Automated valuation models (AVMs): implications for the profession and their clients

Global

April 2022

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1st edition, April 2022

Effective from April 2022

Typeset using Typefi.

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Acknowledgments

1 Introduction

RICS published its AVM roadmap in July 2021, and subsequently engaged with stakeholders across major world markets to understand the current levels of adoption of AVMs and help shape its response to their adoption. From July to October 2021, RICS conducted forums, had individual conversations and received written contributions from over 120 individuals, representing RICS members and firms (large and small); AVM providers; government agencies; lenders; insurers; and other regulatory, standard setting and professional bodies. Contributors came from North America, the UK, Europe, the Middle East and the Asia-Pacific region. This paper could not have been written without their input and market insight, and our first task is to express thanks to all those who contributed and made this work possible.

This paper does not set out to provide formal guidance. It represents a snapshot of the current landscape of AVM adoption across all asset types and outlines the choices that RICS has in shaping its response. As business strategist Michael Porter says, 'the essence of strategy is choosing what not to do'. RICS' response must recognise the key role it plays in the valuation of real and intangible assets and its public interest mandate, while at the same recognising the boundaries of our standard setting and regulatory function, and the fast moving and profoundly technical nature of AVMs themselves.

2 Key themes

As we will see, AVMs are well established in many jurisdictions for many asset types in addition to residential property. Like so many advances in data and technology, AVMs present both opportunities and risks for all stakeholders who produce or rely on the concept of 'value'. RICS recognises AVMs' widespread use in influencing and informing valuation and transaction-related activity. With their continued development and adoption across markets and asset types, RICS will support all relevant stakeholders with appropriate standards, guidance, regulation, education and training, and will continue to promote the critical role that RICS members play in the valuation sector.

Before we delve deeper into the insight and choices that RICS faces, let's summarise the key themes that are identified in this paper:

- RICS must ensure its continued relevance as a standard setter, as the adoption of AVMs deepens and widens across all asset types and jurisdictions.
- Automation and the use of digital data impact the whole valuation process, for almost all asset types and across the majority of world markets.
- Both existing and any proposed new standards need to align regarding the impact of data, technology and increased automation.
- The concept of due diligence for both valuers and users of valuations must evolve and reflect the new landscape of digital data and automation.
- With the increased reliance on automation and digital data sources, the extent, levels and provision of liability and assurance on valuations must evolve, and reflect the risks and how those risks are allocated across stakeholders.
- There needs to be clarity about the scope and boundaries of our standards and regulatory reach, and the need to work with other standard and regulatory bodies for a whole-system approach.
- There is a need for clarity on what forms of valuation processes fall within RICS' standards framework.
- There are implications for RICS' regulatory function itself with respect to regulatory scope, skills, knowledge and the adoption of data and technology to leverage resources, automate tasks and provide digital IDs and certificates for RICS members and member firms.
- A new cohort of data scientists and data analysts working across the built and natural environments have a powerful mix of technical and property knowledge, but our current pathways and competencies do not currently support a route to RICS membership.
- This new cohort coming into the sector will increase the need for the profession to reach other demographics, and RICS' focus on diversity and inclusion will need to focus on attracting these new and diverse groups.

- Both prospective and existing RICS members need upskilling to gain the knowledge to work with the new landscape of data science, big data and data analytics, starting in universities and then being reflected in RICS' core competencies and CPD offerings, complemented with on-the-job training and work experience.

- There are profound implications for RICS as data, technology and automation are adopted across the profession as a whole – we need to ensure that there is always an F/MRICS in the loop!

3 Why is it difficult to define the term AVM?

While many people will read the term AVM and picture a fully 100% automated process, where a valuation is produced by a computer with little or no human intervention, the reality is a much broader spectrum of hybrids involving varying degrees of automation, digital data sources, and different levels of human involvement and intervention. There is therefore a case to be made for a re-evaluation of the term AVM, and a broader discussion and response to the use of automation more generally, considering three key themes around data, models, and automation and process. This paper looks at this broader landscape, while still considering the effects of purely automated approaches.

An additional, and crucial, factor is the word 'valuation' itself. The terms 'valuation' and 'value' are widely used but often do not relate to a valuation produced under the Red Book/ International Valuation Standards (IVS), or other standards such as Uniform Standards of Professional Appraisal Practice (USPAP). In this paper, the terms 'valuation' and 'value' are used in the general sense, but we should be clear when a valuation should or does fall within a standards framework such as the Red Book.

4 What are the market drivers?

The reasons for the development and increased adoption of AVM-type approaches are relatively straightforward and mainly client-driven. They can be summed up as:

- speed

- cost

- scale and

- consistency.

Speed and cost are clear benefits from a client perspective. When we consider the requirement to value at scale for either taxation purposes or for funds, portfolios, non-performing loans, real estate-owned, risk-weighted asset calculation and securitisation purposes, it is easy to understand that these often frequent valuation requirements would not be practical without some degree of automation. In many cases, AVMs are also viewed by the market as providing a level of consistency when compared to manual valuations and to be removing human errors from the valuation process. Often some form of AVM is seen as a useful double-check or second opinion on a more traditional valuation method. An additional unforeseen factor has been the COVID-19 pandemic, which has accelerated many existing trends. For physical property assets, it has placed significant constraints on physical inspections and travel.

5 Which stakeholders are affected?

In addition to the valuation profession itself, a wide range of capital market participants are affected including lenders, asset managers, private equity, family offices, fund managers and real estate investment trusts (REITs). Tax authorities, audit and accountancy firms, regulators, central banks, financial supervisors and rating agencies are all affected to a greater or lesser degree, given the size of real estate as an asset class and the importance of reliable valuations to the stability of the financial system at a macro level.

The provision of professional indemnity and other forms of assurance for valuers by the insurance sector must continue to evolve to reflect the risks associated with automation. AVM providers themselves are key participants in the development, governance and efficacy of their models.

All valuation professional organisations (VPOs) need to consider their response in the same way that RICS is seeking to do with its roadmap and this paper.

Last but not least, we need to consider brokerage and lending, and their effect on consumers. Consumers may use some form of AVM to get an idea of value when considering entering a property transaction, or a broker may employ an AVM to calculate value when marketing a property. Furthermore, for both remortgaging and origination purposes, a lender may use an AVM to support their underwriting process in addition to other considerations such as affordability. In all these cases, consumers are owed clarity and transparency on how these values are being calculated.

With the emergence of the Instant Buyer (iBuyer) business model, where companies purchase residential properties directly from private sellers to eventually re-sell them, there is a strong need for consumer protection and education to ensure fairness on prices offered versus resale values. However, with the withdrawal from this market of US operator Zillow in November 2021, citing market volatility, the long-term sustainability of this business model is unclear.

6 Which asset types are AVMs being used for?

In general terms, AVMs work best with widely traded homogenous assets, and their performance degrades with increasingly heterogenous assets or assets that are thinly traded.

For real estate assets, it is unsurprising that residential property – particularly for classes of property with similar characteristics and which are traded reasonably frequently – has led the adoption of AVMs in mature markets, with good data availability for lending and mass appraisal.

Even within residential property, AVMs cannot be applied where properties don't fulfil the basic criteria of homogeneity and a sufficiently liquid and transparent market. From the perspective of lenders, there are often restrictions on the use of AVMs around construction type, such as the use of modern methods of construction. In addition, although work is underway to extend the use of residential AVMs, categories such as buy-to-let and houses in multiple occupation are not widely included. AVMs will typically be effective for a percentage of properties; so-called edge cases, outside of the set of properties where confidence in the AVM is considered acceptable, will require a less automated approach with increasing degrees of human intervention.

Given the scale of many social housing portfolios, AVM-type approaches are already being used to provide estimates of value.

Before considering commercial real estate, it is worth highlighting that institutional build-to-rent, or 'multi-family' to use the US term, is increasingly being valued using AVMs in many markets.

The various classes of commercial real estate (CRE) across offices, retail, industrial, logistics and alternative assets such as data centres, senior living, student accommodation, co-working and self-storage all represent much more heterogeneous and thinly traded assets than residential. In addition, with valuations of commercial property so often based upon income-producing characteristics, which in turn are linked to various attributes such as lease terms, occupier covenant strengths, rental growth projections, void levels, market yields, and capital and operating costs, the nature of effective AVMs and the data sources required are very different from residential property.

Despite the nature of CRE, there are many instances of the development and application of AVMs in markets where assets are being traded with similar characteristics and a sufficiently deep enough dataset of property attributes and market data. Some of these AVMs are producing capital valuations on the assumption of vacant possession, with others focusing on forecasting market rents. Another active role for automation is the creation of various market indices around the movement and forecasting of various market metrics such as rents, capital values, and yields at sector and subsector level.

At the portfolio level, we are already seeing the implementation of AVM approaches for CRE, albeit with the caveat that the efficacy and accuracy will tend to degrade as you drill down into segments, subsegments and individual assets themselves.

Once again, the use of AVMs in a hybrid role should be emphasised when considering CRE. AVMs are increasingly being used as an input to the valuation process or as a second opinion. There are examples of funds being valued using an internal AVM, with a human valuer reviewing and providing assurance in their role as an external, independent valuer.

With complex, high-value CRE investment properties, the need for detailed valuations provided by valuers with an intimate knowledge of the asset and the local market will continue. However, AVMs continue to be developed and applied to CRE, and we should recognise that their use will continue to increase. As the effects of automation continue to grow, many of the data collection functions that support these detailed valuations will themselves be automated.

In some jurisdictions, mature AVMs are being used in mass appraisal for property taxation purposes for both residential and CRE properties.

A high degree of automation already exists in the world of financial instruments, and the International Valuation Standards Council is already considering the issue of data and models for this asset class in the IVS.

AVM-type approaches are also being applied to plant and machinery, where once again issues of scale and speed are driving automated approaches for large portfolios. An example cited by a stakeholder was the valuation of circa 180,000 motor vehicles. In many cases, plant and machinery are being valued as part of an inter-company transfer process with complex Excel models being used to calculate valuations.

In the field of business valuation, there are already a variety of low-cost client-facing tools and internal valuation models being employed to calculate multiples, discount rates and other important metrics. Most tools are being employed for the valuation of complete business entities, although there is also activity around their use for intangible assets – albeit around the automation of data collection. The use of AVM-type approaches in business valuations provided directly to clients raises similar concerns to those raised by their use in residential property:

- Are these valuations being used for the correct purpose?
- What are the tax implications?
- What assumptions have been made?
- Has the correct asset identification process taken place?

7 Where are AVMs being used?

Having spoken to market participants across the globe, the use of AVMs in some form or other is now at a global scale. Their use continues to be predominately, but not wholly, for residential property for the purposes of lending, mass appraisal and consumer-facing valuations.

The degree of adoption varies widely, with 'mature' markets such as North America, the UK, the Netherlands, Switzerland and Australia leading the way. At the other extreme, countries like India are starting to consider adoption, with some use already in mass appraisal for property taxation.

Across Europe there is a mixed picture driven by data availability and the regulatory landscape, but adoption is being seen across Spain, Portugal, Italy, Greece and Turkey, as well as across northern Europe where data availability is generally better. In the Asia-Pacific region, adoption was reported in Singapore, Hong Kong, China and Australia. Elsewhere, AVM use was also reported in Brazil, with proposals for their use in the Caribbean.

While AVMs are widely used across most of the UK, lenders don't use them in Northern Ireland. However, they would like to extend their use to cover the Isle of Man and the Channel Islands, and for higher-value properties. AVMs are being extended into the single asset buy-to-rent sector based on rental data and to assess houses in multiple occupation. It is also worth noting that the effects of the Grenfell Tower fire, and the subsequent need for external wall system (EWS) certification, have impacted the ability of AVMs to be used for flats potentially affected, since the datasets available to AVMs lack this information.

8 What valuation purposes are AVMs being used for?

AVMs are being employed for a variety of valuation purposes, both within and outside of valuation standards such as Red Book/IVS and USPAP. From a market perspective, the term 'valuation' is being applied very broadly to estimates of value that are being produced wholly or in part with the use of AVMs.

In many cases, AVMs are being used by financial institutions and other capital market participants where estimates of value are required, in some cases prior to a formal valuation under a standard such as IVS, for:

- residential mortgage lending origination and remortgaging, albeit done within a lender's risk appetite based on loan-to-value and borrower affordability criteria
- non-performing loans
- real estate-owned, often just for the initial non-binding phases of loan transactions
- risk-weighted asset calculations
- International Financial Reporting Standard (IFRS) 9 requirements
- collateral valuation, for example based on ECB regulations
- loan book valuations (including CRE assets) by ratings agencies and
- open-ended funds, to establish regular net asset value calculations for spread pricing (bid/offer).

In the residential brokerage/agency market, AVMs are commonly used to provide clients with an estimate of value for marketing purposes, and in the emerging iBuyer business model to set price and offer expectations.

Central and local government agencies employ AVMs for periodic mass appraisal revaluation exercises across both residential and non-domestic properties.

Within existing valuation processes, AVMs are increasingly used to provide quality assurance, a double-check, scoring and identification of comparable evidence, and broader consultancy valuation services.

Given the relaxed and imprecise way in which the term 'valuation' is used across markets, there is an argument as to whether the output of an AVM should ever be described as 'market value' based on the definition in IVS and the Red Book, whether we need a new distinct basis of value for AVM outputs or whether AVMs should fall outside of valuation standards entirely.

9 What data do AVMs need?

One of the oldest phrases in computing, first coined in the late 1950s, is 'garbage in, garbage out'. While the same principle applies to the data underpinning a valuation produced without the use of an AVM, the efficacy of any AVM is underpinned by the data used to develop and operate it. To perhaps belabour the point, given the scale at which AVMs can be used, we need to remember an aphorism coined in the late 1960s: 'to err is human, but to really foul things up you need a computer'.

At a simple level, we need data that is of a high quality, since no model can overcome a lack of data or data that is erroneous in some form or another. The term 'high quality' is easy to use, but what does it mean in practice? Quality in the context of AVMs means we should consider the following factors, with an emphasis on transparency around every aspect of the data sources being used:

- **Recency**: How long ago was the data collected and what period does it reflect?
- **Availability**: Will the source of data be available in a consistent form over the life of the AVM through the development and operation of the model?
- **Security, privacy, ownership and ethics**: Can the data be used for the purpose of valuation without breaching legal, ethical, data protection, licencing and ownership considerations, and is there a risk that privacy protections could be breached in some way?
- **Provenance and lineage**: Is there a clear audit trail so the source and provenance of the data is well understood?
- **Assurance**: Is there any form of legal and/or financial assurance provided in the event of material issues with the data?
- **Consistency**: Will the data provide similar levels of efficacy over time?
- **Collection methodology**: How is the data collected and what methodologies, such as screen scraping of public websites, are used to gather, filter and select the datasets used for the model?
- **Scale and range**: What depth and breadth of coverage does the data represent in terms of asset type, region, etc. given that for statistically meaningful results, representative sample sizes free of bias are needed?

In addition to data that captures the attributes of the assets being valued, the availability of transactional data is of critical importance. However, in many jurisdictions this data is unavailable, of poor quality or substituted with asking price data as a proxy.

Another consideration on data sources for AVMs, and indeed for non-automated valuations, is the increasing variety of data being used as part of the valuation process. Some of these data points can be seen as proxies for more traditional attributes, such as using crime rates to assess the attractiveness or otherwise of the location and region, TripAdvisor/Airbnb ratings, air quality, broadband availability, etc. In the case of CRE, there is increasing use of location-type

characteristics such as local amenities, quality of transport links, etc. in a way that is already well embedded for residential properties.

Caution needs to be taken when adding additional data sources for use with an AVM, since their effect on the models needs to be measured and models need to be recalibrated against external reference points.

With the rise of environmental, social and governance (ESG) measures as a driver of value, both AVMs and non-automated valuations need increasing access to various data points around energy performance certification and accreditation schemes such as Energy Performance Certificates (EPCs) and the Building Research Establishment's Environmental Assessment Method (BREEAM). Ideally, this data should include actual energy performance in addition to certificates of theoretical performance, the absence of which can sometimes lead to the 'performance gap' problem. The need for ESG data is becoming critical across all forms of valuation to firmly establish the correlation and causation of links between ESG and value for both residential and CRE.

To assess both the condition and characteristics of properties without the expense and time of a physical site visit, images are being captured and interpreted using a variety of artificial intelligence (AI) approaches to provide data on the presence of swimming pools, verify property size and assess the level of dilapidation.

Many challenges exist even in mature, developed markets where key data is either unavailable in a digital form, difficult to connect to the correct asset/region because of a lack of suitable identifiers above and beyond postal type addresses, or while available in a digital form is still held as an unstructured document such as a PDF or Word document.

A further consideration is that the relevant depth and breadth of data required to support an AVM may become consolidated with a small number of market participants, raising barriers to entry and restricting competition and innovation. This 'data flywheel' effect will drive the improvement of a particular AVM, but may come at the expense of other AVMs unless the data sources are open to other market participants. The opposite effect my take place if the developer of an AVM relies only on their proprietary data sources, which if not fully reflective of the market will have a negative effect on the AVM's efficacy because of this inbuilt selection bias.

Going back to first principles, we need to ask whether the data sources being used provide sufficient data for the assets being valued, any compatible assets and the marketplace in which the asset will be transacted.

10 What models are being used in AVMs?

An AVM may consist of one or more models used to analyse the assets being valued, providing estimates of value, confidence in the valuation itself and a control model, as well as supporting other functions such as calibration, benchmarking and back-testing against other valuations and price discovery data. In addition, to support different types of assets and different regions, some AVMs are built using a set of micro-models that address a specific set of assets.

The need to continually calibrate models against the real world is a key requirement that needs to be addressed by continual calibration against transactional data, non-AVM valuations and other back-testing approaches. Many models are designed to work at the portfolio level, and by not considering comparable evidence at an individual asset level produce a different statistical distribution.

Some market participants have raised concerns that AVM model development is not being done against a rigorous understanding of the methodologies and approaches used by valuers. This is surely an argument for valuers and property professionals to play a key role in the development, operation and governance of AVMs.

While AVMs in many markets have access to an ever-increasing volume of datasets, many of the firms that have evolved to test and evaluate the performance of the models used have commented that a small number of key value drivers, between four and five at most and which vary by market and asset type, continue to dominate. However, the process of adding new datasets to an existing model effectively creates a new model, increasing risks related to consistency, stability and the need for continued calibration to revalidate the models.

The models themselves take many forms and – when considering the full spectrum of automation seen in the market – range from Excel models, through relatively simple computer algorithms, to well established statistical tools using regression analysis (many multi-level) and various forms of AI such as supervised and unsupervised machine learning (ML), neural networks and simple graph convolution. Many AVMs use a mix of model types as part of their overall architecture.

Many models employ a hedonic method, which is a regression technique based on the hypothesis that assets can be treated as bundles of characteristics and that values can be attached to these characteristics.

Rather than focusing on this rather technical taxonomy of the different kinds of models, it is perhaps better to consider the concept of a range of models from white box (models that are easy to audit and understand) through to black box (models where the only observable data consists of the inputs and outputs; none of the inner workings are visible). While technologies such as ML and neural networks are inherently more likely to represent the black box end of the

spectrum, we should recognise that many Excel models and other relatively simple algorithms can also be sufficiently complex and poorly documented to behave as black boxes themselves. There is also a school of thought that holds that the human brain on many occasions behaves as a black box when challenged on the reasoning behind a particular decision.

This concept of white box through to black box models leads us to a fundamental issue that needs to be understood and addressed by all market participants when they develop, operate, and use the output from AVMs: how can we evaluate, explain, interpret and audit the performance and efficacy of an AVM?

Even for black box models, there are methodologies available to judge performance. However, these involve trade-offs that must be considered in the context of the impact and risks associated with the use of a particular AVM for a valuation purpose.

An AVM should allow transparency across several dimensions of its performance so the following types of questions can be answered and some form of audit trail made available:

- What asset types is the AVM suitable for? For example, it might not be suitable for all residential properties; it might be suitable for houses but not for flats or apartments.

- What valuation purposes is the AVM suitable for?

- What time periods and/or market conditions is the AVM suitable for?

- What level of confidence for an output is available, and how is that defined and calculated?

- Where specific comparable evidence has been used, how has it been adjusted and weighted?

- How broad an area has been used for comparable evidence? For some niche asset types a wide geographical extent may be necessary, or comparable evidence from other regions with similar characteristics may be appropriate.

- What are the key value drivers that the model has identified, and what is the sensitivity of the model to changes in these?

- What are the data sources used to train and/or operate the AVM?

- When is the AVM failing for a particular asset? These edge cases must be identified so that other non-AVM approaches can be used.

As the various AI and ML approaches being developed and used in AVMs support this concept of interpretability or 'explainability', we will see further adoption of these more sophisticated technologies and a move away from more traditional regression analysis.

With more and more data available to big data analytics platforms, there may be instances where the sheer scale of data being analysed with AVM models will be too dynamic, variable and complex for a human to comprehend, and judgements will need to be made as to whether the balance of risk and reward involved in using these approaches is acceptable given this potential lack of explainability. How any standards-type framework, valuation or otherwise, can be applied to a system that is unknowable in this way remains an open question.

There is an argument to include in this discussion the many existing valuation software solutions that are currently used for valuing CRE assets. These products can handle complex discounted cash flow-type models where the various inputs, settings, assumptions, etc. have a

significant effect on the valuation output. There is a risk that these models don't allow for a clear explanation of the impact and sensitivity of changes to these inputs and the resultant valuation.

11 What kinds of processes and degrees of automation do we see with AVMs?

In the same way that we see such a variation in the kinds of models used in AVMs, there is a similar range when we consider the degrees of automation and the processes used to implement an AVM.

At one end of the spectrum, we see 100% automation, albeit with processes to select assets to be valued and to manage assets that fall out of the AVM as edge cases, either because of low confidence levels or because of other characteristics that suggest a non-AVM approach is required to produce a valuation. The architecture of the process surrounding a fully automated approach needs to support the selection and triage of appropriate assets to be valued either fully, partially or totally outside of the AVM, together with the ability to handle exceptions as assets fall outside of the efficacy of the AVM at whatever stage of the process.

At the other end of the spectrum, we see the valuation process being supported by AVMs either as a quality control mechanism, as one of a variety of valuation inputs, or to provide and score comparable evidence. Between these two extremes we see various hybrids, with AVM outputs augmented by valuers providing desktop or drive-by valuations, using some form of remote or virtual inspection, conducting physical inspections or using information gathered by non-valuers onsite using a structured data capture process. Where we see desk-based valuers working with AVM outputs, it is worth highlighting the potential risk that if such functions are overly centralised, the personnel may lack the requisite regional knowledge to be able to apply appropriate judgement.

At every point on this spectrum, we need to understand whether the valuations being produced and consumed by the client are being signed off by a valuation professional under some form of standards framework, and what level of assurance and liability is being extended. If a single professional is effectively signing off significant volumes of valuations over a short period of time, we need to consider how such a supervisory role is being executed with the appropriate level of due diligence in order to protect all parties.

For many physical assets, some assessment of condition will remain a key criterion for the valuation process. There is a strong argument that any process using an AVM should explicitly describe how this attribute is handled and the methodology (if any) used to assess condition.

On a purely technical level, some lenders have a direct application program interface (machine to machine) with an AVM for a highly automated approach, while others have a more manual process for using AVM outputs.

12   What are the risks in using AVMs?

AVMs provide many opportunities for the marketplace, but it is wise to list the potential risks to make sure they are understood and quantified, and – where necessary – actions are taken to manage and mitigate their effects.

At the most fundamental level, there is a potential danger that we increase the use of AVMs without fully understanding these risks and putting in place the appropriate management and mitigation measures. Valuations matter, with large volumes of derivatives in the capital markets linked to them.

The following were highlighted by stakeholders:

- There can be significant issues around bias – a general risk with many algorithms and AI approaches.
- There are potential conflicts of interest in markets where a small number of professionals have multiple roles in both developing and being users of AVMs.
- AVM outputs are being used as indicative numbers to drive perceptions of value, particularly for consumers.
- Many AVMs are being developed in jurisdictions and/or for asset classes where data and model maturity is not sufficient for robust and accurate outputs.
- Outputs from an AVM intended as a risk assessment tool are being treated as valuations.
- There is a specific risk around depreciated replacement cost valuations being automatically adjusted using building cost indexes.
- There are general risks around using market indexes to automatically drive portfolio valuations that don't reflect effects on individual assets.
- Users in the audit and accountancy sector may view the outputs of AVMs as being equivalent to traditional valuations.
- There is insufficient management and supervision by valuation professionals of AVM outputs produced by less-qualified personnel.
- There is uncertainty on how AVMs will deal with market adjustments and corrections (both up and down), periods of market uncertainty with limited transactions and periods of extreme market volatility, and that they lack the ability to be forward-looking.
- There is concern that AVMs could drive market volatility and/or act as market makers – making rather than reflecting the market.
- Without regular and systematic calibration against reference data such as manual valuations, there is a risk that AVMs could become circular and self-reinforcing in their outputs.

- If an AVM is driven by a partial view of the market and based on the data held by a particular market participant, there may be a risk of inherent selection bias.

- There is a danger that the 'data flywheel' effect will concentrate and consolidate data for a particular market in a single or small number of data aggregators, thus limiting competition and innovation, and creating barriers to entry.

- With an increasingly varied set of models and approaches being used to develop AVMs, a lack of standardisation may negatively impact consistency and the ability of the market to evaluate their efficacy and application across markets and asset types.

- Consumers may lack awareness of the use of AVMs and the implications of their use when compared to manual valuations.

- There is a concern that the insurance sector is being reactive around the risk of underwriting the liability and assurance extended by valuers using AVMs, as the adoption of AVMs grows across markets and asset types.

- There are concerns from many participants that valuation and property professionals are not sufficiently involved in the design, development, operation and governance of AVMs, given the idiosyncratic nature of many asset types being valued.

These risks, and the other issues outlined above, would suggest that an overarching due diligence framework for the use of AVMs that supports all affected market participants would be of value.

13   How should AVMs provide liability and assurance?

A wide range of clients rely to varying degrees on the valuations they receive as businesses, government bodies or consumers, and often make decisions with significant financial implications based on them. RICS' **Rules of Conduct** state:

> 'The following obligations are mandatory for RICS-regulated firms [...]

> 2. Firms must ensure that all previous and current professional work is covered by adequate and appropriate professional indemnity cover that meets the standards approved by RICS.'

In the same way that we see considerable ambiguity around whether AVMs are providing valuations within the remit of a standards framework such as IVS/Red Book, the marketplace also needs clarity on the extent and provision of liability and assurance to valuation clients. Where an AVM is being provided as a service by a data and technology vendor to a firm providing valuation services, there should be clarity on which party or parties are extending liability and assurance, if any, so that the ultimate client of the valuation understands where the risk lies. Based on market feedback, it remains unclear as to which AVMs are being used within a standards framework, whether liability and assurance is provided, at what level and which stakeholders are carrying part or all of the associated risk.

Since most liability and assurance is further underwritten by the insurance sector, there needs to be a clear understanding of the risks associated with using AVMs. Given the issues raised above around transparency and explainability, it would seem that when an AVM is tested either in a claim or legal setting, the AVM should be able to be defended in a similar manner to that of a non-AVM valuation.

To counterbalance the potential risks, some market participants believe that AVM use acts in a positive way with the use of transparent and higher-quality data, as well as the removal of human error. Also, by automating data collection it allows the human valuer to spend more time on the actual valuation process when some form of hybrid AVM-supported valuation is undertaken.

14   What should a due diligence framework for AVMs cover?

Market participants such as valuers, users of valuations, regulators/VPOs, insurers and AVM providers should work to a common understanding to ensure transparency, consistency and risk management, and to protect market confidence in asset valuations. Any framework should be able to be prescriptive but allow its implementation across a range of jurisdictions and asset types. Many of the issues and themes discussed in this paper reflect the current valuation standards but should be reemphasised in the context of AVMs and automation more generally. The aim of any due diligence framework for AVMs would be to deliver confidence and transparency to all affected stakeholders through full disclosure of automation within the valuation process. The points below provide a non-exhaustive list of themes and issues that should be considered in any proposed framework:

- Is an AVM-based estimate of value appropriate for the valuation purpose, or should it be an independent valuation under a standard framework with sign-off by a professional valuer with appropriate assurance?

- What basis of value (IVS), assumptions, special assumptions, premises of value, limitations, etc. are being considered by the AVM and surrounding processes?

- For what valuation purposes is the AVM or automated process appropriate, and will the output be used for internal and/or external, potentially regulated, requirements?

- Is the AVM appropriate for the asset type, region/area/jurisdiction and current market conditions?

- Why were AVMs chosen for the valuation assignment and has the asset identification process been correctly followed?

- Is the AVM suitable for either portfolio and/or individual asset-level use?

- Is the AVM free from risk around bias and drift, and how are these risks managed?

- Is the AVM stress tested against periods of market volatility and/or uncertainty?

- Is the provenance, lineage, collection methodology, manipulation and efficacy of all the data sources used clear, and are they legal, ethical, appropriate, free from selection bias, consistent and available on a sustainable long-term basis to support the AVM?

- What information can the AVM provide to explain and justify the valuations it has produced?
  - confidence levels
  - comparable evidence selected and any adjustments made
  - sensitivity analysis
  - evidence of factors driving value and a ranking of their importance as drivers of value
  - ability to explain a valuation in a similar manner to a manual valuation process

   – description and explanation of the models used in the AVM

   – methodologies used to calibrate and back-test against external arms-length benchmarks such as manual valuations, pricing and transactional data.

- What is the process for selecting the assets to be valued using the AVM, as opposed to a manual approach, and for dealing with edge cases where confidence in the valuation is low or the nature of the asset indicates a less automated approach?

- What are the different degrees of automation being employed, and where there is human intervention, what tasks are conducted and what skills, experience and qualifications do those personnel have?

- Do the organisations providing and operating the AVM have an overall governance framework for the use of algorithms?

- Which organisations are providing liability and assurance, at what level and to whom is it being extended?

- Do the terms of engagement, and other terms and conditions documents, fully reflect the use of automation in the valuation process?

- For tangible assets, what level of physical inspection was conducted or what proxy data sources were used, if any, to assess the condition of the asset?

15   How could RICS shape its approach to AVMs and the automation of the valuation process?

RICS has a variety of tools to support RICS members, member firms and all other stakeholders affected by AVMs and automation. From a valuation standards perspective, IVS, and RICS' adoption of it in the Red Book, will continue to evolve to reflect the impact of AVMs and automation as well as other themes such as ESG. One fundamental issue that must be reviewed in IVS and other similar standards is a clear definition of which AVM-type processes should fall within the regulatory framework afforded by such standards. With such a wide spectrum of degrees of automation, and humans still responsible for the design, development, maintenance, operation and governance of AVMs, there is an argument that organisations using AVMs in whatever form to provide external, independent valuations should be working within a standards framework to ensure market confidence. While this approach may be viewed by the market as an endorsement of the principle of AVM use by RICS, the market is driving the development and adoption of these tools and the role of RICS and other VPOs should continue to encompass all the tools and methodologies being used to produce valuations.

There is in fact a very strong argument for having a 'human in the loop' as part of the design, development, maintenance, operation and governance of AVMs, and that that human should be a valuation and property professional. Valuation and property professionals need to work with technology professionals to produce these tools, as well as retaining and evolving their roles and functions in performing manual valuations and valuation consultancy where AVMs are not appropriate or effective.

A separate standalone standard for AVMs and automation per se may not be the best approach. A combination of the proposed due diligence framework developed into a guidance note, coupled with educational, CPD and training content, may be the best approach to deliver the necessary market confidence and transparency.

Many market participants have expressed the need for some form of accreditation of AVMs by bodies such as RICS. There are already organisations that provide validation services for AVMs, notably in the US, and while there are arguments in support of an RICS accreditation process, the following issues would suggest that this approach may not be practical or appropriate:

- Given the varied, fast moving and technical nature of many of the models, approaches and data sources used in AVMs, providing a detailed and consistent technical accreditation

that would be effective across the range of jurisdictions and asset types could be seen as unrealistic.

- Any accreditation could be seen to imply a degree of assurance and liability, which would create legal, risk and insurance implications for any accrediting body such as RICS.

However, these concerns should not preclude RICS from providing market insight and examples of good practice in the application and efficacy of AVMs and automation when applied to different asset types across multiple markets.

There is a clear need for educational content for all affected stakeholders, in order to overcome a basic lack of awareness around AVMs and the automation of valuation in general, and to help navigate the inevitable jargon associated with any new and developing area of technology and professional practice. Given the prevalence of statistical approaches used in AVMs, a basic grounding in the subject would help stakeholders to understand concepts such as confidence levels, correlation and standard deviations. These skills would allow valuers and clients to work with data scientists, and be able to participate confidently and challenge where appropriate.

There is also a case for bodies such as RICS to raise awareness of the use of AVMs with consumers, particularly given their use in brokerage, marketing and mortgage lending.

The increased pace and breadth of the application of data and technology across valuation and the broader property sector raises a significant issue around the education and training provided to RICS members. From university through the Assessment of Professional Competence (APC) and beyond to CPD, this should ensure that current and future property professionals are equipped with the necessary skills to work with or even develop technology solutions for the sector. These skills include, but are not limited to, data science in general, SQL and database design, statistical models and approaches, and the principles of ML and other AI tools. There is a strong case for RICS' competencies to evolve at pace to reflect these skills, knowledge and experiences; for this to be reflected in existing pathways; and for the creation of a new property data scientist pathway.

RICS should continue to emphasise the need for more standardisation around property data held in a digital form and the importance of underlying measurements conforming to the appropriate standards, such as IPMS, to allow consistent treatment of data sources such as area measurements.

AVMs and automation in general are now an established part of the valuation process across many jurisdictions, and are being applied to many asset types beyond their original applications for residential mortgage lending and mass appraisal. RICS, like other VPOs, must recognise this new and fast-moving landscape, and ensure our standards, regulation, qualifications, training, CPD and thought leadership reflect this new reality.

Delivering confidence

We are RICS. Everything we do is designed to effect positive change in the built and natural environments. Through our respected global standards, leading professional progression and our trusted data and insight, we promote and enforce the highest professional standards in the development and management of land, real estate, construction and infrastructure. Our work with others provides a foundation for confident markets, pioneers better places to live and work and is a force for positive social impact.

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