVMs. Will these AVMs be designed by or for appraisers (e.g., AAVMs), or will these products be an extension of the purely statistical residential AVMs?

Another way to characterize AVMs is by their primary sales data source. Many private sector residential AVMs use public assessment data, particularly in the United States where this information is generally publicly available at no cost or minimal cost. An example of a web portal offering access to hundreds of public real estate sites is "The Public Records Online Directory"[26] founded in 1993 by NETR Real Estate Research and Information, a title search and title insurance company. Other AVM vendors in the US rely on several data sources including public records and information from large national sale data providers such as DataQuick, Fidelity and First American. In Canada, as we learned earlier, MDA Corporation and Teranet Enterprises, and to a lesser extent Landcor (regional example, explained later in this lesson), fulfill similar roles in managing very large real estate information portals. Of course, the data source also defines the extent of territory that is covered by an automated model and the limitations in depth of information. The difficulty for AVM vendors in Canada is that they must deal with multiple jurisdictions (Real Estate Boards) and public transaction data is not freely available. AVM vendors have focused on geographic coverage of their products as a marketing tool or competitive advantage, although each vendor recognizes gaps in coverage exist. The coverage rate for AVM or in industry vernacular, the "hit rate", is examined in more detail later in this lesson in the Evaluating AVMs section.

Perhaps the most common method of categorizing AVMs is by the system or modeling process they employ to achieve their objective. These processes include price indices, hedonic (regression) analysis, expert systems, and neural networks. Expert systems and neural networks fall into a broader category of science known as artificial intelligence. Some AVMs are based on a combination of these modeling processes.

The predictive model that underlies an AVM is a valuable patent-protected asset. These have been the subject of a number of high profile lawsuits in the USA. A review of the case law is a good way to learn more about the differences and similarities between various AVM models. The appraiserlaw.com website, cited at the beginning of this lesson, is a good starting point for your review. One notable case involves a patent infringement claimed by First American Corelogic. In their suit, Corelogic names a number of entities that provide AVMs, including Zillow.

Brief explanations of common AVM systems are provided below:

Price Indices. AVMs based on price indices are very simple models. These models are generally based on repeat-sales to generate a price index for a specific geographic area, usually defined by zip or postal code. This method does not rely on the detail present in a hedonic model and hence the output is more subject to variability. The Zillow "zindex" is an example of a price index AVM (explained later in the lesson).

Hedonic. Hedonic systems are the most common AVMs and are largely based on statistical models using some form of linear regression. These models require information on property attributes, such as location, property size, and nature of improvements. The hedonic AVM includes a search engine that compares the subject property attributes (contained in a database) with other comparable properties using a "radius" search pattern or other logical search parameters, over a pre-determined time period. AVMs developed by Landcor and MPAC (Municipal Property Assessment Corporation) are examples of hedonic systems (both AVMs are explored later in the lesson).

[26] *http://publicrecords.netronline.com*

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Expert Systems. An attempt to model the behaviour of experts (i.e., appraisers) using mathematical relationships. These systems are complex and, as noted by George Canning, expensive and not very adaptable to changing conditions.[27] An AVM expert system would work by combining three parts: a user interface, a logic-based computation system, and a related knowledge base.[28] The user responds to a series of questions that allows the logic engine to search the knowledge base to lead to a conclusion.

Neural Network. An attempt to use computing resources to mimic or model the way the human brain works. A digital network relies on computations involving zero and one, while a neural network relies on a series of connections that are turned on and off (similar in the brain function). As input is provided to all units in the network, the organization and weights of the inputs determine the outputs.[29] Due to the complexity and highly theoretical nature of these networks, they have not been widely adopted as the basis for AVMs.

Some may argue that the Appraisal Assisted AVM described earlier (Yellen) is another form of AVM where the appraisal professional reviews or edits the output of a conventional AVM.

Most of these systems described above require high level programming skills to participate in their technological development. Any appraiser contribution toward their development, therefore, is more likely to come in a consultation role, providing modeling information. To preserve this lesson's general non-technical flavour, we will omit detailed technical descriptions of how AVMs make their value predictions. Students interested in the technical aspects of AVMs may find more information in the "Online Readings" available on the Course Resources website.

Defining a secondary role for appraisers, as users and reviewers of computer-assisted appraisals, is difficult. Many AVM providers consider their technology to be proprietary; information as to how the AVM reaches and supports its predictions is not readily forthcoming. At the same time, a disclaimer can be found on the websites of most commercial AVMs about their relationship to traditional appraisals. For example, Teranet's website provides this disclaimer about the firm's reavs AVM:

> *The reavs application is not an automated appraisal system. It has been developed as an information service that can be used to replace, supplement and/or audit the traditional appraisal process, depending on the situation. It does not use traditional appraisal techniques to determine property values and no physical inspection of the property is performed.*[30]

The Zillow website includes a similar message regarding their free market value estimate:

> *The Zestimate (pronounced ZEST-ti-met, rhymes with estimate) home valuation is Zillow's estimated market value, computed using a proprietary formula. It is not an appraisal. It is a starting point in determining a home's value. The Zestimate is pulled from data; your real estate agent or appraiser physically inspects the home and takes special features, location, and market conditions into account. We encourage buyers, sellers, and homeowners to supplement Zillow's information by doing other research such as:*
>
> - *Getting a Comparative Market Analysis (CMA) from a real estate agent*
> - *Getting an appraisal from a professional appraiser*
> - *Visiting the house (whenever possible)*

[27] Canning, George. *What Makes AVMs Work*? UBC Real Estate Division. Vancouver. p.2.

[28] Waller, Bennie. "The Impact of AVMs on the Appraisal Industry". *Appraisal Journal*. July 1999. Chicago. p.290.

[29] *www.webopedia.com/TERM/n/neural_network.html*

[30] Teranet Enterprises. "What is reavs: Information in real-time for real estate risk management". *https://www.reavs.com/about.htm*

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The Zoocasa website provides very little information about the basis for the Zoopraisal, possibly due to Centract's licensing requirements.

The message seems to be that vendors of private sector AVMs are not in competition with professional appraisers, but offer a service complementary to traditional appraisals. However, as we will see in the Standards discussion and Case Studies later in this lesson, the appraisal community has been debating AVMs for years: is the output of an AVM an appraisal or simply information that may be more valuable in the hands of an appraiser? If an appraiser participates in the development or management of an AVM, what are the professional responsibilities for decisions such as the nature and quality of related data, or intended use? In the next section, we take a closer look at the professional appraisal practice issues associated with AVMs.

AVM Standards

In the USA, appraisal and assessment practice is largely regulated at the state level. Professional appraisers have their choice of a number of licensing organizations: the Appraisal Institute, American Society of Appraisers, International Association of Assessing Officers, and others dealing with specialized practice areas (e.g. right-of-way valuation). All of these organizations are affiliated with the Appraisal Foundation, a not-for-profit national organization founded in 1987 to provide uniform standards for professional appraisal practice, appraiser education and licensing. The Foundation is best known for its annual release of the Uniform Standards of Professional Appraisal Practice or USPAP.

Recognizing the emergence of AVMs in the 1990s and the need to address practice issues, the Foundation developed AVM Standard 6-4 and related Advisory Opinion #18 (practice note). In summary, Standard 6-4 requires appraisers developing mass appraisal applications to:

- identify and understand the market information required to perform the appraisal (i.e., demonstrate competence in data collection, analysis and reporting for mass appraisal assignments); and
- use recognized techniques for specifying and calibrating mass appraisal models.

While USPAP Standard 6-4 provides considerable scope in the development and use of AVMs, there is a repeated use of the term "recognized technique" to provide bounds on the specification, calibration, and use of AVMs. The message for appraisers is that use or development of AVMs does not eliminate or modify the requirement for conformity with generally accepted appraisal practices.

Advisory Opinion #18 provides advice to appraisers on the steps required to meet Standard 6-4 as well as all other related appraisal standards. Those wishing to examine AO#18 in its entirety can find a link to this information on the course webpage. The key messages in AO#18 are that:

- you must be competent in the use of AVMs before using the output from an AVM or building an AVM for an appraisal assignment;
- an appraiser should only use an AVM if they understand how it works, how it should be used, have confirmed that the data sources are appropriate, and that the output is credible and reliable;
- the appraiser must verify the relevancy and quality of data used in the AVM;
- the appraiser must understand whether the AVM is suitable for a specific market area and valuation assignment (e.g., whether it is an acceptable tool for the appraisal assignment); and
- when communicating the results of an AVM, the appraiser must disclose that the output is not an appraisal, and also disclose the nature of the AVM operation, data used, and degree of appraiser intervention.

The communication responsibilities of the appraiser in AO#18 have created some controversy in the appraisal community. For example, when an appraiser enters data (e.g., property address) in an AVM, does it remain a "black box" or is the output an appraisal subject to USPAP? Taking this issue one step further, what about the

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scenario when the appraiser makes decisions about what goes into the AVM and how it should be adjusted, essentially applying appraisal judgement. Is the output, despite the report disclaimers, an appraisal? In his paper delivered at the 2000 Appraisal Institute conference, Deane Wilson, ASA, argued the USPAP Standard 6-4 and related Advisory Opinion were contradictory. He stated that *if the output of an AVM is used in place of an appraisal (to estimate market value), then it must be an appraisal.*[31] Wilson stated that AVMs are "unsafe at any speed" and raised additional issues:

- If the client relies on an AVM, rather than appraisal, does that mean the AVM must comply with professional appraisal standards (USPAP)?
- What credentials are required for use of an AVM? How can the consumer be informed about the reliability of an AVM?
- Are AVMs based on statistical or appraisal theory?
- Who is regulating AVMs?
- How do we know which AVMs are credible and which are not?

In Canada, professional appraisal practice is largely un-regulated by government. However, the Appraisal Institute of Canada (AIC) is the leading national organization of appraisers and is widely recognized as a credible professional accrediting body by the private and public sectors. The AIC has adopted standards of professional appraisal practice (Canadian Uniform Standards of Professional Appraisal Practice, CUSPAP or "Standards"), although a less detailed approach has been taken in relation to USPAP. The AIC Standards place an obligation on the appraiser to understand the process that generates any AVM-produced prediction of value used in a consulting or review assignment, and to provide an opinion on the credibility of the output.

Section 7.17.5 of CUSPAP 2012 provides direction on AVMs similar to USPAP. When an automated valuation model is applicable, an appraiser must:

- have a basic understanding of how the AVM operates;
- determine if use of the AVM is appropriate for the assignment;
- ensure that the AVM does not exclude relevant data necessary for a credible result; and
- when developing opinions or conclusions in an appraisal, respond to these Standards.

However, there are practical standards issues for appraisers who use or review private sector AVMs in Canada. At the present time, most AVM vendors view the algorithm that drives their products to be proprietary and are generally reluctant to share this competitive information. In addition, there are significant research and development commitments in both time and money required to create a workable AVM. Consequently, this business model presents a serious barrier to appraisers in meeting their professional standards in using or reviewing private sector AVMs.

AIC published a policy paper on AVMs in 2002, recognizing the emergence of the AVM product, the growing need to inform the public (e.g., lending community), and encouraging appraisers to "adapt" to new technology. Some of the main recommendations in this paper were:

- the development of "Best Practices" for use of commercial AVMs; and
- appraisers have a role in "qualifying" the results of all AVMs, except for low-risk residential mortgage applications.

In contrast, the assessment community was an early adopter of AVMs, known in assessment circles as CAMA or Computer-Assisted Mass Appraisal. In 2003, the International Association of Assessing Officers (IAAO) released a detailed standard for use of AVMs, "*Standard on Automated Valuation Models (AVMs)"* (available on the Course Resources website). The preface to the IAAO Standard states "these standards are intended for public sector CAMA and private sector AVM systems". Given the depth of coverage, this document is a useful primer

[31] Wilson, L. Deane, ASA. "AVMS: Unsafe At Any Speed". *Appraisal Journal*. Chicago. 2000. p.245.

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for all appraisal professionals seeking more information on AVMs. The IAAO standard provides depth of direction for all aspects of AVM development including data capture, model specification, calibration, and communication of the outputs. The detailed IAAO standard goes beyond USPAP and the Canadian Standards by providing specific measures for evaluating various types of AVMs (e.g., confidence tests for regression AVMs). However, the following statement in the Introduction section of the IAAO Standards appears to directly conflict with USPAP and add confusion:

> *The purpose of an AVM is to provide a credible, reliable, and cost-effective estimate of market value as of a given point in time.*

This statement is qualified somewhat later in the Introduction with the statement: "AVM values reviewed for reliability and generated in compliance with USPAP Standard 6 are considered appraisals".

How has the private sector reacted to confusion over the professional standards governing the use and interpretation of AVMs? In 2004, Fitch Ratings, a prominent international credit rating agency recognized by the US Securities Commission, issued an alert to vendors of US residential mortgage-backed securities (RBMS), known as commercial mortgage-backed securities or CMBS in Canada, noting that Fitch would apply 10-15% discounts on lenders' value estimates based on "non-full appraisals". The concern expressed by Fitch Rating was that there was a significant delay or lag in measuring market trends associated with the data used by AVMs. In a May 2006 news release, Fitch reversed its earlier position, using AVM research to conclude there is no significant lag. Fitch Senior Director Suzanne Mistretta stated that Fitch will "evaluate each lender's processes and controls for its AVM and other non-full appraisal usage as a sole valuation tool for new first lien originations to ensure that overvaluation risk is adequately mitigated".[32] AVM evaluation is covered further in the next sections.

While appraisal standards exist for development and use of AVMs, practice issues remain. What would be your recommendations to Canadian and US appraisal standards organizations to bring more clarity to use of AVMs by appraisers?

AVM Strengths and Weaknesses

Strengths

As we learned earlier, the driving force that led to the rise of AVMs was the competitive pressure to deliver mortgage appraisals faster and cheaper than "live appraisers". The artificial intelligence of AVMs illustrates that it is possible, with some limitations, to use a computer program to model appraiser judgment to deliver consistent, inexpensive results, particularly with large volumes of data. AVMs are not limited to one valuation method and some will deliver multiple valuations for a specific property, also determining the best approach given the property type, location, and data availability. As well, given ongoing concerns about mortgage fraud, an AVM cannot commit fraud or make mistakes with calculations. AVMs can even be designed to evaluate and rank other AVMs, which in some ways is a metaphor of the future depicted in Isaac Asimov's *I Robot*.

In 2006, BenchMark Consulting International published a *Home Equity Lending Study* for the Consumer Bankers Association. A key finding in the study was that the time taken for an appraisal was reduced from the traditional 7-10 days for an in-person in-home appraisal to just 30 seconds. Benchmark concluded that this factor was the major contribution to a 30% reduction in loan turnaround time between 2003 and 2005.

AVM vendors pitch the major strength of AVMs as providing information that clients want versus what appraisers and others have decided they need. These desires include reduced administrative expense and more in-

[32] Business Wire. "Fitch Revises Its Stand on AVMs for US RMBS". May 8, 2006. *www.businesswire.com*

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depth exposure to market trends. George Dell notes that larger lenders see advantages to an improved "supply chain" since they only need to deal with a few AVM vendors, rather than a large number of small appraisal firms. The problems and costs in managing a large number of suppliers are eliminated by dealing with large national AVMs.

Weaknesses

An automated valuation model is only as good as the data and workmanship programmed into it. The soft underbelly of AVMs, in general, is the quality, consistency and availability of data. Keep in mind that this data will typically come from multiple sources: Multiple Listing Services, government property transfer records, assessments, and, in some cases, appraised values. There is a body of evidence, mainly in the USA, which indicates serious concerns with the quality and consistency of private sector AVM output. The US lending community and debt rating agencies have begun to develop technical standards for evaluation of AVMs (covered in the next section).

Residential AVMs tend to perform poorly when the volume of recent sales for a particular area is scarce since system "business rules" calling for a minimum amount of transaction data are not met. In these cases, system rules usually dictate that no output be produced or that data should either be extracted from a broader geographic area or a broader time horizon. The other issue is currency of information. AVMs have been accused of providing high valuations for residential property when US markets show signs of decline. AVMs have recently been accused in the USA of driving down the value of new housing since the comparable data is weighted to foreclosures and distress sales of newer residential housing in some neighbourhoods.

A second problem area for AVMs is inaccurate or incomplete property inventory and neighbourhood data. This is a particular issue with distressed properties that are typically vacant at the valuation date. One company, Lender Processing Services (LPS), announced in September 2011 a new hybrid AVM that includes a real estate agent's opinion of property condition and value as an additional analysis metric. Realtor opinions, known as BPOs or Broker Price Opinion, are common in the USA. BPOs are used by lenders to value properties where the cost and time delay for an appraisal is not deemed necessary. BPOs can be drive-by or internal inspections. These hybrid AVMs are sometimes aimed at markets dominated by foreclosures – called *Distressed Asset Reviews*. This approach has some similarity to the Appraiser Assisted AVM with the exception of two key differences: the process is still entirely automated and there is no appraiser involved.

Because of the lack of public information on AVM data screening methods, database structures, and algorithms, it is difficult to determine their structural weaknesses. Some AVM products, such as *Zillow* and *Home Value Explorer*, have partially addressed this issue by warning users about gaps in geographic coverage. However, the actual nature of the data used by many AVMs remains a mystery. For example, AVM vendors may disclose their use of assessment data and other public records for residential AVMs, but the quality, timeliness, and relationship between assessments and market value varies considerably across the USA. AVM vendors generally address this issue by providing large clients in-depth information on their processes, subject to negotiated confidentiality agreements to avoid giving away the "secret recipe".

The Taurean model, an AVM that we highlight in the Online Readings on the Course Resources website, provides an example of both good disclosure practices and good data screening. Taurean offers a data analysis routine to scan for missing data or anomalies before the records are incorporated into the database for valuation use.

This process is illustrated in Figure 9.2.

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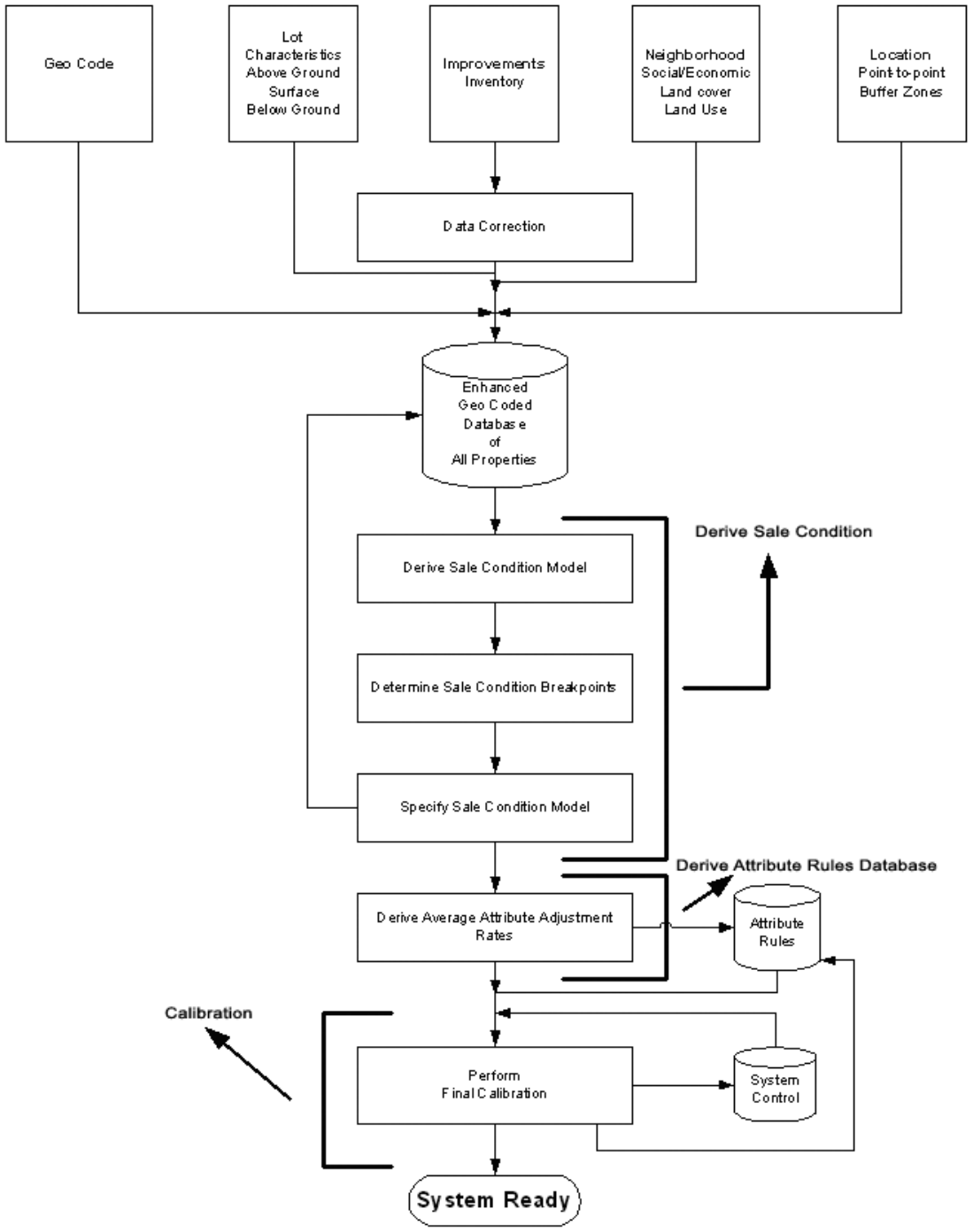
Figure 9.2: External Data Management



An inherent additional weakness of AVMs is their attempt to model human reasoning. It is extremely difficult for mathematics to model the complexities of human behaviour, especially in appraisal where technical information is transformed by personal experience. Market relationships are not static and an AVM will require periodic adjustment to reflect observed market changes over time. Therefore, the risk associated with reliability of AVM outputs increases when they become the sole determinant of value for real estate decisions.

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There is an absence of research data and conclusions on the commercial success of AVMs. Many are integrated with other products and services offered by developers, and so their profitability is disguised in the mix. Of course, profitability is the fuel that drives the development and advancement of commercial AVMs.

Evaluating AVMs

Generally accepted standards and methods for measuring the performance of AVMs or ranking AVM output in relation to conventional appraisal reports are not available at this time. However, this situation is changing as lending organizations, debt rating agencies and AVM vendors demonstrate leadership in AVM evaluation.

In the previous section we learned that Fitch Ratings has put measures in place to evaluate the reliability of AVMs to predict value in certain market areas.

In 2003, the residential mortgage industry group Collateral Risk Management Consortium (CRC) released the "Guide to Automated Valuation Model Performance Testing". The complete guide is available from the BUSI 344 Course Resources webpage. According to the CRC website, the guide represents an extensive review of Automated Valuation Model performance testing practices. They noted that the lending industries struggle with unique AVM databases, proprietary technology and systems and very different quality control measures, recognizing there was no consistent way to evaluate or rank AVMs in relation to industry standards.

The Guide recommended the following tests for evaluation of AVMs, with the emphasis on residential AVMs.

- **Hit Rate**. The hit rate is the number of times the AVM will return a result for a given population sample. There are two types of hit rates: raw response rates (actual hits regardless of information returned) and the useful response rate (the adjusted response rate after non-reliable responses are excluded).
- **Comparison of AVM output to Sale Price**. This measure is simply the comparison of the AVM return for sold property where a re-finance transaction takes place.
- **AVM Percentage Error**. The percentage error is the difference between the AVM return for sold property and sale price, expressed as a percentage of the sale price.
- **AVM Bias**. Analysis of all percentage errors to determine if the model consistently over- or under-values property.
- **Number of Outlier Outcomes**. The number of records where the disparity between the sale price and predicted value is very large.
- **Comparison of AVM Percentage Error to Vendor Confidence Level**. This is a measure of how well the AVM performs in relation to vendor specifications. For example, if the vendor specifies that the AVM will consistently return a value within 10-15% of the sale price, but the percentage error exceeds this tolerance level, then the model's reliability should be questioned.

The Consortium suggested that the above measures can be used to rank the performance of various AVMs for a specific market area and indicate whether the output from an AVM should be subject to additional scrutiny. The industry refers to this review process as "bump" logic. Where the output from an AVM does not meet a prescribed standard, the lender "bumps" the output to an appraiser for review. An AVM valuation may also be "bumped" to an appraiser when the lending risk exceeds normal parameters. The CRC's guide deals with issues related to designing the AVM testing methods. For example, should an AVM be tested at different geographic scales (e.g., national and regional)? If more localized testing is required, the sample size must be sufficiently large to obtain statistical validity. The other recommendation is that the test should reflect the same expectations for response targets and quality that an institution normally meets under "production conditions" for loan applications.

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The above discussion provides a series of measures for AVM evaluation, but we still need to understand how the performance of AVMs should be evaluated. Douglas Gordon, Freddie Mac's Director of Model Development and Bud Sottili, Customer Service Manager, provide practical advice for larger scale consumer AVM products in their August 2001 paper for the *Secondary Marketing Executive*.[33] The authors identify key requirements for AVM testing:

- an appropriate sample size;
- loans (e.g., properties with approved loans) that reflect the firm's lending pattern;
- loans that have closed recently; and
- a sufficient number of loans (at least 1,000 data samples are recommended).

Gordon and Sottili's advice appears to be mainly common sense, but it highlights a very important weakness with some AVMs. Most AVMs rely exclusively or heavily on public data to generate value estimates. The AVMS will return highly accurate results if the testing samples include loans for which the property sale or re-finance was recorded in public records (up to three month delay). According to the authors, this unfortunate phenomenon occurs since many AVMs are designed to return a recent sale price of a property with little deviation. Therefore, the best approach is to obtain the sales database for review of AVM outputs before the transactions are dated and likely to appear in public records. Gordon and Sottili recommend using all the criteria identified in the Consortium report, along with statistical measures (e.g., standard deviation) to form a "template" for ranking AVM performance using subjective weighting criteria. Since AVMs will generally produce a value range for loan risk analysis, it is also recommended that percentages of sales prices that fall within the projected model value range be determined.

In 2004, Standard and Poor's (S&P), an international debt rating agency similar to Fitch Ratings, reported on its evaluation of 13 national AVM systems.[34] The AVMs submitted to the review on a voluntary basis and provided S&P technical information on the AVM development, algorithm, and vendor testing measures. Some of the AVMs tested included APS (Fannie Mae), Home Value Explorer (FreddieMac), Quantum (MRAC), ValuePoint4 (First American), ValueSure (Fidelity Hansen Quality), and ValueWizard (TransUnion).

The S&P review process involved the following steps:

- assembly of test dataset (about 1 million sold properties desirable);
- ensuring representative distribution of data involving residential mortgage for all states;
- analysis of the dataset for outliers – these were trimmed from the same dataset since it was recognized that AVMs will not generally produce an acceptable result for properties with unusual attributes or exceptionally high or low values;
- AVM vendors valued each property in the database;
- AVM outcomes were stratified and statistical measures of central tendency and dispersion were determined (e.g., variance of actual sale price to AVM value, accuracy of data returns for property address).

Each AVM vendor requesting an S&P review was required to submit information on the system overview, AVM algorithm, system development, database management and planned enhancements.

S&P found that AVM accuracy and hit rates varied considerably among AVM products, with a range of 53% to 84%. The variance between predicted AVM value and actual sale price ranged from a median of 0% to 300% for various research samples. When the standard deviation of each system was considered on a national basis, all AVM products appeared to have similar statistical results with a normal distribution (see sample chart from S&P

[33] Gordon, Douglas and Sottili, Bud. 2001. "Using Tests to Find the Best Automated Valuation Model Vendor". *Secondary Marketing Executive*. August 2001.

[34] Parris, Michael. "US RMBS Automated Valuation Models Are Becoming More Accurate". Standard & Poor's. October 14, 2004 (reprinted from Ratings Direct).

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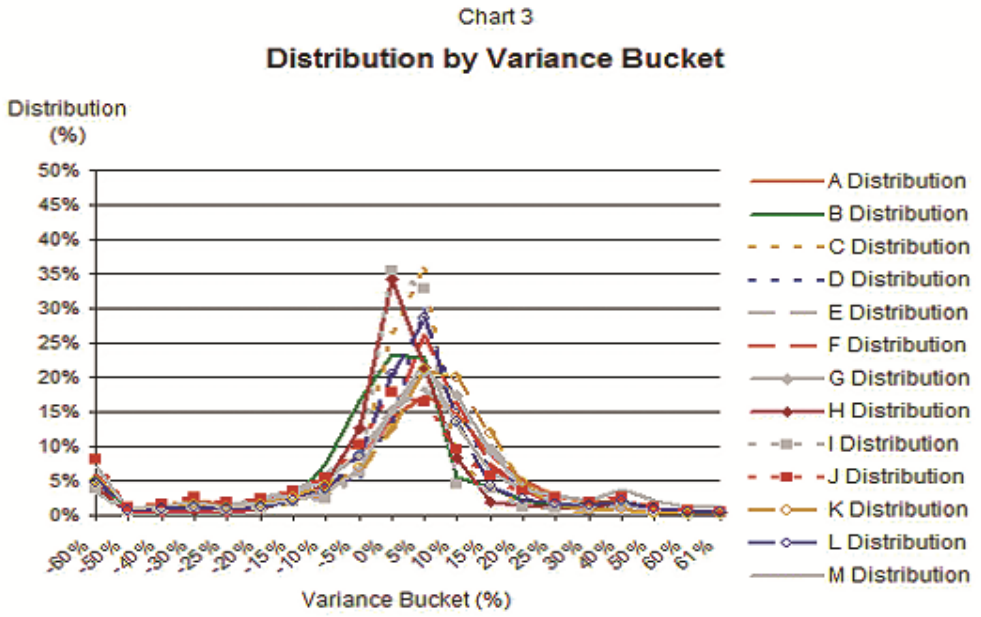
Report, Figure 9.3). However, this statistical similarity was lessened in smaller geographic areas, suggesting the underlying quality and extent of AVM data varies considerably.

One might conclude that the S&P study confirms that AVMs outcomes are not sufficiently reliable for specific properties. However, from the perspective of secondary lenders who deal in very large pooled mortgage funds, the S&P study indicates that AVMs are just fine. What does this tell you about the market for AVMs?

Figure 9.3: S&P Report – Chart 3

Chart 3 contains the distribution of variance returns for all 13 systems. The positive numbers represent a variance where the AVM system undervalued the property, while the negative variance buckets of this chart show overvalued properties. The bell-shaped curve shows that the majority of the valuations fall within plus or minus 10% of the actual sale price, which is an accepted industry standard for the full URAR.



In 2003, the residential mortgage industry group Collateral Risk Management Consortium (CRC) released the "Guide to Automated Valuation Model Performance Testing". The complete guide is available from the course webpage. According to the CRC website, the guide represents an extensive review of Automated Valuation Model performance testing practices. They noted that the lending industries struggle with unique AVM databases, proprietary technology and systems, and very different quality control measures, recognizing there was no consistent way to evaluate or rank AVMs in relation to industry standards.

Another example of AVM measurement is a software product being marketed by a California firm called Platinum Data Solutions. In a November 2006 news release, the firm announced the release of OptiVal, an AVM performance tool. According to the news release, "OptiVal was developed to support the emerging industry imperative regarding AVM standardization. It enables originators and investors to fine-tune their deployment of AVM products to ensure the greatest accuracy and quality of valuations derived from them".[35] Students are encouraged to conduct independent research to learn more about this evaluation tool.

[35] *Fresh_News.com*. "MISSION VIEJO—Platinum Data Solutions Offers AVM Performance Testing Solution". November 1, 2006. Cited in Orange County News.

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Over the past few years, there has been an increasing debate in the US housing industry that markets were over-heated and that real estate lending and appraisal processes were contributing to the real estate "bubble". Partially in response to this growing concern and the recognition that loan risk was increasing, the Real Estate Information Professionals Association (REIPA) established an AVM Standards Committee, in collaboration with a number of AVM providers. On June 25, 2005, the REIPA released a document entitled "Systemic Risks in Residential Property Valuations: Perceptions and Reality".[36] In this paper, the REIPA set out to test a number of perceptions about AVMs and conventional appraisals, such as:

- AVMs have a tendency to result in over-valuations of property relative to conventional appraisals; in soft markets (more sellers than buyers, or a buyer's market);
- AVMs produce more "outlier" valuations than conventional appraisal reports; and
- AVMs have a neutral bias in relation to conventional appraisals.

The results of the study will be surprising to many appraisers and AVM skeptics since researchers found that the concern with over-valuation of property in soft markets extends equally to AVMs and conventional appraisals. In fact, the research indicated that conventional appraisals result in values greater than the sale price more often than AVMs, particularly in a soft market. This outcome suggests that AVMs may be more "immune" to bias and more independent than conventional appraisals. The concern that data lags associated with AVMs will also result in over-valuation in soft markets does not appear to be valid either. The authors note that one explanation for this outcome is that vendors are slow to reduce prices in soft market conditions. This downward rigidity in home prices means that market prices may decelerate or decline at a slower pace than appears warranted by the level of demand.

Conclusion – AVMs

AVMs and real estate appraisers have one thing in common: they predict value. The methods to determine value are extremely varied. Likewise, the quality of results varies considerably and is dependent upon the calibre of the appraiser or the predictability of the AVM. Both of these valuation systems, human and computer, are commonly linked to one undeniable need: market data. Key data includes sales comparable(s), physical inventory, assessments, price indices, inflation rates and other economic indicators.

The role of an AVM is directly linked to user needs. In many instances, users are satisfied with AVM predictions because they are less expensive and can be obtained much faster than form report appraisals completed by appraisal professionals. As we have seen with the Fitch Rating example, many lenders and secondary market investors consider AVMs, with certain conditions, as a suitably reliable property valuation tool. Institutional firms that market mortgage money seek reductions in transaction costs and approval time while ensuring sufficient reliability. According to Michael Parris of S&P, there is a general trend in "the rise in scrutiny of loan originations by bank and thrift regulators, and appraisals are being targeted. Regulators are looking for the key elements of independence and credit decision support rather than 'how much paper is in a file.' The partition between the loan officer/loan production and appraisal ordering process is key".[37]

The long-term potential of AVMs is very promising, but their acceptance is subject to economic changes in mortgage markets. Their performance will be measured against actual loss by mortgage defaults, falling housing prices, and mortgage frauds just as their human counterparts have been judged in the past. They are simply another tool used to transact a specific type of business arrangement. It is not inconceivable that in the future, lenders will not even require AVM values, much less human appraisers.

A large financial commitment and specialized knowledge in statistics, decision science, and computer science is necessary to develop large private sector AVMs. As this is not the typical purview of appraisers, few

[36] Collateral Assessment & Technologies Committee. "Systemic Risks in Residential Property Valuations: Perceptions and Reality". Real Estate Information Professionals Association. June 2005.

[37] *Ibid*.

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opportunities are available to them for their direct participation. However, there are a number of opportunities for appraisers to implement AVMs on a smaller scale, either as a supplemental tool or a complete valuation system. With the increasing availability of user friendly statistical tools such as SPSS, there are opportunities for growth of smaller local AVMs. The most likely venue for appraisers seeking to incorporate AVMs into their practice, or even specialize in them, is as a client or user of an AVM. The Taurean system spotlighted in the Online Readings is a good example of an AVM developed by appraisers.

The other opportunity is to participate in the AVM process through a value added process. In the United States, the term Appraisal Assisted AVM or AAVM is beginning to appear in appraisal literature. In a winter 2002 edition of *Valuation Insights & Perspectives*, Mark Yellen offers the view that even AVMs require spot checking and some level of review. Yellen states that a market exists for appraisers who can offer the combined advantage of AVM speed and appraiser expertise.[38] The AAVM has emerged as a new software tool to evaluate the output of an AVM and is being marketed as "USPAP compliant". Some may see the approach of using AVM type software to evaluate an AVM as somewhat ironic. Bradford and Linne (2011) suggest a similar value-added approach for appraisers in their paper on the evolution of the residential lending and valuation industry.

Another discussion of opportunities created by AVMs is presented by Mark Rattermann in the Winter 2006 edition of the *Appraisal Journal*.[39] According to Rattermann, AVMs will only eliminate the low risk residential lending assignments while there will remain a role for appraisers for high ratio mortgage scenarios or challenging assignments (e.g., neighbourhoods in transition). As proof of his hypothesis, the author quotes Jacqueline Doty, Collateral Policy Director for Freddie Mac. Doty confirms that (based on US Census data), "the fastest growing real estate market segments in America today are largely comprised of borrowers with limited credit and limited down payment savings. The outcome is seen as more work for appraisers with higher skill levels. The net result will be more assignments requiring appraisers with advanced skill sets".

We've presented a number of points of view in this lesson about AVMs and a considerable volume of information about the AVM industry. For more in-depth reading on this subject, refer to the Bergsman article in the suggested readings: "Friend or Foe: Commandeering AVMs for Your Use".

What will the AVM of the future look like? How will appraisers adapt to AVMs in the future? Will they be leaders, followers or bystanders?

Case Studies – Private and Public Sector AVMs

The following case studies illustrate the successful development of commercial and public sector AVMs in Canada and United States. In these cases, we examine the business opportunity or business need solved by the AVM, model overview, and practical application. One caveat: the detailed specifications for most AVMs, particularly those in the private sector, represent the developer's competitive advantage; consequently, it is difficult to obtain detailed information on their design and performance.

Case Study 1: Small-Scale Appraisal AVM

Around 2001, a southern Ontario appraisal firm developed an AVM for the local residential market. The goal was to target the low risk lending portfolio typically served by "drive-by" or desktop appraisals. While the appraisal firm no longer runs or markets the AVM, lessons learned from the research, development and

[38] Yellen, Mark. 2002. "The AAVM: Putting the Appraiser in Automated Valuation Models". *Valuation Insights & Perspectives*. Appraisal Institute. 3rd Quarter, 2002.

[39] Ratterman, Mark. 2006. "Residential Appraising: Changes and Challenges Ahead". *Appraisal Journal*. Winter 2006.

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implementation phases are useful for any appraisal firm contemplating this type of "new horizon".[40] According to the firm's principal, the AVM was successful but required a substantial amount of oversight and maintenance. The firm has subsequently re-positioned into a more commercial focus.

The principal of the appraisal firm had an MBA in financial analysis and saw an opportunity to create a small AVM for local markets. However, he recognized the need to bring in professional assistance, so he engaged programmers and web designers to transform the mathematical relationships (additive MRA) for residential markets into an e-commerce website. The interface was based on a series of property attribute filters, similar to most AVMs. The database was replicated from local MLS Board data, providing the advantage of very up-to-date market information. According to the appraiser who developed the AVM, it produced very accurate results within the specified market areas of southern Ontario and was superior to a well-known large private sector AVM, likely because of the appraiser's ability to fine-tune the model based on years of in-depth and local market knowledge.

While AVM research and development are significant resource commitments, the marketing of the AVM can consume almost as much time and money, according to this appraiser. Marketing expense includes design of a sophisticated website for e-commerce, AVM report form design, promotional literature and other forms of marketing. The cost was partially off-set by partnership with a local business college seeking opportunity for real-life student marketing exercises.

What was learned:

- AVMs require an equally large investment in both technology and marketing;
- plan on investing at least $40,000 to start up a small AVM and devoting considerable time to managing and marketing the product; and
- appraisers who do not have a statistical real estate analysis background will face barriers in developing AVMs or understanding how they work.

One closing thought: in a strong real estate market, many appraisers are too consumed with work volumes to contemplate AVM opportunities. This raises a risk that others in the financial services and information processing industry may move into smaller-scale AVM opportunities.

Case Study 2: Landcor

Landcor provides a number of automated value and risk assessment tools for the real estate industry.[41] The Landcor AVM, developed in 1999, was targeted at British Columbia lending clients and property owners. Landcor's goal was to provide clients with up-to-date, real-time market valuations and market research to support real estate decisions. While the market valuation reports are the core product, Landcor also provides a mortgage risk analysis tool, custom reports on sales activity, residential rent trends and a property details report. Landcor is also developing tools for commercial real estate brokers and appraisers to enhance their efficiency and access to market information.

An example of Landcor's efforts to market the AVM beyond the traditional lending risk assessment market is encapsulated in the following quote from the company website:

> *"By integrating the outputs of Landcor™'s powerful custom query tools with a demographic analysis and spatial mapping program, Landcor™ can provide a Custom Report as the foundation for powerful strategic development planning".*

[40] The Appraisal Institute of Canada is actively promoting expansion of the scope of practice for its membership to maintain competitiveness within the financial services industry. The general term for this initiative is "New Horizons".

[41] Adapted from *www.landcor.com/about/avm.aspx*

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Similar to other AVM vendors, Landcor's website has e-commerce functionality for individual customers. Commercial customers, or others requiring custom reports or bulk sales, generally contact a marketing or account representative.

At the present time, Landcor's AVM competition in BC is limited to CMHC's *emili* Automated Underwriting risk assessment tool. As of January 2012 there are no signs of additional competition to Landcor within BC.

Landcor AVM Report

The focus of this case study is the "Landcor Property Valuator".

According to the Landcor website, the Property Valuator report provides "an in-depth summary of the subject property, which includes legal description, assessment data, sales history, lot and building attributes, a summary listing of the comparable sales used, a regression based current market value estimate and a chart showing historical market trends for the subject neighbourhood". Users order Property Valuator reports through the Landcor website, searching for properties by address.

The screen capture below illustrates a portion of a typical Landcor residential AVM report. The report also provides additional inventory details for the land and improvements, sales history for the subject property, a map showing the approximate location of the subject and comparables and a graph showing market movement in the neighbourhood over the past 24 months. The following sections explain how this property value estimate is calculated.

Figure 9.4: Sample Landcor AVM Report (portion only)

Comparable Sales Data* - SINGLE FAMILY DWELLING

	Subject	Comparable 1	Comparable 2	Comparable 3
Address	2055 FERNDALE RD	1910 CASA MARCIA CRES	1858 FELTHAM RD	1194 ROCK ST
Neighbourhood	GORDON HEAD/FERNDALE-SAN JUAN	GORDON HEAD/FERNDALE-SAN JUAN	UNIVERSITY/KENMORE -MAJESTIC	QUADRA - MAPLEWOOD
Sale Price	-	$636,000	$630,000	$586,000
Sale Date	-	Jun-2011	Oct-2011	Sep-2011
Assessed Value	Land: $490,000	Land: $468,000	Land: $439,000	Land: $374,000
	Improv: $220,000	Improv: $154,000	Improv: $167,000	Improv: $202,000
	Total: $710,000	Total: $622,000	Total: $606,000	Total: $576,000
Floor Area (sq ft)	2,572	2,336	2,659	2,202
Year Built	1960	1961	1972	1989
Effective Year	1960	1961	1974	1989
Manual Class	1 STY SFD - AFTER 1960 - MODERN STD	1 STY SFD - AFTER 1960 - MODERN STD	1 STY SFD - AFTER 1960 - MODERN STD	2 STY SFD - AFTER 1960 - MODERN STD
Lot Size (sq ft)	13,261	10,129	11,308	10,556
No. Bedrooms	4	3	4	4
No. Bathrooms	3	3	3	3
Parking	Multiple Garage	Multiple Garage	Single Garage	Single Garage
Foundation	Partial Basement	Basement	Basement	Partial Basement
Characteristics	Sanitary Sewer Available	Curb & Gutter		Rock Extrusion

Conclusion:	The estimated value** of this property on	07-Feb-2012	is	**$717,000**

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Compare Landcor's estimated value for this property, $717,000, with the Zoopraisal estimate provided on Page 9.4 earlier in this lesson. Zoocasa estimated a value of $831,311 with a range of $785,000 to $880,000. The valuation dates are within days of each other. How would you reconcile this difference? Which AVM estimate do you give more credence?

Landcor Database

The data for Landcor's AVM is provided by BC Assessment (BCA), a Crown Corporation responsible for all property assessment in British Columbia. BCA provides Landcor with electronic data "feeds" of all BC assessed values and property sales (registered in Land Titles Registration System), as well as specific elements of residential property inventory. To ensure currency of information, Landcor obtains weekly data updates from BCA. The depth and extent of assessment and Land Titles sales data provides Landcor with the ability to apply their AVM for residential property throughout BC, regardless of whether properties were marketed through the Multiple Listing Service (MLS). This factor is important since non-MLS sales are common for acreage and remote properties in many small and rural communities in BC.

While this arrangement provides Landcor with a competitive advantage, one concern is the ability of Landcor to accurately estimate market value for large urban markets where there is rapid market movement. The concern is the series of delays between MLS transactions and subsequent Land Title registration, upload of Land Titles information to BCA and electronic data "feeds" (updates) to Landcor. Another consideration is the critical importance of inventory accuracy for Landcor's additive multiple regression AVM. Essentially, Landcor relies on BCA to provide accurate property inventory with no or very minimal data gaps. If errors or gaps exist in BCA's residential inventory (e.g., baths or bedroom counts), the assessment for affected properties may still fall within acceptable assessment measures of quality, but the AVM output will be significantly impacted (largely due to a different valuation approach). Landcor and BCA have identified this potential issue and implemented a series of audits to maintain data integrity and quickly resolve data errors. BCA uses this "external" audit along with regular quality enhancement projects to maintain and improve its inventory and address data gaps.

Landcor AVM

Landcor relied on assistance from the academic world (University of BC Faculty of Commerce) to develop a "Direct Comparison" AVM. The engine of this AVM is a series of multiple regression models with market-derived independent variables for a variety of residential property types (e.g., strata condominium, single family dwellings, townhouses), fine-tuned for various BC markets. The AVM creates a sample population for regression analysis based on characteristics of sales that most closely align with the subject property. According to the Landcor website, the AVM system then adjusts the comparable sales data to reflect any differences that may exist in property attributes, location, or time, and generates a value estimate for the property based on the current month.

Landcor promotes its AVM as different from other AVMs since it relies on both multiple regression and a fuzzy-logic[42] based algorithm to estimate current market value. According to Landcor, most other AVMs in North America use only multiple regression or other regression variations to estimate market values. Landcor suggests that this added feature improves the accuracy of their value estimates. An example of how a fuzzy logic algorithm can improve an AVM would be in data screening for subsequent regression analysis. The computer could be programmed to scan a database for a series of comparable sales (based on pre-determined parameters) within a neighbourhood and return X number of "comps". If the target number of comps is not available given initial parameters for time, location and physical inventory, then a fuzzy-logic algorithm instructs the computer

[42] Barron's Educational Series: Fuzzy Logic refers to computer Artificial Intelligence, where a system of computer instructions enabling the computer to deal with ambiguities. The instructions are not restricted to "either/or" choices. Fuzzy logic emulates the way humans think, so its decisions appear to be more natural. *www.answers.com/topic/fuzzy_logic*.

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to conduct a new search based on broader or different parameters. The search pattern would be constantly adjusted by the computer to return the best possible sample set for analysis.

Landcor, in the Frequently Asked Questions webpage, notes several property types for which AVM reports cannot be obtained. For example, the AVM will not produce a report for non-residential property (e.g., property coded as non-residential by BCA), property with no improvements, properties in neighbourhoods with few or no sales and very unique properties.

Landcor has granted BUSI 344 students a temporary free account, so that you may visit their website, see how it works, and try some reports at no cost. If you would like to do this, see the "Online Readings" page on the BUSI 344 course webpage for instructions.

Case Study 3: Freddie Mac/MDA Corp – Home Value Explorer

The Home Value Explorer was developed in 1998 by Freddie Mac, the leading broker of secondary funds in the USA, and licensed to a number of AVM vendors throughout the USA. Freddie Mac promotes the Home Explorer for lending functions (e.g., second mortgages, home equity loans, lines of credit), real estate purchase or sale decisions, evaluation of insurance requirements and quality control processes.

The MDA Corporation, a Canadian company specializing in the acquisition and management of large volumes of land and property information, is one of the firms licensed to use the Home Value Explorer. In an interesting business arrangement, a US subsidiary of MDA Corporation, DataQuick, provides the national real estate database that powers the Home Value Explorer. According to MDA, DataQuick is a premier provider of US real property information, offering extensive, up-to-date information on approximately 80 million properties across the country.[43]

MDA provides a good example of the globalization of property information. In 1999, MDA signed a partnership with the Province of British Columbia to develop BC OnLine, a fee-based web portal for all government property- and company-related electronic registries in British Columbia. In 2004, MDA acquired Marshall & Swift/Boeckh, the leading cost valuation specialists in North America, and in the same year launched its proprietary AVM, known as the DataQuick Valuator. MDA has continued to expand its electronic registry business and valuation business in the United Kingdom and has recently acquired a German information enterprise that has developed an AVM.

The DataQuick business unit has also developed a series of products for the real estate brokerage, lending, and appraisal industries.

AVM Report – Home Value Explorer

Two sample reports are shown below: the DataQuick licensed Home Value Explorer (HVE) and the Freddie Mac HVE. Although the report display is different, both reports are driven by the same AVM.

Both AVM reports provide two measures of value estimate reliability, a Rank (High, Medium, Low) and Forecast Standard Deviation or FSD. The FSD is the proportional standard deviation associated with the property value estimate in relation to the sale price. The Rank is a more user-friendly interpretation of the statistical FSD outcome:

- a High confidence score would be an FSD of 13% or less;
- a Medium score would be an FSD between 13% to 20%; and
- a Low Score would be an FSD greater than 20%.

[43] MDA Corporation, MDA News, June 13, 2006. *www.mdacorporation.com/corporate/news/pr/pr2006061301.shtml*.

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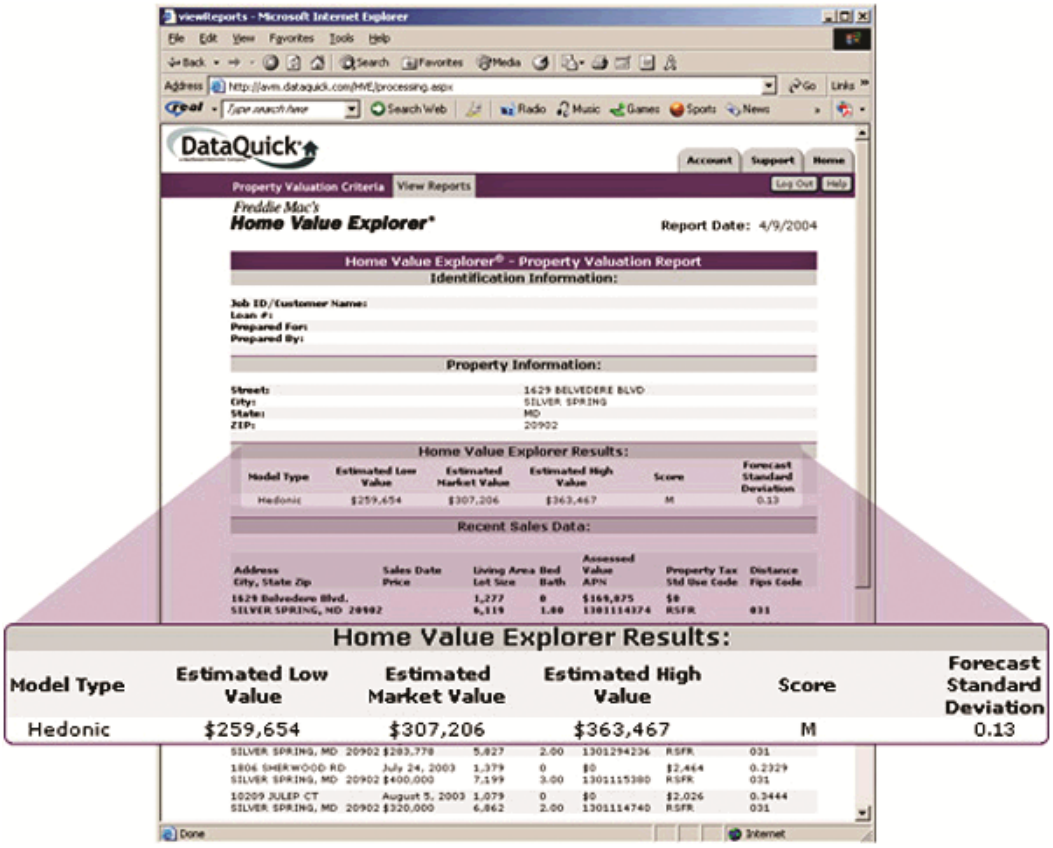
Figure 9.5: Home Value Explorer (DataQuick Corp)



In the Arlington, Virginia example illustrated below, the FSD of 9% means that the HVE value estimates for 68% of all sample observations fall within 9% of the actual sale prices.

Figure 9.6: Home Value Explorer (Freddie Mac)

Sample Report (the actual format will vary based upon your distributor)

Freddie Mac's
Home Value Explorer®

Property Address: 999 99th Road N **City: Arlington** **State: VA** **Zip: 22207**

4/20/2005	Model Type	Low	Point	High	Score	FSD
	HVE	$478,500	$490,880	$503,260	H	.09

Address	City	County	State	Zip	Sale Date	Price	Living Area	Lot Size	Bed	Bath	Units	Year Built	Assessd Tax	Ppty Tax	Pool	Garage	APN	Code Std	Zone Code	Cost Per Sq Ft	Distance
999 99th Rd N	**Arlington**	**13**	**VA**	**22207**	**2/25/2004**	**$467,560**	**1250**	**5115**	**2**	**1.5**	**1**	**2000**	**$280,536**	**$3,740**	**N**	**-**	**2058006**	**RSFR**	**R-6**	**$374.05**	
998 Glebe Rd	Arlington	13	VA	22207	3/1/2003	$525,000	1410	7015	3	2	1	2002	$315,000	$4,200	N	-	2046011	RSFR	R-6	$372.34	0.11013
997 N Oakland St	Arlington	13	VA	22207	1/4/2004	$399,800	1010	4000	2	1.5	1	1999	$239,880	$3,198	N	-	2054014	RSFR	R-6	$395.84	0.1668
999 33rd St N	Arlington	13	VA	22207	12/2/2004	$478,890	1255	5025	2	1.5	1	1998	$287,334	$3,831	N	-	2068018	RSFR	R-6	$381.59	0.1893
999 N Nelson St	Arlington	13	VA	22207	11/5/2003	$490,000	1200	5500	2	2	1	2000	$294,000	$3,920	N	-	2073046	RSFR	R-6	$408.33	0.1931
998 N Stuart St	Arlington	13	VA	22207	2/15/2003	$500,640	1300	6500	2	2	1	2001	$300,384	$4,005	N	-	2086023	RSFR	R-8	$385.11	0.2816
999 N Tazewell St	Arlington	13	VA	22207	3/10/2002	$385,000	900	3150	2	1	1	2002	$231,000	$3,080	N	-	2074031	RSFR	R-6	$427.78	0.3357
999 N Utah St	Arlington	13	VA	22207	3/19/2004	$433,500	975	4010	2	1	1	2002	$260,100	$3,468	N	-	2075022	RSFR	R-6	$444.62	0.4108
997 N Utah St	Arlington	13	VA	22207	1/30/2005	$425,000	1000	3900	2	1.5	1	2002	$255,000	$3,400	N	-	5038006	RSFR	R-8	$425.00	0.535
999 N Taylor Rd	Arlington	13	VA	22207	2/14/2004	$460,500	1150	5000	2	1.5	1	2001	$276,300	$3,684	N	-	3060053	RSFR	R-6	$400.43	0.6081
999 N Pierce St	Arlington	13	VA	22207	2/28/2003	$445,000	1030	4500	2	1.5	1	2000	$267,000	$3,560	N	-	20680111	RSFR	R-6	$432.04	0.7305

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The Freddie Mac AVM has national coverage, including 2,700 counties in 50 states. Given this extensive coverage, Freddie Mac claims that over 70% of its HVE estimates are high confidence. About 25% of HVE estimates are medium confidence, and less than 5% are low.

Freddie Mac Database

The database is a combination of information from two national real estate information data providers (DataQuick and First American Real Estate Solutions) and Freddie Mac owns a 30 year plus archive of mortgage-related information. The First American component of the database includes information that extends conventional public records, such as:

- Census information
- Neighbourhood data
- Education (schools) and crime records
- Flood data (including FEMA disaster zones)

Freddie Mac AVM

According to the Freddie Mac website, the Home Value Explorer utilizes results from both repeat sales and hedonic model (regression analysis) logic to derive a current estimate of market value and then delivers the "best" estimate.

Case Study 4: Municipal Property Assessment Corporation National Automated Valuation Model (AVM) – The AVM Comparable Report

Evolution of AVMs at MPAC

On December 31, 1998, the Province of Ontario transferred responsibility for property assessment to the newly formed Ontario Property Assessment Corporation, which later became the Municipal Property Assessment Corporation (MPAC). MPAC is responsible for delivering uniform property assessments across the Province of Ontario representing more than 4.5 million properties and over $1.4 trillion. MPAC is a non-share capital, not-for-profit corporation funded by all 445 municipalities in Ontario. Every municipality in Ontario is a member of the Corporation, which is governed by a fifteen-member Board of Directors.

In 1996, MPAC began using regression analysis to assist in determining accurate and up-to-date property values for all residential properties across Ontario. MPAC began diversifying beyond core assessment activities in 1999 by applying its valuation experience and comprehensive property database toward the development of Automated Valuation Model (AVM) products. MPAC now offers three AVM products targeting the lending industry's need for more accurate and cost-effective "real-time" estimates of market value, as well as mortgage fraud identification tools.

Clients for MPAC's AVM include:

- Primary and secondary lenders;
- Credit unions;
- Mortgage insurance firms; and
- A variety of real estate professionals.

MPAC has received very positive feedback on its AVM products. In 2006, a real estate website, *BytheOwner.com*, focusing on customer education and non-agency sales, recommended purchase of the MPAC AVM as a consumer tool to assist in real estate marketing.[44] Peter Vukanovich, President of Genworth Financial

[44] www.bytheowner.com. 2006. *http://bytheowner.com/files/seller_guideBTO.pdf.*

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

MPAC plans to expand its product offering to serve markets across Canada. Current coverage for AVM products, in addition to the Province of Ontario, includes properties assessed in Newfoundland and Labrador (Municipal Assessment Agency, Inc.), the City of St. John's, and the Province of New Brunswick (Service New Brunswick), representing over five million properties in total. MPAC has produced an e-commerce gateway to serve a variety of markets.

In this case study, we will examine one of MPAC's AVM products, the *AVM Comparable Report*.

AVM Comparable Report

The MPAC *AVM Comparable Report*, similar to reports from other large AVM vendors, such as the *Home Value Explorer*, provides key property inventory attributes, a value range, estimate of value, and a value confidence rating as well as up to three comparable properties that have recently sold in the neighbourhood. Figure 9.7 below illustrates a sample report.

Figure 9.7: MPAC AVM Comparable Report (sample)

mpac

AVM - Comparable Report Generated on 3/6/2006

~ Comparable Sequence	0 - Subject	1 - Comparable	2 - Comparable	3 - Comparable
~ Address	40 GROVE RD	99 PENNY CRES	36 MEYER CIR	70 TILMAN CIR
~ Municipality	MARKHAM	MARKHAM	MARKHAM	MARKHAM
~ Postal Code	L3P 4M4	L3P 5X7	L3P 4C4	L3P 5V7
~ Province	ON	ON	ON	ON
~ Roll Number	193603023055038	193603023053816	193603023049752	193603023055298
~ Comparable Sale Date (yyyy/mm)	Not Available	2005/10	2005/09	2005/09
~ Comparable Sale Price	$ 0	$ 406,000	$ 375,000	$ 425,500
~ Subject Real Time Market Value (AVM)	$ 387,000			
~ AVM Valuation Date (yyyy/mm/dd)	20060301			
~ AVM Rating (H=High, M=Medium, L=Low)	H			
~ Lower AVM Value	$ 368,000			
~ Upper AVM Value	$ 404,000			
~ Property Style	001	001	001	001
~ Year Built	1981	1983	1980	1983
~ Total Floor Area (Sq Ft)	2260	2320	2260	2350
~ Basement Finished Area	0	870	0	0
~ Number of Bedrooms	4	4	4	3
~ Number of Full Bathrooms	2	2	2	2
~ Number of Half Bathrooms	1	1	1	1
~ Frontage	50.8	44.29	49.21	48.95
~ Depth	Not Available			
~ Site Area	5344	4951	5500	5345
~ Site Area Unit of Measure	F	F	F	F

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Consistent with most private sector AVMs, the *AVM Comparable Report* is generated by the client entering the property address or assessment roll number. Since the AVM is linked to the MPAC residential assessment database (with up-to-date address information), a competitive advantage of MPAC's AVM is a very high "hit rate" or ability to produce a report for any residential address selected.

The AVM report shows the confidence rating as high, medium or low. Figure 9.8 below explains the two major factors that contribute to this AVM report confidence score: (1) its characteristics relative to the market average and (2) the degree of market activity.

Figure 9.8: MPAC AVM Confidence Rating Matrix

	Low	Medium	High
Property Characteristics	Atypical Property	Typical/Average Property	Homogeneous Property
AVM Value	No Market Activity	Market Activity	Consistent Market Activity

The matrix above indicates how the confidence rating is developed. For example, a property may have sold for a premium value in an active market, however, be atypical for the immediate neighbourhood, thereby receiving a Low confidence score.

The Database

The AVM relies on the same database that MPAC uses for property assessment, so the geographic coverage for Ontario is comprehensive and in-depth, including more than 3.5 million residential properties. MPAC also has licensing arrangements with assessment jurisdictions in Newfoundland and Labrador, and New Brunswick, so comprehensive information is also available for these provinces. The AVM is one of the largest, most comprehensive and dynamic databases of real property data in Canada and it is enhanced by MPAC's appraisal experience and valuation technologies.

MPAC's database is continuously updated with information gathered from building permits, property inspections, sales investigations, Requests for Reconsideration (RfR), and Assessment Review Board (ARB) appeals. The AVM is subject to rigorous quality assurance programs targeting data integrity and statistical validity to confirm its accuracy.

MPAC updates market movement factors monthly for each of 137 primary market areas and a large number of secondary or sub-markets (25,000 defined market areas in total). An example of this detailed market differentiation is strata title properties, where each strata plan is generally considered its own neighbourhood.

MPAC notes that a specific advantage of its AVM in relation to competitors is the in-depth market analysis. While the engine that powers some AVMs relies heavily on indexing using repeat paired sales, MPAC AVMs are designed to take advantage of all validated property sales and extensive "at-time-of-sale" data collected on all relevant properties.

MPAC also notes its AVM is subject to rigorous quality assurance programs targeting data integrity and statistical validity to confirm its accuracy. A separate validation process is conducted quarterly to ensure product standards are being achieved.

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AVM Algorithm

MPAC's AVM and Current Value Assessment (CVA) systems for residential properties are somewhat similar in design, based on an additive multiple regression analysis using the direct comparison approach. MPAC notes that the key difference between the CVA and the AVM is that the AVM value is updated monthly (as noted above) while the CVA value has a legislated annual valuation date.

MPAC uses a three-step valuation process:

1. Sales investigations and data collection
2. Model specification/model calibration
3. Model application

To implement the initial step, MPAC establishes the market area and neighbourhood boundaries to be used for market analysis. MPAC refers to these market areas as "models" and has created a model for each of the 165 market areas in Ontario. An Auto Regressive Integrated Moving Averages (ARIMA) Forecasting Model is used to improve the value forecast by removing seasonal variation and market movement from sales data within the market areas.[45]

The models are further refined with sub-neighbourhoods to address locational differences (see Database section). The result is a series of multiple regression equations for each market area that include coefficients (e.g., $ per sq ft) for key independent variables.

According to MPAC, an initial analysis of the following variables accounts for about 85% of value for a typical residential property:

- Location;
- Lot dimensions;
- Building area;
- Age of the property, adjusted for any major renovations or additions; and
- Quality of construction.

Additional variables are included in the modeling process to fully account for the influence of secondary influences and bring the valuation up to full market value, as of the valuation date. Examples of these secondary variables include:

- Fireplaces;
- Garages;
- Basement finish;
- Air conditioning;
- Bathrooms; and
- Site influences (e.g., proximity to major roads).

The base model is specified with all variables and then the variable coefficients are calibrated through sales analysis using both SPSS and SAS statistical applications. When the analysis is complete, the model is stored in a syntax file and the results tested against a database of current sales or adjusted sales.

[45] The ARIMA forecasting process is covered in UBC Course BUSI 460 *Real Estate Consulting and Forecasting*.

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An example of an MPAC additive model for residential property is provided in Figure 9.9 below.

Figure 9.9: Sample MPAC MRA Model

CV = 86,934 + 60.14*QU_AREA1 + 44.19*QUAREA23 + 384.12*SQRT_LS +17.09*BSMTAREA + 4.24*BSMTFINA - 0.33*EFFSQFT + 5281*AIRCOND +4991*BATHS + 3526*FIREPLCS + 9976*ATT_GAR + 6889*POOL -10273*HEAT_EL - 4260*TRAFFIC - 8690*NB030 - 6929*NB026 + 9869*NB028

Where CV = Estimate of Current Value
QU_AREA1 = Quality Adjusted First Floor Area

QUAREA23 = Quality Adjusted Second and Upper Floor Area

SQRT_LS = Square Root of Lot Size
BSMTAREA = Total Basement Area
BSMTFINA = Finished Basement Area
EFFSQFT = Effective Age x Total Area (Depreciation)
AIRCOND = Property has Air Conditioning (Yes/No)
BATHS = Number of Bathrooms (Full and Part)
FIREPLCS = Number of Fireplaces

ATT_GAR = Number of Attached Garage Spaces

POOL = Property has an In-ground Pool (Yes/No)
HEAT_EL = Property has Electric Baseboard Heating (Yes/No)
TRAFFIC = Property abuts a Major Street (Yes/No)
NB030 = Property located in Neighbourhood 30
NB026 = Property located in Neighbourhood 26
NB028 = Property located in Neighbourhood 28

The final stage in the modelling process requires redefining the statistical model in MPAC's main computer system, for application to all properties in each model area (market area).

According to MPAC, the multiple regression process powering the model works well as long as there is sufficient volume of sales for analysis and the property inventory quality is maintained through regular re-inspection cycles.

As a part of its assessment function, MPAC has a responsibility to explain the statistical modelling process used in the Current Value Assessment to non-technical stakeholders such as property owners and local governments. However, in doing so, MPAC must also take care to ensure the proprietary nature of its models is protected. This is perhaps even more critical for its commercial AVM products, where the need for model disclosure must be balanced by the need to protect the AVM's proprietary functions.

For more information on MPAC and its products, please visit the MPAC website at *www.mpac.ca*.

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Case Study 5: Teranet reavs

The Business

Teranet Inc. was formed in 1991 as a public-private sector partnership with the objective of transforming Ontario's paper based land registry into an automated database application (known as the Province of Ontario Land Registration Information System "POLARIS"). Teranet subsequently diversified into providing a range of land and legal electronic information services for the financial, real estate and legal sectors. At the present time Teranet has three distinct AVM products, including the Reavs Information Technologies (reavs) loan risk management system.[46] These AVMs currently serve markets in Ontario, Quebec, Nova Scotia, Manitoba, and Alberta.

The reavs risk management tool is primarily aimed at the prime (major banks) lending market, providing property valuations for home equity loans, re-financing, transfers, and home purchases. Reavs is a good fit for the branch distribution model of the major banks since it provides lending staff the opportunity to input lending parameters for their local markets. The reavs AVMs, similar to other AVMs, offers lenders the additional advantage to respond rapidly to high volumes of real estate mortgage and loan applications with consistent outcomes and low unit transaction costs.

According to Teranet's 2005 media release announcing the purchase of reavs:

> *With this acquisition, automated valuation services will be available for properties in Alberta, Manitoba, Ontario, Quebec and Halifax and plans for increased coverage are currently underway. With the acquisition, Teranet now serves 43 Canadian lenders and insurance customers and will continue to provide a wide variety of valuation and risk management solutions to mortgage originators, lenders, insurers, appraisal management providers and title insurers. With the greatest geographic coverage of any AVM provider, clients can now access information on over 6 million properties across Canada.*

A long-term business goal of Teranet is to continue geographic expansion of the reavs product into markets not presently served, such as British Columbia.

AVM Report

Figure 9.10 below from the reavs website illustrates an AVM report that is distinctly different than those from Home Value Explorer and Landcor.

A unique aspect of the reavs report is the opportunity for lenders to enter the loan amount and estimate of market value (e.g., from appraisal or salesperson). While the AVM does not include the loan amount or initial estimate of value in the algorithm, entry of this information in the report allows comparison with the reavs value estimate and is also used to determine a lending decision outcome for clients that subscribe to the reavs decisioning component.

The reavs report provides a range of values, a predicted value for each property, the range of property values for the subject neighbourhood and property type, and other neighbourhood metrics such as liquidity and price appreciation. In the above (dated) example, the property value for a residence in the City of Ottawa is predicted to fall between $143,000 and $241,000, with a statistically predicted value of $196,000, as shown by the dark line in the range bar. The dark line slightly to the left of the reavs $196,000 value estimate shows the mean value of like properties in the neighbourhood. The core value is determined by applying a series of factors to a base assessed value (refer to the "AVM Algorithm" section later in this case). A market movement factor for the

[46] Teranet Enterprises purchased reavs in 2005.

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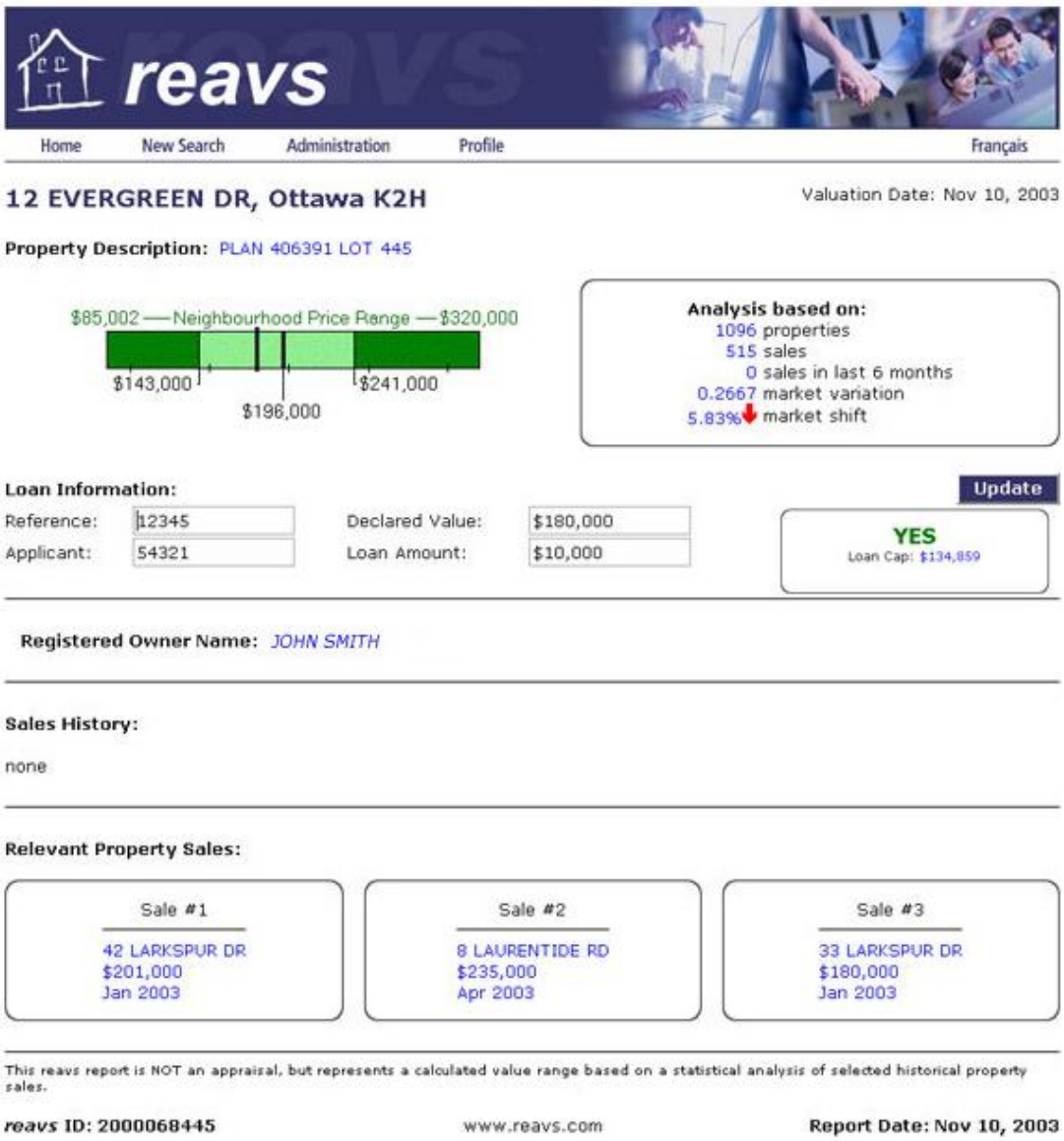
neighbourhood, in this case a -5.83% downward shift in relation to the previous 12-month period, is provided in an analysis summary box.

Figure 9.10: Sample reavs AVM Report
(*https://www.reavs.com/reavs_home.html*)



Notice that the AVM report also includes an estimate of the maximum lending amount for the property based on the lender's risk parameters along with the sales history of the property. When loans fall outside the AVM parameters, the client can then opt to use a conventional appraisal report. The report also serves another important purpose: mortgage fraud detection, a growing issue for the lending community. The combined intelligence provided by the AVM core value, sales history, and loan recommendation (using the lender's custom risk parameters information) are geared to help lenders identify potential mortgage fraud.

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The Ontario Database

Teranet manages the POLARIS database for the Province of Ontario and can pursue value added opportunities under its agreement with the Province. As a result, historical property transactions are included in the database to power the reavs AVM. Additional key data elements for each property include the property address, neighbourhood code, and property code (e.g., property use). Properties are assigned starting neighbourhood codes based on Statistics Canada Census Tract polygons. These spatially distinct areas are further refined in the reavs AVM process. Each property is associated with a distinct neighbourhood using GIS (geographic information systems) to establish specific a "geo-code" reference.

AVM Algorithm

The reavs AVM is a hybrid model that includes elements of both a price indexing and expert system. In contrast to the detailed (property attribute) hedonic models used by MPAC and Landcor, the reavs AVM is powered mainly by large volumes of reported property sale prices. The concept is that if a sufficient volume of sales transactions can be analyzed, the AVM can capture the market response to a complete range of economic, physical and social factors associated with a property and neighbourhood.

The essence of the AVM is a multi-pass sales analysis process, beginning with the establishment of an initial reavs value for each property within the neighbourhood. Similar to the other AVMs, the reavs processing engine is designed with business rules to expand the time interval for processing when an insufficient volume of sales has been returned. Additional processing engine rules ensure that extreme high or low sales within the neighbourhood are filtered out. The outcome of this analysis is a factor that is used to adjust the historic assessed value to the initial reavs value (i.e., historic market value).

The reavs value for each property in the neighbourhood is then factored forward in time by the AVM with successive "passes". All reavs values are adjusted to the new timeframe by analyzing the values against a subset of core of properties dynamically designated to represent the most homogeneous properties in the area. The process continues for a number of relatively small time windows to bring the reavs values up to current market conditions. A refinement of the AVM sales analysis and indexing methodology is an algorithm to weight the attributes of the sales in relation to the subject property.

Teranet has conducted a number of statistical trials for reavs to demonstrate its reliability and accuracy. Consistent with most other AVM vendors, Teranet tests for the relationship between AVM output for properties and their actual purchase prices using recognized measures of central tendency and dispersion such as standard deviation and the R^2 value. Teranet tests this monthly for each jurisdiction and publishes the results to its AVM clients.

Students seeking more information on reavs and other Teranet applications should navigate to the reavs and Teranet websites.

Case Study 6: Free Online AVM – Zillow.com

There are a number of Internet sites offering free residential valuations. This case study focuses on Zillow, a free US-based AVM that has generated significant publicity and controversy since its 2006 release.

Zoocasa has adopted a similar business model focused on Canada. However, they publish relatively little information on their AVM (licensed by Centract), so this case study will focus instead on Zillow as the US equivalent.

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The Business – Zillow

In early 2005, Seattle-based Zillow founders Rich Barton and Lloyd Frink extended their Internet travel marketing success, Expedia.com, to a new information-intensive business, real estate. The owners saw a business opportunity in reaching thousands, possibly millions, of home sellers and purchasers looking for free advice on marketing or buying residential properties. As described in the website, "why not help consumers by giving them access to the same kinds of information and tools agents use? Why not equip consumers with information about what is their most important investment – their home?" The name Zillow evolved from the founder's desire to make zillions of data points for homes accessible to everyone. Barton and Frink continued the Z theme onto their AVM products, including the Zestimate and Zindex.

The Zillow business model works by generating huge volumes of web traffic and creating an attractive advertising environment for lenders, real estate professionals and others. Keep in mind that Zillow is not recognized by primary lenders or secondary loan markets as a risk or valuation tool. The AVM website promotional material declares that Zillow will be useful as a starting point for home buyers and sellers and anyone just plain interested in the value of houses. The Zillow website directs individuals seeking financing to a separate mortgage financing website.

On October 27, 2006, the National Community Reinvestment Coalition (NCRC), a US not-for-profit housing organization filed a complaint with the Federal Trade Commission over Zillow's estimates. The NCRC alleged in their complaint that Zillow is "intentionally misleading customers and real estate professionals to rely upon the accuracy of its valuation services". The Coalition argued that Zillow's statements of accuracy are mistaken and their disclaimer about proper use of the product provides an ineffectual warning to consumers. At this point it is not clear whether the FTC will open an investigation into this complaint. However, a quick scan of the web on this controversy will reveal interesting pro and con perspectives on the Zillow valuations.

AVM Report (Zestimate)

A Zestimate report is generated from the Zillow website by entering a property address and clicking "Go" for the valuation. The resulting Zestimate is provided on a new webpage which, along with advertising in the margins, includes:

- property inventory, including information on whether the owner has "edited" the data;
- map of the subject property and satellite view (if coverage is available);
- information on comparable homes;
- sales history; and
- the Zestimate or estimate of market value.

The Zestimate webpage is designed to prevent editing, copy and save functions. However, students can re-create the Zestimate for a sample property, 88905 Alder St, Swisshome, OR 97480, by navigating to: *www.zillow.com/howto/Zestimate.htm* and entering the above address. Note that Zillow relies exclusively on a correct address so the possibility exists of a false "hit".

The disclaimer in the Zillow website identifies the Zestimate AVM report as an estimate of market value but not an appraisal. Appraisers may find this somewhat confusing given the USPAP and Canadian Standards definition of appraisal. USPAP provides the following definition of an appraisal:

> *APPRAISAL: (noun) the act or process of developing an opinion of value; an opinion of value. (adjective) of or pertaining to appraising and related functions such as appraisal practice or appraisal services.*

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Comment: An appraisal must be numerically expressed as a specific amount, as a range of numbers, or as a relationship (e.g., not more than, not less than) to a previous value opinion or numerical benchmark (e.g., assessed value, collateral value).

The Appraisal Institute of Canada defines an appraisal as follows.

APPRAISAL: A formal opinion of value:

- *prepared as a result of a retainer;*
- *intended for reliance by identified parties; and,*
- *for which the appraiser assumes responsibility*

Comment: An expression of value is not an appraisal if it is not the result of a retainer, if it is not intended to be relied upon, and if it is one for which the appraiser would not be expected to accept responsibility.

The quotes bring this disclaimer into question. The AIC definition appears to indicate this is not an "appraisal", while the USPAP definition seems questionable. Is the Zillow disclaimer sufficient to allow the Zillow AVM to avoid having to meet appraisal standards (and regulatory requirements in some areas)?

Zillow's AVM Database

Zillow relies on public real estate records, widely available throughout the USA. However, high variability exists in the quality of the data. As well, the extent of records is highly inconsistent and the timeliness of transaction data is a concern. The AVM vendors provide an acknowledgement on their website that the Zestimate will be impacted by these factors: "Some counties provide all the data we could hope for, but others are lacking such key things as the number of bedrooms and bathrooms, or, in some cases, the square footage of the home. Zillow overcomes this limitation by offering the opportunity for end users to 'adjust' the AVM using a tool called My Estimator". In other words, Zillow users can update existing AVM data with their own information, presumably more accurate or up-to-date, on property land and improvements, location and neighbourhood factors. The ability to adjust the AVM inventory according to the user's opinion is the most controversial aspect of Zillow and this feature has drawn significant criticism in the AVM community.

Zillow's AVM Algorithm

Information on the algorithm behind Zillow is difficult to obtain and the vendors are reluctant to provide more than a general overview of the analysis. Information extracted from the Zillow website states: "Hundreds of home details feed into the formula and the home characteristics are given different weights according to their influence in a given geography and over a specific period of time, suggest use of a hedonic model".

An Illinois appraiser, Lee Ovington, SRA, posted his September 26, 2006 analysis of Zillow's approach on Valuation 411, an appraisal "blog". Ovington's theory is that the Zillow AVM principally relies on a calculated relationship between assessed value to sale price. According to Ovington, the Zillow AVM appears to select transactions meeting a range of criteria similar to the subject, and calculates the relationship between the assessed values and the sales prices. The AVM then applies that ratio to the subject's assessed value (plus or minus some adjustments) and delivers the Zestimate.[47] As a result, Ovington claims that the Zestimate seems to be highly correlated with the Assessor's value. He notes that Zillow may be adding in additional weighting factors for the impact of time or distance from the subject property.

[47] Ovington, Lee, SRA. "Cracking the Zillow Code". *Valuation 411: Real Estate Info and Links*. September 26, 2006: *http://valuation411.blogspot.com/2006/09/cracking-zillow-code.html*

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However, David Gibbons of Zillow wasted no time (same day response) in preparing the following counterpoint:

> *"According to Gibbons, the reason you measure a strong correlation between tax assessed values and Zestimates is not because our algorithm is simplistic but because the data we have is incomplete in your area. If you review most houses in Elgin and Hampshire, you will see that the only data we have are sales records and tax assessments —we're missing the other information we typically get from the assessor, like sq. ft. and # of beds and baths. In cases like this, no other data is considered in the Zestimate – not because the algorithm is flawed – but because we don't yet have the info. When we do have more information, we use it. The last time I saw a correlation coefficient for all of our data fields, the most correlated field was actually "finished sq. ft". Our algorithm mashes up multiple valuation approaches. This allows us to both produce fairly accurate Zestimates with little data but also to significantly tighten up Zestimates when there is more data to be considered".*

Zillow ranks the accuracy of each property's Zestimate AVM calculation with a user friendly "Star Rating". According to Zillow, *four stars indicate the best (most accurate) Zestimates, three stars better Zestimates, and two stars good Zestimates. One star indicates that we are only able to show tax assessed values, and not Zestimates*. No stars means Zillow has insufficient data to generate an estimate of value. In terms of statistical measures, Zillow provides some examples of Zestimate accuracy, claiming a national variance of 7.3% between estimates and sale prices, and a standard deviation of 10% for estimates in the Sacramento, California area, assuming a normal distribution.

Case Study 7: Assessment Applications – BC Assessment Commercial AVM

BC Assessment (BCA) produces an annual assessment roll for 1.9+ million properties in British Columbia. About 80,000 of these properties are commercial properties, typically valued through the income approach.

From 2004-2007, BCA phased in the implementation of a new assessment valuation system known as value*BC*. As a part of this initiative, BC Assessment developed and implemented a more efficient AVM process for the mass valuation of commercial properties. Property owners received their first commercial valuations derived from the value*BC* AVM in January 2007.

AVM Report – BCA Property Value Summary

BC Assessment continues to report assessed values using its traditional assessment notices. However, property owners seeking more in-depth information on their assessments are provided with summary information on the applicable AVM used for their valuation.

The AVM

At the heart of the value*BC* commercial property AVM is a series of "models", each for specific types of properties such as commercial, industrial, strata residential and strata commercial. Each model contains derived market rates (e.g., rents, vacancies, expenses, cap rates) that can be applied to a group or a competitive market set of properties. To better understand the model's operation, a simplified example is provided below for high-rise (concrete) rental apartments. Although the model is hypothetical, the information is representative of rental apartments within a market area in a major BC centre.

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Figure 9.11: Sample valueBC Model Specifications

Occupancy	Quality	Economic Rate	Unit of Measure	Annualization
Apt-Concrete	Fair	$ 600	Bachelor	monthly
Apt-Concrete	Average	$ 650	Bachelor	monthly
Apt-Concrete	Good	$ 700	Bachelor	monthly
Apt-Concrete	Fair	$ 700	1-Bedroom	monthly
Apt-Concrete	Average	$ 750	1-Bedroom	monthly
Apt-Concrete	Good	$ 850	1-Bedroom	monthly
Apt-Concrete	Fair	$ 870	2-Bedroom	monthly
Apt-Concrete	Average	$ 950	2-Bedroom	monthly
Apt-Concrete	Good	$ 1,150	2-Bedroom	monthly
Apt-Concrete	Fair	$ 975	3-Bedroom	monthly
Apt-Concrete	Average	$ 1,025	3-Bedroom	monthly
Apt-Concrete	Good	$ 1,500	3-Bedroom	monthly
Quality	**Cap Rate**		**Vacancy**	**Expenses**
Poor	6.00%		3%	34%
Fair	5.25%		3%	34%
Average	5.00%		3%	34%
Good	5.00%		3%	34%
Excellent	4.75%		3%	34%

The information above would be keyed into a value*BC* model and this model would then be used for the valuation of a high-rise apartment competitive market set. For example, if the model included 25 high-rise rental apartments, value*BC* would draw the valuation rates for each property from these specifications. Each of the properties associated with a model must have an occupancy code and quality rank.

In the case of a 10-storey rental apartment with an average quality (quality of income, not physical building quality), the net operating income would be determined in the AVM by multiplying the number of units of bachelors, 1-, 2- and 3-bedrooms by the corresponding model (average) rates for these units of measures, and applying model vacancy and expenses. The resulting net operating income would be capitalized by the average quality model cap rate to produce a value estimate.

BCA's models also account for unique property features not necessarily reflected in the base rates. This additional complexity could involve factors such as size of investment, age of property and provision of amenities (e.g., cable TV, parking, hydro). In the case of strata residential properties, models based on direct comparison must have sufficient flexibility to account for factors such as floor height, view, suite size, parking, and other amenities that can be identified from market analysis.

In general, BCA has learned that model building requires an intimate knowledge of market comparability when deriving competitive market sets. These competitive market sets and models must reflect the interaction of the marketplace in regards to rent, vacancy, expenses, and the risk rate.

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Summary: Appraisal Valuation Models (AVMs)

In this lesson, we outlined the history and evolution of automated/appraisal valuation models (AVMs). We briefly explored the statistical and valuation foundations for these models, discussing the pros and cons of a variety of approaches. We ended the lesson with an assortment of diverse examples of how AVMs have been used in practice, determining value opinions to serve a variety of client needs. By focusing on numerous different areas, our intention was to highlight the many possible specializations that currently exist for AVMs, as well as the limitless opportunities presented by an uncertain future.

Now that you have read the lesson and case studies, reflect on the growth and acceptance of AVMs in the world of commerce. Will AVMs eventually replace appraisers or will appraisers evolve to embrace AVMs and modify them for specialized valuation applications? Do appraisers have the necessary skill-sets to use or evaluate AVMs – what barriers must be overcome? Will standards of professional appraisal practice change to address confusion over the AVM outputs versus reports created by accredited appraisers?

Our advice is to keep an open mind about the future of AVMs and continue to monitor the industry. For those who see a future in harnessing AVMs, we recommend completion of this course and further courses on statistical and critical analysis, plus practical experience.

This concludes our review of AVMs, and with it, the mass appraisal aspect of this course. We have focused on statistics in some depth, in particular exploring how regression analysis can be used to value numerous properties at once. In the final lesson of the course, we will turn our attention to a non-statistical computer tool: geographic information systems (GIS).

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Review and Discussion Questions

1. It has been suggested that residential appraisal is a dying industry in Canada, with the majority of the traditional work going to automated models and the remainder obtaining too low a fee to survive. Do you agree or disagree with this statement? Explain why or why not.

2. What are the similarities and differences between traditional appraisal and appraisal using automated valuation models? What are the advantages and disadvantages of each?

3. Do you have any personal experience with AVMs, either as a developer, customer or competitor? Share your experiences with your classmates on the course discussion forum.

4. What are the general approaches available for evaluation of AVMs? Based on the measures of central tendency and dispersion reviewed in earlier lessons, what would you conclude about AVM statistical measures of accuracy?

5. How well is the appraisal industry in Canada positioned for adoption of Appraisal Assisted Valuation Models? What barriers do you see for the growth of these AVMs?

6. What are the advantages and disadvantages of various types of AVMs (e.g., hedonic, price indices)? Provide some examples of the users for different AVM products.

7. Consider the remarks by Michael Parris, risk analyst for Standards & Poor's, about the loan assessment requirements of lenders in relation to the content in conventional appraisal reports. What did you learn?

8. What would you conclude about the data screening processes used by Zillow and Zoocasa versus those used by other commercial AVMs discussed in the case studies?

9. Assume you are a statistician, working for a major AVM vendor. The vendor has begun marketing a new product: Appraiser Assisted AVM. The appraiser operates the AVM and can modify the data entered in the model. As a statistics professional, what would be your likely response to this type of flexibility?

10. Consider the problems faced by AVM users in areas declared a "natural disaster" by Federal agencies, whether in the USA or Canada. What risks are AVM users assuming and what steps would you recommend to reduce the risk?

11. Review the Zillow experiment in the McDonald recommended reading. You may wish to try a similar experiment on your own, for a US real estate market you are familiar with. Did your changes result in logical outcomes? Did you find any apparent anomalies for the Zillow model? Share with your results on the course discussion forum.

12. Assume you work in the head office of a secondary (or Alt-B) Canadian lending institution. Your assignment is to investigate and evaluate options for adoption of one or more AVMs to use as a mortgage risk analysis tool. You will present your written findings and recommendations to the firm's senior management. How will you approach your research? What do you think will be your main concerns? Share your thoughts with your classmates on the course discussion forum.

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ASSIGNMENT 9

LESSON 9: Appraisal Valuation Models (AVMs)

Marks: 1 mark per question.

1. Evaluate the following statement: Private sector appraisers led the early development of AVMs.

   (1) This statement is true because appraisers were early adopters of technology.
   (2) This statement is false because the assessment community was first to recognize the potential for technology to automate the appraisal process.
   (3) This statement is true because appraisal standards were available to guide AVM development in the private sector, in the early 1990s.
   (4) Both (2) and (3) are correct.

2. AVMs are most commonly used in the USA for which of the following types of financial services?

   (1) Evaluating the risk of secondary loans (e.g., pooled mortgage assets).
   (2) Approval of primary loans on real estate, such as first mortgages.
   (3) Risk assessment tools to evaluate home equity loan applications.
   (4) Both (1) and (3) are correct.

3. While Automated Underwriting (AU) tools and Automated Valuation Models (AVMs) are similar, which of the following statements best illustrates their key difference?

   (1) AU tools were developed by the lending industry to meet a need for faster, low cost responses to an increasing volume of loan applications, while AVMs were developed by the appraisal industry.
   (2) AU tools focus on the composite risk of a loan to a specific individual, while AVMs provide an estimate of the market value of the property subject to the loan application.
   (3) AU tools were developed after AVMs, mainly in response to US Federal loan agency requirements.
   (4) None of the above.

4. As we learned in this lesson, some confusion exists over the obligations of appraisers to their accreditation organizations in relation to use or review of AVM reports. Which of the following professional requirements do these organizations commonly impose on appraisers who use AVMs?

   (1) No requirements are imposed because the output of an AVM is not an estimate of market value and therefore the AVM report is not an appraisal.
   (2) According to appraisal standards, an appraiser who uses or relies on an AVM must understand the model and have competency in use of AVMs.
   (3) An appraiser is required to verify the AVM model algorithm but is not required to certify the quality or appropriateness of the underlying database.
   (4) It is not clear from the standards whether an AVM report in the hands of an appraiser constitutes an appraisal.

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5. Which of the following statements does NOT represent a weakness of *private sector* AVMs?

   (1) There are no generally accepted performance standards for evaluation of AVMs.
   (2) The data coverage associated with AVMs is often subject to serious gaps, reducing the "hit rate" for specific geographic areas.
   (3 Since public registry information commonly serves as the basis for AVMs, they may lag behind the market, especially in areas of rapid price inflation.
   (4) AVMs represent a relatively high cost on a per unit transaction basis in comparison to conventional appraisals.

6. While AVMs have been the subject of considerable criticism in the appraisal community, they offer clients a number of advantages. Which of the following is an advantage of AVMs compared to conventional appraisals?

   (1) AVMs are not subject to "appraisal pressure" (pressure to meet lender's value target).
   (2) AVMs have generally accepted standards for performance evaluation.
   (3) The underlying process of an AVM can be readily communicated to the lending community and general public.
   (4) Both (2) and (3) are advantages of AVMs.

7. Consider the barriers to adoption of AVMs by the Canadian appraisal industry. Evaluate the following statement: Canadian appraisal firms are likely to embrace AVMs in the near future, following trends in the USA.

   (1) This statement is true since private sector appraisers have been early adopters of new technology.
   (2) This statement is false since the market for AVMs does not overlap with the markets served by appraisal firms.
   (3) The statement is true since most appraisal firms have sufficient size and expertise to design and implement an AVM.
   (4) None of the above are correct.

8. A sub-prime lender (e.g., secondary loan source) has contacted you for consulting advice to determine which automated risk management tool best meets their lending practices for home equity loans and re-finance applications. Since the lender will mainly be relying on the applicant's credit score, and the bulk of their business is within a fixed geographic area with high volumes of market activity, they are seeking a very simple AVM with low transaction costs. Which of the following types of AVMs would you recommend to your client?

   (1) A hedonic AVM
   (2) A price index AVM
   (3) An AVM based on a neural network
   (4) Expert system AVM.

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9. The AVM evaluation process recommended by the Collateral Risk Management Consortium identified a series of criteria which are analogous to "bump logic". Which of the following best describes the intent of a "bump logic" analysis?

(1) To apply an additional AVM if the result from the first AVM is considered invalid.
(2) To send the output to an appraiser if the AVM output falls outside acceptable parameters.
(3) To determine if a hedonic AVM is required rather than a price index AVM.
(4) To identify a trigger in the AVM process where a refined set of database filters is required when the initial AVM does not return a "hit".

10. The Real Estate Information Professionals Association (REIPA) published a report in 2005, dispelling which commonly held belief about AVMs relative to conventional appraisal reports?

(1) The most common AVMs are hedonic models.
(2) AVMs are not really appraisals, in a conventional sense.
(3) AVM value estimates lag the market due to the reliance on public records and delay in title registration.
(4) The inelasticity of demand in declining markets means that AVMs are very sensitive to sudden market declines.

11. Which of the following statements best describes Appraisal Assisted AVM or AAVM?

(1) Appraiser involved in operating the AVM and interpreting the output.
(2) Appraiser designs the AVM but others run and market the AVM.
(3) Lenders rely on appraiser insurance programs to "underwrite" the output of an AVM.
(4) None of the above are correct.

12. Which of the following statements about the S&P evaluation of AVMs is FALSE?

(1) AVM products appeared to have similar statistical results with a normal distribution, when the standard deviation of each system was considered on a national basis.
(2) AVM results are sufficiently reliable for individual properties.
(3) AVM results are sufficiently reliable for secondary lenders who deal in very large pooled mortgage funds.
(4) AVM accuracy and hit rates vary considerably among different AVM products.

13. Referring to Case Study 1, which of the following is FALSE regarding the research and development of a small-scale appraisal AVM?

(1) AVMs require a large investment in technology, but this is offset by low marketing expenses.
(2) In order to develop an AVM, a statistical real estate analysis background is necessary.
(3) An investment of at least $40,000 is necessary for the start up of a small-scale appraisal AVM.
(4) Local market knowledge is important.

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14. Referring to Case Study 2, which of the following statements about LANDCOR are TRUE?

A. The data for Landcor's AVM is provided by BC Assessment.
B. Landcor's AVM is a series of multiple regression models with market-derived independent variables for various residential property types.
C. The Landcor AVM will not produce a report for non-residential property.
D. The Landcor AVM will not produce a report for vacant lots.

(1) Only statements B and C are true.
(2) Only statements A, C, and D are true.
(3) Only statements A and B are true.
(4) All of the above statements are true.

15. Referring to Case Study 3, which of the following statements about the Home Value Explorer are TRUE?

A. The Home Value Explorer was developed by the Federal National Mortgage Association.
B. The Home Value Explorer AVM reports provide two measures of value estimate reliability, a Rank and a Forecast Standard Deviation.
C. The database used is a combination of information from both DataQuick and First American Real Estate Solutions.
D. The Home Value Explorer utilizes results from both repeat sales and hedonic model logic.

(1) Only statements A and B are true.
(2) Only statements A, C, and D are true.
(3) Only statements B, C, and D are true.
(4) All of the above statements are true.

16. Referring to Case Study 4, which of the following statements about the MPAC National AVM Project is FALSE?

(1) MPAC uses a computer-driven approach with a detailed property inventory for residential and commercial property.
(2) The process used by MPAC relies on the assessment jurisdiction to maintain property inventory through regular re-inspection cycles.
(3) The MPAC AVM report only provides a value range and not a final estimate of value.
(4) The AVM relies on the same property database that MPAC uses for assessment.

17. Referring to Case Study 5, which of the following statements about the Teranet reavs AVM is FALSE?

(1) The reavs risk management tool is primarily aimed at the secondary lending market.
(2) A unique aspect of the reavs report is the opportunity for lenders to enter the loan amount and estimate of market value.
(3) The report produced by reavs is geared to help lenders identify instances of mortgage fraud.
(4) Unlike the Landcor AVM, the reavs AVM is powered mainly by large volumes of reported property sale prices.

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18. Referring to Case Study 6, which of the following statements about Zillow are TRUE?

A. The Zillow business model works by generating revenue from advertising, rather than by charging users.
B. Significant controversy in the AVM community has arisen from the ability of users to adjust the AVM inventory in the database.
C. Zillow is recognized by primary lenders as a risk assessment tool, but not a valuation tool.
D. A high correlation between Zestimates and tax assessed values may arise when sales records and tax assessments are the only data available for a given area.

(1) Statements A and C are true.
(2) Statements A, B, and D are true.
(3) Statements B, C, and D are true.
(4) All of the above statements are true.

19. Which of the following statements is FALSE regarding AVMs?

(1) AVMs are typically econometric models.
(2) AVM models do not require data to predict values.
(3) AVMs are generally characterized by mathematical (statistical) relationships and computer automation.
(4) An Excel spreadsheet that automates the appraisal process can be considered an AVM.

20. Which of the following is NOT a major contributing pressure for the growth and development of AVMs?

(1) The need to obtain information more quickly than through traditional appraisal.
(2) The need to obtain reports with a higher level of detail and analysis than form reports.
(3) The need to reduce the turnaround time for loan applications.
(4) A greater incidence of mortgage fraud.

____
20 Marks

Planning Ahead

Please note that the material from Lesson 9 and 10 is not covered in Project 2. However, this content will be tested on the final examination, so ensure you study the materials carefully.

Also note that Project 2 is due at the end of week 11, one week after the Assignment 10 due date. You should start your work on Project 2 well in advance, to ensure you have sufficient time to complete it to your satisfaction.

End of Assignment 9

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