HouseCanary

July 23, 2023

Re: Quality Control Standards for Automated Valuation Models

Consumer Financial Protection Bureau (via Regulations.gov)
Federal Deposit Insurance Corporation (via comments@fdic.gov)
Federal Housing Finance Agency (via Regulations.gov)
Federal Reserve Board (via regs.comments@federalreserve.gov)
National Credit Union Administration (via Regulations.gov)
Office of the Comptroller of the Currency (via Regulations.gov)

Dear Regulators:

HouseCanary would like to express our sincere appreciation to the Consumer Financial Protection Bureau (CFPB), Board of Governors of the Federal Reserve System (FRB), Federal Deposit Insurance Corporation (FDIC), Federal Housing Finance Agency FHFA), National Credit Union Administration (NCUA), and Office of the Comptroller of the Currency (OCC) (collectively, the Agencies) for their dedicated time and extensive efforts to ensure the safe and appropriate utilization of automated valuation models (AVMs).

Founded in 2013, HouseCanary is a national brokerage firm based in San Francisco, California with offices in San Antonio, Texas and Boulder, Colorado. We are known for our industry-leading, comprehensive information and analytics system for residential real estate. Our system is considered by many to be the "gold standard" for residential real estate valuations with a 3% median absolute error rate measured against arm's-length sale prices on closed transactions occurring across 115 million properties nationwide.

Very importantly, HouseCanary's valuation estimates are continually tested by independent, third parties, as well as internally, for both accuracy and racial bias[1]. The ongoing testing has proven that HouseCanary's AVM not only accurately values properties, but that our AMV is non-discriminatory.

So, we share the Agencies' goals of ensuring that AVMs, including Evaluations, are both accurate and nondiscriminatory and are very pleased to have the opportunity to make recommendations to the Agencies

[1] HouseCanary uses the Freddie Mac methodology in its testing for racial bias.

to achieve those dual goals.

While our comment letter begins with a necessary Background section, our recommendations focus on 1) the process for putting in place a system that will enable AVM standards, including Evaluations, to be updated so that technological advances can be incorporated as they occur, and 2) the technical requirements for one, centralized set of AVM standards that will ensure that appraisals are both accurate and unbiased.

Part A: Background

The Proposed Rule

On June 1, the Agencies published the proposed rule with request for public comment that would implement quality control standards mandated by Subpart F of the Dodd-Frank Wall Street Reform and Consumer Protection Act (Dodd-Frank Act). The standards would require mortgage originators and secondary market insurers that use AVMs to determine the value of mortgage collateral adhere to quality control standards designed to:

1. Ensure a high level of confidence in the estimates.
2. Protect against the manipulation of data.
3. Seek to avoid conflicts of interest.
4. Require random sample testing and reviews.

The Agencies proposed adding a fifth requirement that would require AVM systems to be compliant with applicable nondiscrimination laws, a requirement that HouseCanary strongly supports.

The proposed rule would also require that AVM systems be tested by independent, third-party organizations.

In addition, the proposed rule would require that mortgage originators and secondary market issuers adopt policies and controls to ensure that AVMs, including Evaluations, used in certain credit decisions or covered securitization determinations adhere to quality control standards. However, to provide flexibility, the proposed rules would permit regulated institutions to adopt their own AVM policies and control systems to satisfy the statutory factors, rather than prescribing those policies and systems.

Under the proposal, the agencies suggest an effective date of 12 months after issuance of the final rule. (Presumably, the proposed effective date would not preclude mortgage market participants from adopting standards and using AVM systems prior to the effective date.)
Finally, the proposed rule poses 37 questions. Responses to those questions are included in Attachment B to HouseCanary's comment letter.

Definition of AVMs, Including Evaluations

AVM

While many use cases for AVMs exist, we focus on the definition proposed in 12 U.S.C. §3354, which states that an automated valuation model is "any computerized model used by mortgage originators and secondary market issuers to determine the collateral worth of a mortgage secured by a consumer's principal dwelling."

By emphasizing the word "any computerized model", this allows for room in the market for various mathematical, statistical, and/or machine learning models to be used in combination with different methodologies to estimate the value of a property.

Evaluation (AVM + Up-to-Date Inspection)

When an AVM fails to meet all the standards for appropriate use for a property, an Evaluation is the next possible alternative to a fully automated valuation. An Evaluation is a condition-informed home evaluation that leverages high confidence AVM systems in combination with independent data collection, along with market and subject characteristic validation. By combining onsite property data collection with deep contextual data supporting a value, software-based Evaluations have the potential to provide a solution that extends the benefits of a standalone AVM by adjusting the value based on the insights gained from the new data.

As well as meeting the 12 U.S.C. §3354 requirements for AVM use, an Evaluation must adhere to the Interagency Appraisal and Evaluation Guidelines (IAG). According to the IAG, an Evaluation is defined as "a valuation permitted by the Agencies' appraisal regulations for transactions that qualify for the appraisal threshold exemption, business loan exemption, or subsequent transaction exemption. An Evaluation should also "contain sufficient information detailing the analysis, assumptions, and conclusions to support the credit decision."

Benefits of AVMs, Including Evaluations

Presently, the expenses associated with a conventional appraisal typically falls within the range of $400 to $1500, with completion times spanning from 4 to 6 weeks. In recent times, there has been a rise in reports concerning racial bias in appraisals conducted by traditional appraisers.

Fortunately, properly designed and continually tested AVMs are very accurate, eliminate racial bias, are far less costly, and can be delivered much more rapidly than traditional appraisals.

- Approximately 40%+ of the single-family residential real estate in the United States can be served by a fully automated valuation, an AVM, at a cost of about $10. A fully automated valuation can be completed in seconds.

- Another 45%+ of the single-family residential real estate can be served by an Evaluation, an AVM plus an up-to-date inspection, at a cost of $100 - $200. The Evaluation can be completed in 1 – 2 days.

Roughly 15% of residential properties will continue to require appraisal by traditional appraisers due to their unique or remote nature.

For approximately 85% of the residential properties in the U.S., though, these technology solutions can benefit participants across the housing market ecosystem:

- Consumers - buyers and sellers
- Mortgage originators, underwriters, and servicers
- Mortgage insurers and mortgage guarantors
- Investors
- Neighborhoods and communities

We'd like to highlight an additional advantage for mortgage homebuyers. Currently, highly sophisticated investors on Wall Street employ AVMs and advanced analytics to assess single-family residential properties. It stands to reason that individual homebuyers can also benefit from using similar technology tools that are utilized by these seasoned Wall Street investors, when deemed appropriate.

Aside from being faster, less expensive, more accurate, and less biased, properly trained AVMs can also enable many homebuyers the ability to compete with institutional investors in buying a home. Using AVM technology, institutional investors offer home sellers market-priced cash offers that can close quickly. Right now, homebuyers using traditional appraisals can face a lengthy wait and significant expense for a completed appraisal. AVM technology will give individual homebuyers the same tools and opportunities as institutional investors, effectively enabling individual homebuyers the ability to compete against institutional investors when purchasing a home by being the equivalent of a cash buyer.

Lastly, there is another advantage for consumers. The adoption of AVMs will expedite the mortgage process for them, reducing the time between the consumer's application and the loan closing. A conservative estimate suggests that for each month eliminated from this period, consumers could save approximately ¼ percent on their mortgage loan interest rate due to the lenders' reduced hedging costs.

Explanation for Limited Use of AVMs and Evaluations in the Retail Residential Mortgage Market

As noted just above, institutional investors on Wall Street and lenders offering Home Equity Lines of Credit (HELOC) loans use AVMs and analytics to evaluate single-family residential properties. Institutional investors and HELOC loan providers essentially hold those loans “in portfolio.”

Unfortunately, lenders use of AVMs, including Evaluations, is limited in the residential mortgage market because most loans are securitized (Only a small percentage of residential mortgage loans are held “in

portfolio.”). Some lenders use an AVM at the front end of the mortgage process as a quality control measure to ensure that the value of the target property is within an acceptable range before proceeding with underwriting and processing the loan for the consumer.

The reason lenders resort to appraisals completed by traditional appraisers before the underwriting process is because they are uncertain about where they will sell the loan until after the mortgage loan has closed. This uncertainty arises from not knowing whether the eventual guarantor of the loan will accept an AVM value that might have been used. Despite their preference for using AVMs, lenders aim for "best execution" when selling their mortgage loans, which forces them to rely on traditional appraisals to ensure a smoother loan sale process. Best execution in secondary mortgage refers to the process of obtaining the most favorable terms, price, and efficiency when selling or purchasing mortgage-backed securities in the secondary market.

Indeed, the lack of a unified set of standards embraced by Fannie Mae, Freddie Mac, and other mortgage market participants is preventing consumers and other stakeholders within the mortgage market ecosystem from fully benefiting from the advantages that AVM technology can provide. Establishing and adopting a cohesive set of standards is crucial to unlock the potential benefits offered by AVM technology, promoting efficiency and transparency throughout the mortgage industry. Until such standardization occurs, the true potential of AVMs may remain unrealized, limiting their positive impact on the mortgage market.

To provide flexibility, the proposed rule allows regulated institutions to adopt their own AVM policies and control systems to satisfy the statutory factors, rather than prescribing those policies and systems. While we understand and appreciate the Agencies’ efforts to allow for flexibility, we do not believe this approach will work for several reasons:

- As noted above, at the point of origination, lenders, regulated and nonbanks, do not know where the mortgage loan that is being originated will be sold. So, they won’t fully use AVMs until those AVMs’ systems are accepted by other participants in the mortgage market, most importantly Fannie Mae and Freddie Mac.
- It would be very costly, as well as burdensome, particularly for smaller regulated institutions, to continually test to ensure that the AVM policies and systems they use meet the five basic requirements stated in the Dodd-Frank Act and the proposed rule. Therefore, it is unlikely that the regulated, as well as nonbanks, will fully use AVMs for loans that are securitized.

Instead, we have an alternative approach that we believe would better-achieve the Agencies’ goals. It is discussed in the next section of this comment letter.

Part B: The Process

We recommend adopting the processes used today by standard-setting organizations and the federal government. To give the Agencies more context, we first review the history of standard-setting organizations and the role that OMB Circular A-119 plays in the public-private partnership that exists in the U.S. today.

Background on Standard-Setting Organizations

Standard-setting organizations (SSOs) in the United States have played a significant role in developing and promoting standards across various industries. These organizations bring together stakeholders to develop consensus-based standards that ensure interoperability, safety, and efficiency in products, processes, and services. Here is a brief history of standard-setting organizations in the U.S:

- American National Standards Institute (ANSI):
    - Established in 1918, ANSI is a private nonprofit organization that oversees the development and use of voluntary consensus standards for products, services, systems, and personnel in the United States.
    - ANSI coordinates and accredits various standards development organizations (SDOs) and facilitates the creation of American National Standards (ANS).
    - ANSI also has a Memorandum of Understanding (MOU) with the National Institute of Standards and Technology (NIST).

- National Institute of Standards and Technology (NIST):
    - NIST founded in 1901 as the National Bureau of Standards, is a federal agency under the U.S. Department of Commerce.
    - NIST's mission is to promote and maintain measurement standards, including standards for technology, industry, and trade.
    - NIST is involved in research, development, and publication of technical standards and provides guidance on conformity assessment.

- ASTM International
    - ASTM International, formerly known as the American Society for Testing and Materials, was established in 1898.
    - It is one of the largest SSOs worldwide, developing and publishing voluntary consensus standards for materials, products, systems, and services
    - ASTM standards cover a wide range of industries, including construction, metals, petroleum, textiles, and more.

- Institute of Electrical and Electronics Engineers (IEEE)
    - Founded in 1884, IEEE is a professional association that focuses on advancing technology related to electrical and electronic engineering

    - IEEE develops standards for various technologies, such as telecommunications, power and energy, information technology, robotics, and more.
    - The IEEE Standards Association (IEEE-SA) oversees the development and maintenance of these standards.

- International Organization for Standardization (ISO)
    - While not strictly a U.S.-based organization, ISO plays a crucial role in developing international standards, many of which are adopted in the United States.
    - The American National Standards Institute (ANSI) represents the U.S. in ISO and coordinates the adoption of ISO standards in the country.

These are just a few examples of standard-setting organizations in the U.S. There are many other SSOs dedicated to specific industries, such as the American Petroleum Institute (API) or the Society of Automotive Engineers (SAE), which develop standards within their respective domains (Some, but not all these organizations seek ANSI accreditation.). These organizations collectively contribute to the development of voluntary consensus standards that drive innovation and ensure compatibility and safety across industries.

OMB Circular A-119

OMB Circular A-119, titled "Federal Participation in the Development and Use of Voluntary Standards," was initially issued by the Office of Management and Budget in 1982. The circular aimed to establish guidelines for federal agencies regarding their participation in the development and use of voluntary consensus standards.

The original purpose of the circular was to promote the use of voluntary standards in federal procurement and regulatory activities. It emphasized the importance of utilizing existing voluntary standards developed by recognized standards organizations whenever possible, rather than creating unique government-specific standards.

Over the years, the circular has been revised and updated to reflect changes in standards development and evolving priorities. The most recent revision occurred in 2016, when the circular was updated to incorporate current practices and address technological advancements.

- Revised Circular (February 10, 2016)
    - On February 10, 2016, OMB issued a revised version of Circular A-119, updating and modernizing the guidance.
    - The updated circular emphasized the role of voluntary consensus standards in promoting innovation, regulatory efficiency, and international trade.
    - It encouraged federal agencies to consider the use of voluntary consensus standards when developing regulations unless there were specific statutory or regulatory reasons for using different approaches.

- Key Principles and Requirements:
    - OMB Circular A-119 outlines key principles and requirements for federal agencies to follow regarding voluntary consensus standards and conformity assessment activities.
    - It highlights the importance of openness, transparency, impartiality, and consensus in the standardization process.
    - The circular encourages agencies to participate in the development of voluntary consensus standards and to rely on these standards unless there are compelling reasons for using alternative approaches.
    - It also emphasizes the importance of coordination and cooperation among federal agencies, industry, standards development organizations (SDOs), and other stakeholders.
- Federal Agency Compliance:
    - OMB Circular A-119 requires federal agencies to report on their compliance with the circular's principles and requirements.
    - Agencies are expected to review their existing regulations and practices to ensure consistency with the circular and to provide annual reports to OMB regarding their compliance efforts.
    - OMB Circular A-119 plays a significant role in promoting the use of voluntary consensus standards in federal regulations and procurement activities. By encouraging agencies to rely on these standards, the circular promotes interoperability, innovation, and cost savings while maintaining safety and quality.

AVM[2] Standard-Setting Working Group

We highly recommend the establishment of a Standards Working Group dedicated to updating AVM standards in response to technological advancements. This group can adopt a consensus-based approach, similar to the practices employed by other standards-setting organizations. By doing so, the working group can effectively keep pace with evolving technologies, ensuring that AVM standards remain relevant and up-to-date. This collaborative effort will facilitate the widespread adoption of AVM technology, unlocking its full potential and benefiting consumers and participants within the mortgage market ecosystem alike.

The AVM standards that the Standards Working Group would review would be those requirements set by the Dodd-Frank Act and the initial set of standards required in the Agencies' final rule. The final rule, though, should provide for the flexibility that will be needed for the Standards Working Group, described above, to update and adjust the Standards as technological advances occur.

We recommend that members of the Working Group include:

- AVM providers
- Consumer advocate organizations representing buyers and sellers

[2] Includes Evaluations

- Investors
- Mortgage guarantors
- Mortgage insurers
- Mortgage originators, underwriters, and servicers

Following the guidelines established by OMB Circular A-119, the Agencies should participate with the Working Group in the development and use of the consensus AVM standards.

Independent, Third-Party Testing Organization

Also, as envisioned in the proposed rule, a separate, fully independent centralized third-party testing organization needs to be established to test AVM systems to ensure that the systems meet both the broad requirements of the Dodd-Frank Act and the proposed rule. We recommend that this organization be structured as a non-profit and that its Board have representatives from the AVMs, along with other participants in the mortgage ecosystem, as noted above. All mortgage market participants using AVM systems should have their systems tested by the third party independent testing organization that would test for both accuracy and racial bias.

In the present AVM industry landscape, third-party testing agencies also provide their own AVM services that, under the proposed rule, raise concerns regarding potential conflicts of interest. Given the critical role that third-party testing plays in the present use cases of AVMs, and to fulfill the requirements set forth in the proposed rule, the AVM industry needs a centralized solution that is free from any conflict of interest or appearance thereof. Implementing a centralized and independent testing solution would ensure impartiality and maintain the highest standards of integrity in evaluating AVM performance, fostering trust and confidence in the industry.

In addition to addressing the conflicts of interest concern, the establishment of a centralized third-party testing entity to validate and quantify the accuracy of AVM providers fulfills four out of the five factors proposed in the rulemaking process. The implementation of a centralized solution not only enhances transparency and reliability of AVM providers, while safeguarding their intellectual property, but also fosters a high level of confidence in their valuations.

Furthermore, it effectively avoids conflicts of interest, satisfies the requirements for random sampling and reviews, and, if appropriately structured, can ensure adherence to non-discriminatory laws, fulfilling the fifth factor in the proposed rule.

By establishing a core set of metrics that are uniformly measured across all AVM providers, mortgage market participants could, and likely would, seamlessly integrate AVM technology into their operations, eliminating the need to establish their own testing pipelines to measure the same metrics that can be readily provided by the centralized solution. This approach promotes consistency, transparency, and reliability within the industry, benefiting all stakeholders involved.

There is no reason that the implementation of AVM standards needs to be delayed. HouseCanary, as just one example, already follows strict standards that are independently tested for both accuracy and bias. In addition, HouseCanary's clients require that we test our system for accuracy every two days and for bias monthly.

We recommend that regulators and participants in the mortgage market ecosystem consider and adopt these standards, but at the same time, with the approval of their regulator, the Federal Housing Finance Agency, Fannie Mae and Freddie Mac together can decide now on the standards that are necessary for loans they guarantee. Lenders adhering to the requirements set by Fannie Mae and Freddie Mac, along with their regulator, FHFA, can use the services for those AVM providers that meet these requirements.

In addition, we recommend that Ginnie Mae adopt the same standards adopted by Fannie Mae and Freddie Mac so that FHA, VA, RHS and Section 184 borrowers are also able to benefit from properly designed AVM systems when appropriate.

Over time, these organizations' participation in the Standards Working Group discussed above will ensure that the standards are updated as technological advancements occur, presuming that those advancements continue to meet the requirements in the Dodd-Frank Act and the proposed rule.

Part C: HouseCanary's Recommended AVM Standards

HouseCanary's detailed AVM Standards recommendations are included in Attachment A. The following, however, is an overview of the key requirements that HouseCanary recommends the Agencies adopt in its final rulemaking[3]:

- **High Standards Should be Required:**
    - Stringent standards should be set to ensure fair, accurate, and unbiased valuations. Setting high standards will help minimize any adverse impact on consumers (buyers and sellers), mortgage originators, underwriters, and servicers, mortgage insurers and mortgage guarantors, and investors.
    - While high standards are important to all participants in the mortgage market ecosystem, they are particularly important to consumers. A home purchase represents what is for most consumers the most significant investment of their lives, often requiring years and savings and diligent work to attain homeownership. The establishment, adherence and enforcement of quality control standards will represent a monumental stride towards the secure and

[3] HouseCanary also recommends that Fannie Mae and Freddie Mac, along with their regulator, FHFA, adopt these requirements in its final rulemaking. As recommended in Part B of this comment letter, Ginnie Mae should adopt the same requirements so that consumers using the FHA, VA, RHS and Section 184 programs can also benefit from this technology.

responsible utilization of AVM technology.

- **Standards for Consistent Metrics and AVM Transparency are Needed:**
    - Standards need to be set that would require AVM providers to use consistent metrics in determining their level of confidence for each property, and then AVMs need to be completely transparent about their level of confidence for each property.
    - As noted above, AVMs are not suitable for valuing every property in the United States. When confronted with insufficient data density in a specific geographic area or when reviewing properties that deviate from the norm in that area, a traditional appraisal is required. This is important for both homebuyers and sellers.
    - In the absence of comprehensive industry-wide standards serving as a minimum requirement, determining whether a property of interest should be appraised using traditional appraiser methods or AVMs is a serious challenge. The initial step towards understanding the appropriateness of employing an AVM aligns with the first factor outlined in the proposed rules. Absent industry-wide minimum standards, it becomes difficult to measure and ascertain a high level of confidence in the estimates produced, especially considering that the definition of confidence can vary among different AVM providers
- **Setting a standard for calculating forecast standard deviation (FSD)**
    - The need for industry-wide standards is illustrated by the varying methods utilized by different providers to measure confidence in AVM-generated values. An example of this discrepancy lies in the measurement commonly employed in AVMs known as the forecast standard deviation (FSD). However, the lack of a defined standard for calculating FSD and establishing confidence levels poses challenges when comparing values across providers. Some providers adopt a 68% confidence interval, while others utilize a 95% interval, with a range of possibilities in between.
- **Setting a standard for determining FSD thresholds**
    - The measurement of FSD is not the sole concern: determining the thresholds for these FSDs is another aspect left to the discretion of each provider, leading to subjective definitions of what constitutes a high-confidence estimate. As a result, the cutoffs for appropriate valuation levels of confidence may fluctuate, spanning anywhere from 80% to 95%. This demonstrates the pressing need for comprehensive industry-wide standards to address these discrepancies and ensure consistent and reliable measures of confidence in AVM estimates.
- **Setting a standard metrics using percentile-based metrics**

- In addition to establishing a clear definition of how to measure the forecast standard deviation (FSD), HouseCanary strongly recommends the inclusion of industry-wide standards regarding percentile-based metrics in the rulemaking process. Percentile-based statistics, such as median percent error (MdPE) and median absolute percent error (MdAPE), provide robust indicators of the bias and accuracy of an AVM by considering the entire error distribution rather than relying solely on mean-based statistics.

- While MdPE and MdAPE accurately describe the central tendency of the error distribution, other percentile statistics play a crucial role in assessing the overall shape and variability of the errors. Metrics such as PPE 5, PPE 10, and PPE 20 measure the percent prediction error of a model at the 5%, 10%, and 20% thresholds, respectively. PPE represents the percentage of AVM estimates that fall within the specified threshold error. For example, a 50% PPE 5 indicates that 50% of the AVM values in the random sample test are within 5% of the benchmark value. These PPE statistics provide insights into the distribution's variance.

- High values for PPE 5, PPE 10, and PPE 20 signify a narrow distribution centered around zero, indicating a well-trained AVM model that produces appropriately accurate estimates. Including these percentile-based metrics as part of the industry-wide standards enhances the evaluation and monitoring of AVM performance and ensures overall greater accuracy and reliability in the valuation process.

- **Requiring pre-list benchmarks to be used**

    - When establishing a core set of standards aimed at promoting transparency, accountability, and confidence in valuations, it is crucial to include a set of prelist or list-blind metrics. Introducing a prelist benchmark allows for the evaluation of AVM performance before the property is listed on the market and reaches its final agreed-upon closed price. This benchmark is necessary due to the strong correlation between the list price and the closed price of a property.

    - Models that rely heavily on list price information tend to prioritize it over other relevant features, potentially disregarding their significance. By incorporating a prelist benchmark, a more appropriate and accurate assessment of AVM performance can be obtained, mitigating the risks associated with data manipulation or inflated accuracy resulting from bias in knowing of the list price. This would provide mortgage market participants with a true measurement of performance on which to base their policies and procedures, instilling confidence in the estimations provided.

- **Setting standards to prevent discrimination**

- One of the notable achievements in the proposed rulemaking is the inclusion of the fifth factor to prevent discrimination. We commend the diligent efforts of the involved agencies in incorporating this factor into the rulemaking process. At HouseCanary, we wholeheartedly support the addition of this factor and have consistently conducted rigorous testing to identify and address any potential discrimination in our model outputs. A process that incorporates this fifth factor is immensely valuable, as inaccurately valuing properties based on protected attributes, including those of minorities, can lead to unintentional long-term harm.

- Every possible measure must be taken to mitigate the risk of consistently overvaluing or undervaluing a property due to protected attributes. This further underscores the necessity of implementing industry-wide standards. While post-hoc analysis plays a crucial role in comprehending potential bias against protected attributes, it is equally important to establish ex-ante analysis and standards to ensure that training data excludes protected attributes and proxies thereof. Protected attributes used as features for an AVM are not only unnecessary, but also harmful when generating valuations for the real estate industry.

- The primary responsibility of AVM providers is to accurately assess the subject property, not to evaluate the borrower or seller's characteristics. In the absence of industry-wide standards, there are no safeguards against incorporating these attributes as features in the model, emphasizing the urgency and significance of implementing comprehensive standards.

- The absence of consistent metrics measured by a centralized third-party testing entity leaves these policies and procedures heavily reliant on the trustworthiness of AVM providers. It is possible for AVM providers to manipulate their models' performance or exploit limitations in the current third-party testing process in order to present inflated statistics regarding their accuracy.

- A standardized core set of metrics enables lenders of all sizes to seamlessly integrate AVM technology into their operations, eliminating the need to establish their own testing pipelines to measure the same metrics that can be readily provided by the centralized solution. This approach promotes consistency, transparency, and reliability within the industry, benefiting all stakeholders involved.

- **Uniform Appraisal Dataset (UAD) Should be Released**

  - HouseCanary recommends that the Uniform Appraisal Dataset (UAD) at the loan level be released.

- This dataset is indispensable in comprehending the inherent biases that may be embedded in the opaque nature of AVMs. Most studies on discrimination are conducted at the census tract level, assuming the ethnicity of the homeowner. If our industry aims to make continual progress and establish equitable valuations, it is critical that loan level data be made available to create truly unbiased valuations and understand the potential harm that may arise from AVM models.

- Without access to loan level data, AVM providers can only make assumptions about the ethnicity of the subject property. Moreover, implementing a standard that prohibits AVM providers from utilizing loan level data regarding protected classes as inputs into their models promotes the generation of safe and fair valuations. By embracing transparency and leveraging loan level data, the industry can take significant strides toward creating a more equitable real estate valuation ecosystem.

Conclusion

We appreciate the opportunity to provide the Agencies with our recommendations, and we look forward to working with you to enable consumers to benefit from properly designed AVM systems.

Sincerely,

Brandon Lwowski
Senior Director of Research

Jeremy Sicklick
CEO & Cofounder

Chris Stroud
Chief of Research & Cofounder

HouseCanary

HouseCanary has built the infrastructure to automate the +$36 Trillion US residential real estate market. As a national real estate brokerage, HouseCanary provides technologically advanced property valuation solutions, automating the valuation and underwriting process to enable estimated valuations of 110M+ properties instantly.

www.housecanary.com

HouseCanary % WeWork
535 Mission St.
14th Floor, Office 1920
San Francisco, CA 94105

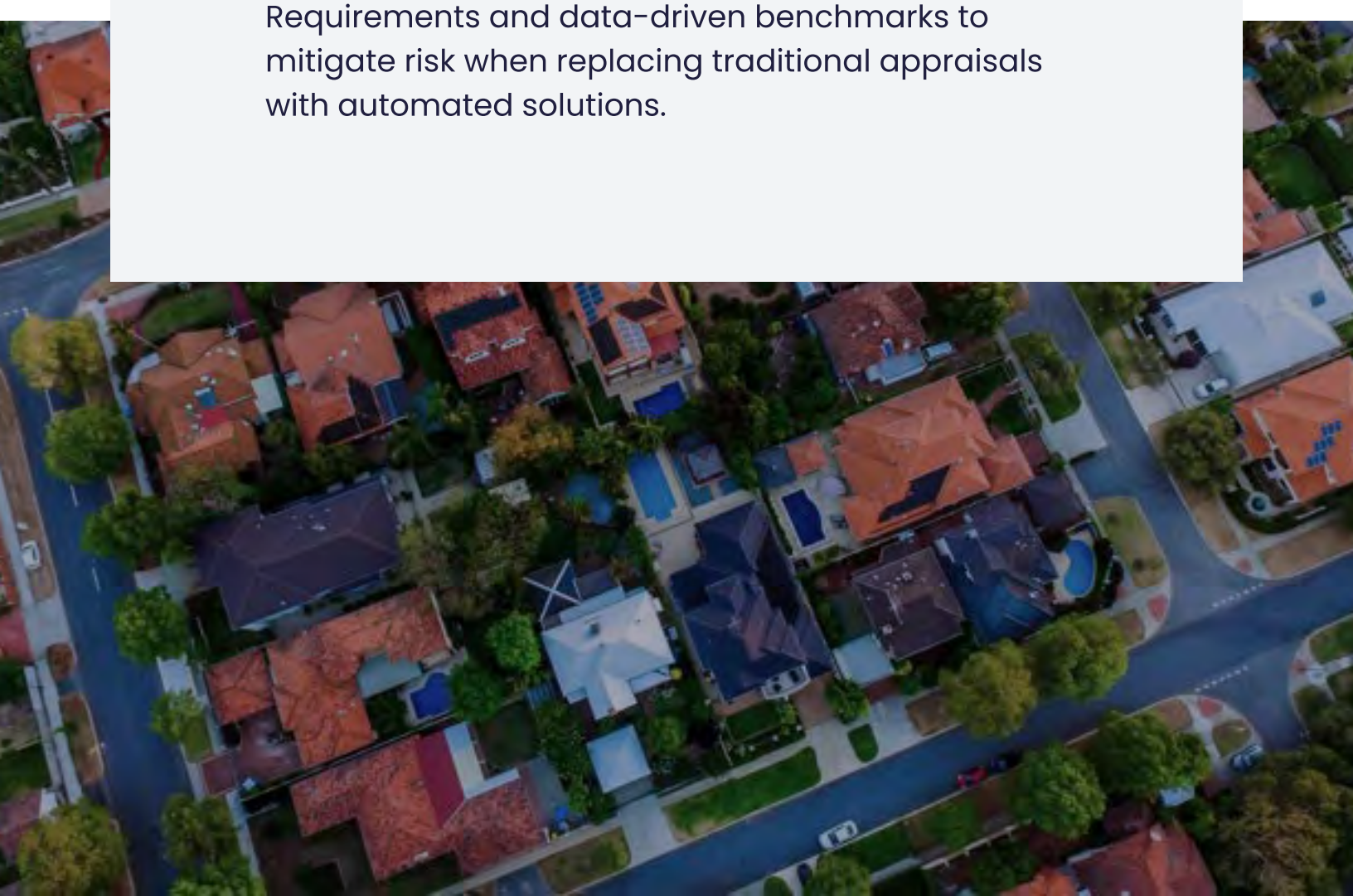
sales@housecanary.com

Attachment A

HouseCanary

Standards for Automated Property Valuation

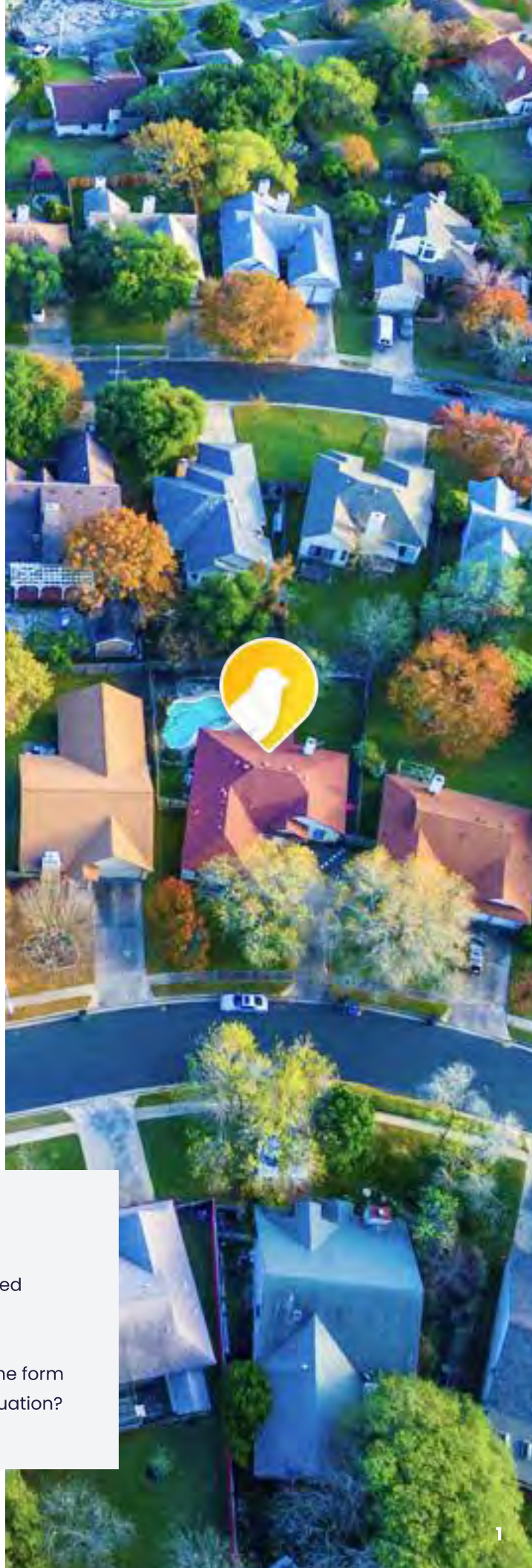
Requirements and data-driven benchmarks to mitigate risk when replacing traditional appraisals with automated solutions.



Introduction

With the increase of technological advances in the housing market ecosystem, providing an alternative to a traditional appraisal with the use of these technologies has quickly become the headline in many discussions across the policy making community. With the negative findings on racial bias in traditional appraisals, combined with the acute need for consumers to have access to property valuation solutions that are faster, more accurate, and less expensive, the push for greater adoption of an automated valuation model ("AVM") and/or a quantitatively-based technological tool for evaluations ("Evaluations") has never been more needed.

While there is promise with AVMs and Evaluations, HouseCanary proposes a set of recommendations for policy makers and AVM providers around industry-wide standards and appropriate uses for an underwriting grade solution, as well as requirements for accuracy and fairness testing that exceed the standards presented in 12 U.S.C. 3354. **With the recommendations presented, we aim to reduce the burden on each individual depository institution, resulting in elimination of duplicative work, and propose a centralized solution, where AVM and Evaluation providers can be certified for use with respect to certain properties and/or transactions.** Our gold standard requirements provide a set of measurable, fact-based rules through which use of an automated solution in lieu of a traditional appraisal results in no additional risks. These rules create a basis for broad use of automated solutions for lenders in qualifying cases based solely on quantitatively-derived criteria.



This paper seeks to answer the following questions:

1. What should the standards be for an AVM to be deemed acceptable for use in a safe and sound way?

2. When should AVM models be condition-informed, in the form of an Evaluation, to produce an accurate property valuation?

Summary of Recommendations

Approach Standards

1. To appropriately value a property, a waterfall approach should be used. If an AVM is not an appropriate method based on the criteria, fall back to an Evaluation. If an Evaluation also fails to meet the applicable criteria, then an appraisal is needed.

2. Based on the standards presented in this paper, approximately 85% of all US properties can be approved for AVM or Evaluation use in lieu of a traditional appraisal.

Data Standards

1. AVM providers need both public record and MLS data to train accurate and reliable AVM models.

2. Appraised value should not be used during the training process of an AVM model.

3. For a property to be considered for an Evaluation, the following conditions must be met:
    a. Address is known, complete and validated
    b. Accurate building or parcel level latitude and longitude available
    c. Accurate and available gross living area
    d. Parcel lot size less than or equal to 10 acres
    e. Property type known (single family, condo, etc.)
    f. Adequate coverage from the AVM provider of all properties in the neighborhood and/or adjacent neighborhoods of subject property. At a minimum, 70% of coverage at the census block group level.

4. For a property to be considered for an AVM, it must pass all Evaluation criteria as well as:
    a. High confidence of AVM for subject property with a forecast standard deviation less than 0.15 or a confidence score greater than 85%
    b. At least 5 highly similar comparable properties available that have been sold or currently pending a sale within the last 365 days
    c. AVM value for subject property falls within the 5th and 95th percentile of comparable properties when property differences are accounted for
    d. AVM value for subject property falls within 5th and 95th percentile of the census block group distribution of price-per-sqft

5. AVM and Evaluation must be conditioned-informed (Human or Computer Vision/ Image Recognition).

6. AVM valuation must have been created no more than 30 days prior to valuation date using closed comparables within the last 365 days to account for the latest market conditions.

Approximately 85% of all US properties can be approved for AVM or Evaluation use in lieu of a traditional appraisal.

Testing Standards and Metrics Recommendations:

1. Mean Percentage Error (“MPE”) should be between -2% and 2%
2. Median Percentage Error (“MdPE”) should be between -2% and 2%
3. Purchase Prediction Percentage Error at the 10% threshold (“PPE10”) should be greater than or equal to 80%
4. Prelist PPE10 should be greater than or equal to 60%
5. Third party testing of two core AVM benchmarks: purchase and prelist
6. AVM and Evaluation should be required to test for bias against minority groups

What is an AVM?

With many use cases for AVMs existing, we focus on the definition proposed in 12 U.S.C. 3354. An automated valuation model is “any computerized model used by mortgage originators and secondary market issuers to determine the collateral worth of a mortgage secured by a consumer's principal dwelling.”

By emphasizing the word “any computerized model”, this allows room in the market for various mathematical, statistical, and/or machine learning models used in combination with different methodologies to estimate the value of a property. It is important for all AVMs to comply and adhere to a set of general quality control standards in order to be deemed safe and appropriate. 12 U.S.C. 3354 provides a list of general quality control standards that must be met for appropriate AVM use.

1. Ensure a high level of confidence in the estimates produced by automated valuation models.
2. Protect against the manipulation of data.
3. Seek to avoid conflicts of interest.
4. Require random sample testing and reviews.
5. Account for any other such factor that the agencies determine to be appropriate.

In this paper, we propose concrete recommendations regarding the processes and tools needed to address the broad standards stated above. We also extend these guidelines to cover Evaluations.

What is an Evaluation?

When an AVM fails to meet all the standards for appropriate use for a property, an Evaluation is the next possible alternative to an appraisal. An Evaluation is a condition-informed home evaluation that leverages high confidence AVM values in combination with independent data collection, along with market and subject characteristic validation. By combining onsite property data collection with deep contextual data supporting a value, software-based Evaluations have the potential to provide a solution that extends the benefits of a standalone AVM by adjusting the value based on the insights gained from the new data.

As well as meeting the 12 U.S.C. 3354 requirements for AVM use, an Evaluation must adhere to the Interagency Appraisal and Evaluation Guidelines (IAG). According to the IAG, an Evaluation is defined as "a valuation permitted by the Agencies' appraisal regulations for transactions that qualify for the appraisal threshold exemption, business loan exemption, or subsequent transaction exemption. An Evaluation should also "contain sufficient information detailing the analysis, assumptions, and conclusions to support the credit decision."

The be approved for use, an Evaluation must at a minimum do the following:

1. Identify the location of the property.
2. Provide a description of the property and its current and projected use.
3. Provide an estimate of the property's market value in its actual physical condition, taking into account use and zoning designation as of the effective date of the evaluation (that is, the date that the analysis was completed), as well as any other limiting conditions.
4. Describe the method(s) the institution used to confirm the property's actual physical condition and the extent to which an inspection was performed.
5. Describe the analysis that was performed and the supporting information that was used in valuing the property.
6. Describe the supplemental information that was considered when using an analytical method or technological tool.
7. Indicate all source(s) of information used in the analysis, as applicable, to value the property, including:
    a. External data sources (such as market sales databases and public tax and land records); and
    b. Property-specific data (such as previous sales data for the subject property, tax assessment data, and comparable sales information).
8. Provide evidence of a property inspection.
9. Provide photos of the property.
10. Provide a description of the neighborhood; or local market conditions.
11. Include information on the preparer when an evaluation is performed by a person, such as the name and contact information, and signature (electronic or other legally permissible signature) of the preparer.

Though this list of requirements may seem extensive, technological advances within the real estate ecosystem have resulted in major efficiencies that allow much of this information to be quantitatively-derived. By using information provided by human inspectors to augment this data-first approach, Evaluation vendors with appropriate technological investment should be able to meet these standards and therefore have their Evaluations certified for use when deemed appropriate. These software evaluations are products, and products are not "compliant" in themselves. Products can be designed in a compliant manner but their appropriate use by the institution is a necessary condition for full compliance. Compliance requires the appropriate use of any product in line with regulatory requirements, which is the responsibility of the institution relying on the chosen product.

Waterfall Approach

An AVM or Evaluation will not be the appropriate approach to valuing every property in the United States. However, based on a sample of 20 metropolitan statistical areas ("MSAs") and using a combination of Multiple Listing Service ("MLS") and public record data, we estimate that 40% of all US residential properties can be appropriately valued using a standalone AVM and an additional 45% can be appropriately valued using an Evaluation. This gives 85% coverage of all US residential properties that could be valued using quantitatively derived models. With the recommendations of standards that follow, HouseCanary proposes a waterfall approach to determining whether a property can be valued using an AVM or Evaluation in lieu of a traditional appraisal.

If certain standards and qualifications are met and an AVM is deemed to be an appropriate valuation method, then full automation is appropriate. When an AVM fails to meet these criteria, the next best solution is to perform an Evaluation with independent inspectors and price validation. Finally, if any of the critical criteria suggested below fail, then use of a traditional appraisal is needed and an AVM or Evaluation should not be used.

With this waterfall approach, additional risks that may materialize with automation will greatly be reduced providing safe, trustworthy, and transparent valuations of consumer dwellings.

40%

Approved for AVM Automation

Meets critical criteria for evaluation plus:

- High confidence of AVM for subject property with a forecast standard deviation <0.15
- A minimum of 5 highly similar comparable properties available that have recently been sold or currently pending sale.
- AVM value for subject property falls within the 5th and 95th percentile of adjusted comparable properties.
- AVM value for subject property falls within 5th and 95th percentile of the census block group distribution of price-per-sqft.

45%

Approved for Evaluation / Condition Informed AVM

Critical criteria:

- Address is known, complete, and validated.
- Accurate building or parcel level latitude and longitude available.
- Accurate and available gross living area.
- Parcel lot size less than or equal to 10 acres.
- Property type known.
- Adequate coverage from AVM provider of all properties in neighborhood and/or adjacent neighborhoods of subject property. At least 70% of coverage at census block group level.

15%

Fails Automation and Appraisal Required

If any of the critical criteria fails for a subject property, an Appraisal must be completed to safely value the property.

Standards for Proper Use of AVMs and Evaluations

To strengthen the existing quality control standards for AVMs and Evaluations, which are fairly broadly defined, HouseCanary strongly recommends more specific requirements for how these standards should be put into practice. Requirements around data, condition, neighborhood statistics, as well as appropriate comparable properties, are needed for an AVM or Evaluation to value a property with sufficient accuracy and reliability.

Data Standards

At a minimum any automated valuation estimate should utilize two primary transactional residential real estate datasets in order to ensure comprehensive coverage of transaction data. The two datasets typically making up this population are public record data, primarily county recorder data, and MLS data.

County recorder data includes deeds recorded with each real estate transaction, and in most markets includes the closed arm's-length sale price. Other relevant public record data includes annual assessments along with any property characteristics used in those assessments, as well as mortgage recordings.

MLS data includes the history of listing prices, contracts, and closing prices for properties listed for sale on an MLS. These records also include a set of property characteristics and other descriptive fields associated with each listing. The primary significance of this dataset is that MLS data offers a duplicate set of closed prices that can be compared and/or verified alongside county deed records. Furthermore MLS is the primary source of data around the history of listed prices for a given property.

While we believe appraisal data should be used to verify property characteristics, we do not think it should be used to train an AVM. With the recent studies done by Freddie Mac [1] [2], as well as the numerous reports of appraisals being subject to human bias and unfair valuations, training a model on this data would eventually lead to similar results.

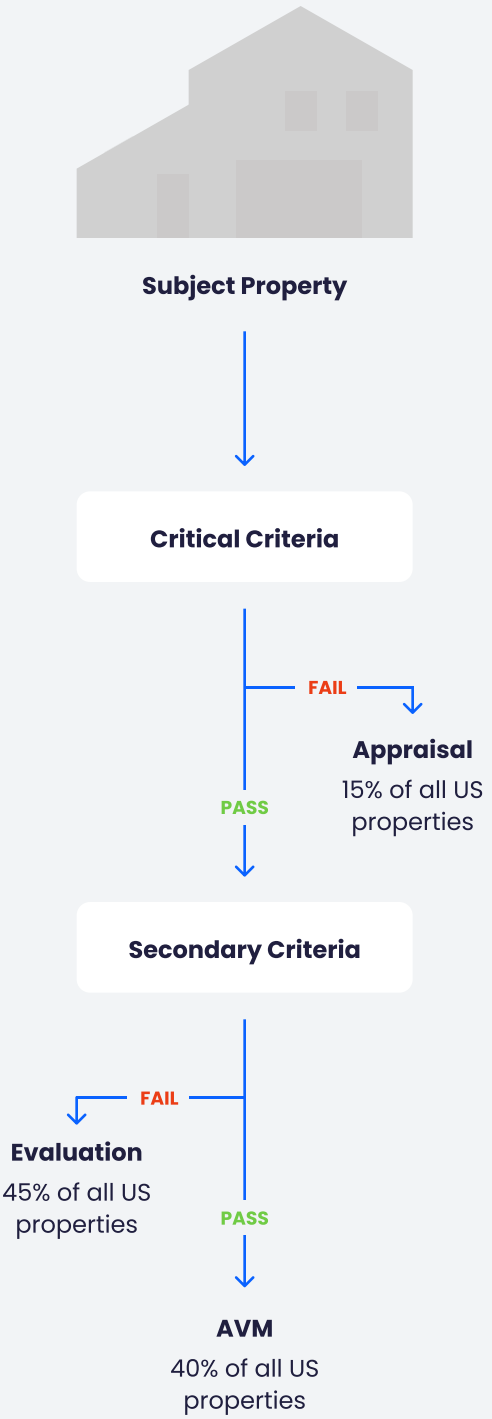
At HouseCanary, we believe that leveraging both public and MLS datasets, while excluding appraisal data, to train an AVM is critical in producing accurate and reliable value estimations of a property. Without both datasets present, reaching nationwide coverage would suffer due to: a) certain "non-disclosure" markets and b) not being able to validate property characteristics across multiple sources. It should be noted that MLS data is only available to MLS participants, which include fully licensed brokerages such as HouseCanary.

Critical and Secondary Criteria

At HouseCanary we recommend a waterfall approach to deciding whether an AVM, Evaluation, or Appraisal is appropriate for a particular transaction. For an AVM or Evaluation to be considered and certified for use, a property should be required to pass the following criteria.

The first level criteria, or "Critical Criteria," can be used to determine whether an AVM or Evaluation meets the requirements presented in 12 U.S.C. 3354, and also includes additional criteria that we recommend to ensure that an automated valuation meets baseline quality standards. The Critical Criteria can be summarized as validating that enough data is available about the subject property to appropriately select comparable properties. Without sufficient data regarding comparable properties, a traditional appraisal is needed to accurately estimate the value.

The AVM Waterfall



Critical Criteria Summary

1. Address is known, complete and validated.
2. Accurate building or parcel level latitude and longitude available.
3. Accurate and available gross living area.
4. Parcel lot size less than or equal to 10 acres.
5. Property type known (single family, condo, etc).
6. Adequate data coverage of all properties in the neighborhood and/or adjacent neighborhoods of the subject property. At a minimum, 70% of coverage at the census block group level.

Failure to satisfy all of the criteria listed would indicate that an appraisal is needed because there is insufficient data and property information for an AVM or Evaluation to confidently estimate the value of a property. If however, the above–listed criteria is met, the property would qualify for an Evaluation at a minimum in lieu of an appraisal without increasing the risk. The next step in the waterfall would then be to apply a second tier of criteria, or "Secondary Criteria", which would be used to determine if an AVM can be used.

Secondary Criteria Summary

1. High confidence of AVM for subject property with a forecast standard deviation less than 0.15 or a confidence score greater than 85%.
2. At least 5 highly similar comparable properties available that have been sold or pending for sale within the last 365 days.
3. AVM value for subject property falls within the 5th and 95th percentile of comparable properties when property differences are accounted for.
4. AVM value for subject property falls within 5th and 95th percentile of the census block group distribution of price-per-sqft.

If a property meets all the standards from the Critical Criteria as well as the Secondary Criteria, then the property should qualify for the use of an AVM in lieu of an appraisal without increasing the potential risks.

Conditioned Informed

Our last recommendation is that both AVMs and Evaluations should be condition informed. One requirement for purchasing a mortgage is to provide the current condition of the property "using the standardized C1-C6 property condition and quality ratings scale." In order for AVMs and Evaluations to be a replacement for an appraisal, they too should be condition informed. This requirement can be completed two different ways: 1. using a human inspector that visits the property, or 2. leveraging artificial intelligence and computer vision/image recognition models to measure the condition.

If an AVM is using images of the property to estimate its current condition, then HouseCanary suggests requirements about the images being used. The images used should be geotagged as well as time-stamped in order to ensure their authenticity. If each photo is time-stamped and geotagged, then users of AVMs can be more confident that the image belongs to the subject property and represents the current state of the property. In addition, HouseCanary also recommends that at least 2 photos of the main kitchen and each of the living areas as well as 1 photo for every other room in the house be used. This provides the image recognition models enough data to accurately and appropriately estimate the condition of the subject property. If these requirements can't be met, a human inspector should visit the site in person to verify the condition of the property.

Testing Standards for Accuracy

In addition to the criteria above, in order to promote transparency and increase the confidence in AVMs and Evaluations, testing and reporting model accuracies should be a requirement. This is clearly stated in FIRREA section 1124 a.4. Access to these reports increases model transparency without the risk of exposing intellectual property. In the following sections, we discuss the minimum requirements for random testing and reviews of the models underlying AVMs and Evaluations.

Target Variable

In order to generate a benchmark that can be used to measure model performance, the model's valuation estimate should be measured against a market observable price. It is HouseCanary's recommendation that the arm's-length sale price should form the basis for the target variable in all benchmarking situations.

First, the arm's-length sale price is a market observed price, and is not itself an estimate or opinion of value. **Second, by definition of being at arm's-length, the closed price represents the value settled upon between two unrelated parties, each acting in their own self interest.**

Metrics

In order to meet the requirements of FIRREA section 1124 a.4, AVMs used to estimate the value of a property are required to be evaluated with random sample testing and reviews. When measuring the accuracy of an AVM on a random sample, it is important that all providers use the same metric to allow for comparisons between providers. We recommend that all AVM accuracies should be reported in terms of percent error. The percent error measurement indicates how accurate the AVM estimate is after normalizing for the sale price of a property. Percent error is defined as the following:

$$\text{Percent Error} = \frac{\text{Estimated Value}}{\text{Sale Price}} - 1$$

Aside from percent error, at a minimum, HouseCanary recommends two different types of metrics when performing random sample testing and review: mean-based and percentile-based statistics.

Mean percent error (MPE) and mean absolute percent error (MAPE) should always be included when reporting mean-based statistics. The MPE is the computed average of percent errors, and since negative and positive values can offset each other, this is a standard way to measure the bias of a model. It can help analysts answer the question, "Does this AVM have a tendency to undervalue or overvalue properties?". The MAPE is the computed average of the absolute value of the percent error. This transforms all negative percent errors to positive percent errors, measuring the overall predictive accuracy of the AVM.

Mean-based statistics are important in evaluating the accuracy and bias of models, but they are also vulnerable to outliers. These outliers can heavily influence the accuracy measure, causing the AVM to appear inaccurate overall. That is why, in addition to MPE and MAPE, we recommend that percentile based statistics also be reported.

Percentile-based statistics are robust to outliers, and similar to mean-based statistics, median percent error (MdPE) and median absolute percent error (MdAPE) are indicators of the bias and accuracy of an AVM. The major difference between the two is how they are calculated. The MdPE and MdAPE use the median, or the 50th percentile, as a statistic, instead of the mean.

While MdPE and MdAPE are accurate descriptors of the center of the error distribution, other percentile statistics help determine the overall shape and variance of the errors. PPE 5, PPE 10 and PPE 20 are used to measure a model's percent prediction error at the 5, 10, and 20 percent thresholds. PPE is the percentage of the AVM estimates that fall within the threshold error. For example, a 50% PPE 5 means 50% of the AVM values in the random sample test are within 5% of the benchmark value. The PPE statistics measure the variance of the distribution. A high PPE 5, PPE 10 and PPE 20 indicate a tight distribution around 0, representing an appropriately trained AVM.

By requiring the mean- and percentile-based statistics above, when reviewing a random sample test of an AVM, an analyst can quickly identify if an AVM is appropriate for the use case at hand. Beyond reporting requirements, we believe an AVM should equal or surpass the performance of traditional appraisals to be deemed acceptable as an appraisal replacement tool. Leveraging data provided by Fannie Mae [1], we propose the following four minimum requirements for AVM accuracy:

1. MPE is between -2% and 2%
2. MdPE is between -2% and 2%
3. Purchase PPE10 greater than or equal to 80%
4. Prelist PPE10 greater than or equal to 60%

Levels of Measurement

Increased transparency will lead to increased confidence in AVMs among mortgage originators and secondary market issuers. To enhance that transparency, we recommend that AVM providers report the metrics described above at varying levels of granularity. These additional levels of measurement should include, but need not be limited to: geography, property type and model confidence.

For geography, the mean and percentile metrics should be reported at a national level, but also reported at different levels of geography. At a minimum, an accuracy report on an AVM should include the metrics at a State, County, and MSA level. This would highlight what locations the AVM achieves high performance and where the model suffers. This is important when testing for fairness and bias mentioned later in the report.

AVM reports should also be broken down by property type: Single Family Detached, Condo, Multi-Family Housing, etc. This would allow AVMs trained for specific property types to show their validity in valuing that type of property and get certified for use in specific use cases.

AVM accuracy reports should also include the metrics grouped by confidence levels, i.e., when an AVM is confident in its estimation, what is the accuracy? When the AVM is unsure and has low confidence, what is the accuracy?

With all of the above information included in an accuracy report, transparency is promoted, allowing analysts to make decisions on the subset of housing for which the AVM is appropriate. Without the above metrics, transparency would diminish, and the confidence in using AVMs would decrease. At the same time, providing these statistics not only promotes transparency but also interpretability of the AVM without risking the intellectual property of the AVM.

Non-Disclosure Markets

There are 15+ states currently where the transaction price does not have to be legally recorded with the county recorder. Consequently, the deed records in these states generally do not include the closed sale price, and often include a placeholder value such as $10.

In order to do model benchmarking in these states, one generally needs to go to the MLS records. In these cases, more often than not, the agent will record the closed sale price within the listing record. Using MLS sourced prices in these non-disclosure markets allows for model benchmarking.

The non-disclosure situation is another example of why we suggest that both public record data and MLS data form the foundation of a residential real estate dataset.

Benchmarks

Continuous benchmarking of AVMs is vital in identifying performance decay. We recommend two benchmarks that measure AVM performance at different points in the life cycle of a property transaction: purchase and prelist.

The purchase benchmark examines the percent error of the AVM as it existed just prior to having the knowledge of the sales price. This benchmark allows the AVM to use the list price as an anchor for making predictions. The

observed error rates on the purchase benchmark serve as a proxy for the valuation uncertainty one would observe in purchase transactions where the property was openly listed for sale on the MLS prior to closing.

The prelist benchmark examines the percent error of the AVM as it existed prior to a property listing for sale, and then compares it to the eventual sold price associated with that listing. We suggest restricting this set of observations to properties that have not listed or sold within the prior five years to truly simulate an off market situation. We believe comparing the accuracy of the AVM value when there was no recent list price to anchor off of provides a truer measure of the AVM's ability to estimate off-market value. The observed error rates on the prelist benchmark serve as a proxy for the valuation uncertainty one would observe in a refinance situation (or any other off-market situation) where the property was not listed for sale on the MLS, or recently sold, at the time the valuation estimate was generated.

Third Party Testing

Section 1135 of FIRREA sections a.2 through a.4 requires that AVMs should be subject to random sample testing and reviews. For these reasons, HouseCanary recommends that AVM providers complete frequent third party testing and reviews.

Third party testing provides trust and equal opportunity across AVM providers by providing objective, independent evaluations of AVM quality. With the third party testers being independent of the AVM provider, the risks of data manipulation and conflicts of interest are greatly reduced.

Recency of AVMs

An AVM valuation must have been created no more than 30 days prior to the valuation date using the most recent closed comparables and latest market conditions. In other words, an AVM model needs to be retrained at a minimum on a monthly cadence to guarantee the value is an appropriate estimation of the property valuation at the time of the inquiry.

Model Validation by Segment

We recognize that there are instances in which an AVM might satisfy our suggested performance requirements in some geographic locations or for certain property types but not for others due to insufficient data, or other reasons. For that reason, we recommend validating models for specific segments of the population as well as globally. These segments could include type of property (single-family detached, condominium, etc), geographic location (county, metropolitan statistical area, state, etc), total loan value and/or loan-to-value, or any other segment of interest.

For example, if a vendor could show that its AVM met our suggested performance requirements in a set of specific counties for single-family detached properties, we believe that AVM should be considered an appropriate appraisal replacement tool in those counties for those kinds of properties, even if the data does not support using the AVM as an appraisal substitute in every location or for every type of property.

As noted above, we believe the minimum benchmark criteria for automated valuations should be in line with the

benchmark values observed in appraisal valuation errors. In particular, for a refinance or other off-market situation, we believe the reference appraisal error should be one in which the appraisal was done blind to any contract price [1].

Fairness and Bias

In recent years, there has been evidence suggesting that systematic bias present in the real estate ecosystem impacts minority populations with appraisals and AVMs. At HouseCanary we take fairness of valuations seriously and consider it an important requirement for using AVMs in all cases. Recently, HouseCanary released a nationwide study that showed AVM technology, when trained appropriately, reduced and eliminated any statistically significant bias between different minority census tracts [1]. For those reasons, we suggest the following requirements for measuring and testing fairness in AVMs and Evaluations.

Racial Disparate Testing for AVMs

In order to discover any negative variance associated with race or ethnicity, we suggest that racial disparate testing should be done on AVMs. By requiring racial disparate testing, this would minimize systematic bias that could negatively impact protected minority groups.

While performing racial disparate testing at the property level is ideal, collecting this attribute on every property is impracticable and would increase the amount of resources needed for automating valuations. We suggest and support performing the racial disparate test at a census tract level, using various thresholds to determine the race of the individual property.

The US Census Tract level data includes statistics on household demographics available to the public. Based on the household demographics, you assign a race to every census tract based on a percentage threshold requirement (HC tests both 50% and 80%). If a census tract has a larger percentage of a certain race that exceeds the threshold, then every property in the tract is assumed to have the same race.

With census tract race identified, AVM providers could test and provide the results on the accuracy similarities and differences between White and minority census tracts, and provide the analysis supporting if the differences are statistically significant. This provides constant fairness measures as well as transparency to how well an AVM performs on different subpopulations.

Evaluation Fairness

The formulation of an Evaluation is such that it isolates the site visit where data is collected about the condition of the subject from the valuation analysis that is generated by an AVM and then finalized by Quality Control professionals. Whereas a traditional appraisal or BPO would generally be completed in its entirety by the same person that visits the home and enters and potentially meets the homeowners, Evaluations include a natural separation of tasks such that any bias that might be a factor with a single person completing a report from inspection through value conclusion is precluded. This separation minimizes the risk that the biases of the person conducting data collection to establish a condition assessment will improperly influence the value that ultimately is determined for the report.

Conclusion

This paper presents a set of recommendations for the use of AVMs and Evaluations in lieu of appraisals. These recommendations are based on a set of industry standards and data benchmarks to mitigate risk when replacing a traditional appraisal with an automated solution. In order to move towards consumer-friendly solutions that lower costs, shorten turnaround times, and reduce racial bias, in a manner that does not increase risk for lenders, greater adoption of AVMs and Evaluations is needed. We present not only data requirements but also testing standards with the goal of reducing the burden on each individual depository institution and creating a centralized solution where AVM and Evaluation providers can get approved and deemed appropriate for use when these requirements are met. By adhering to these guidelines, HouseCanary firmly believes that the potential risks associated with automating a solution for appraisals could be greatly reduced and eliminated in most cases.

Attachment B

Attachment C

HouseCanary

Agile Evaluation

Sample Report

What's Inside?

Machine learning-driven home evaluations at your fingertips.
Agile Evaluation is designed to provide a deeper understanding of the data behind every home value. This unique valuation tool screens for properties with the highest valuation confidence, then augments HouseCanary's industry-leading real estate data with an onsite inspection to arrive at an accurate data-derived, condition-informed value. Agile Evaluation is more objective than a person's assessment of value, and incorporates rigorous quality control to ensure consistent and reliable results.

Benefits of Agile Evaluation

Accuracy
Agile Evaluation incorporates decades of transaction data, deep market context, a current onsite inspection, and robust quality checks to reliably pinpoint a property's market value.

Objectivity
Our sophisticated AVM ensures objective insight that no human can match, algorithmically determining the relationships between many different variables that affect home price.

Depth
By supplementing our comprehensive dataset with an onsite inspection, we confirm property condition and present you with the most recent and relevant property and market details.

Features of Agile Evaluation

Familiar layout that's easy to read

- Report designed to be as scannable as a BPO
- Additional details and analytics are nestled within a clean, intuitive format

Data and analytics you won't get anywhere else

- Potential property risks including FEMA disaster areas, FEMA flood zones, and Superfund sites
- Neighborhood trends including sale/list price trend and comparable home price distribution
- Additional value conclusions such as land value estimate, 30-day quick sale value estimate, and list price estimate

Next-level comps with a wealth of details

- Closest, most relevant comparable listings to the subject property based on our data-enhanced comp selection and intensive quality control
- Calculated locational differences and net adjustments
- MLS photos for all comparable and competitive listings, so you can see similarities and differences with your own eyes

Data confirmed using image recognition technology

- Inspection details and home condition rating
- Highly similar comparable and competitive listed and sold properties
- Information sourced from public record

If you have questions or comments about this sample report, or would like to learn more about ordering an Agile Evaluation, contact your sales representative.

Your logo here

Company Name
www.companywebsite.com

Agile Evaluation

Exterior Inspection Evaluation Report

For Property Located at:

[redacted]

Value Estimate / Condition:
$400,000 / C4

Client:
HouseCanary

Effective Date:
03/13/2019

Subject

APN # 1234567890

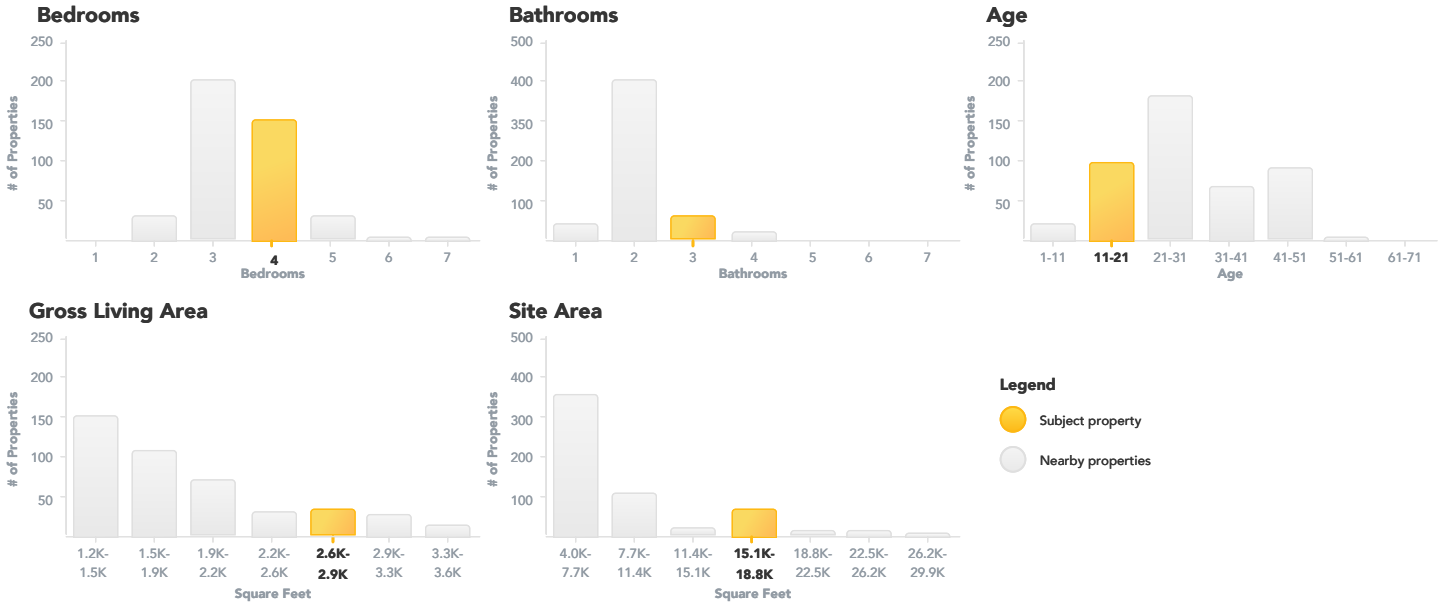
Property Type	Single Family Detached
Beds / Baths	4 Bd / 3 Ba
GLA / Lot Size	2,760 / 17,424 sq ft
Year Built	2003
Property Viewable	Yes
Evidence of Occupancy	Window Coverings
Occupancy Type	Owner
PUD / HOA Fees	Yes / $87 per month
HOA Fee Includes	Common Area Maint
Common Elements	Unknown

Special Amenities	There were no special amenities observed during the exterior inspection of the subject property.
Other Structures on Property	None Visible
Non-Residential Use	No
View Factors / Impact on Value	None Notable / Neutral
Locational Influences / Impact - Comments	Residential / Neutral
Adverse Site Conditions	None noted, There were no adverse site conditions noted during the exterior inspection of the subject property.
Conform to Neighborhood	Yes. The subject property conforms to the surrounding neighborhood.

Transaction History

Sale Type	Date	Price	Source	Loan Type
Listed	01/22/19	$420,000	ARMLS	
Listed	09/15/06	$589,900	ARMLS	
Sold	07/03/03	$251,790	Public Records	Arms-Length

Subject's Comparability to Market



Condition

Condition determined by inspector has been verified by HouseCanary's proprietary image detection technology

Roof Condition	Good
Exterior Wall Condition	Good
Building Damages	None Noted
Damages Comment	None Noted

Condition Rating (C1-C6)	C4

Overall, the subject is considered to be in average condition appears adequately maintained with no evidence of major repairs needed. The front is well-maintained and is average for the neighborhood.

Neighborhood & Subject Marketability

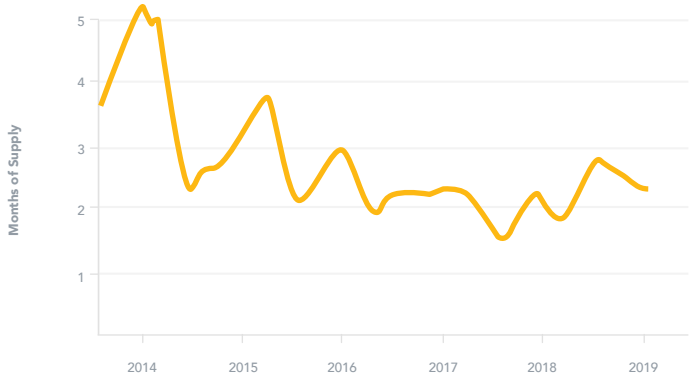
Urban/Suburban/Rural	Suburban
FEMA Disaster	Declared Date: 2014-11-05 End Date: 2014-09-09 Fema Disaster #: 4203 Title/Type: SEVERESTORMANDFLOODING Data Current To: 2018-08-13
FEMA Flood	Effective Date: 2013-10-16 Flood Risk: Low Flood Zone: X Map #: 04013C1715L

Superfund	Within 0 miles: 0 Within 1 miles: 2 Within 4 miles: 0 See addendum for details
Neighborhood Price Range	$355,00 to $485,600
MSA 1-Year Risk of Decline	10.4% very low

Probability this market's median home prices will be lower 12 months from the current market median price

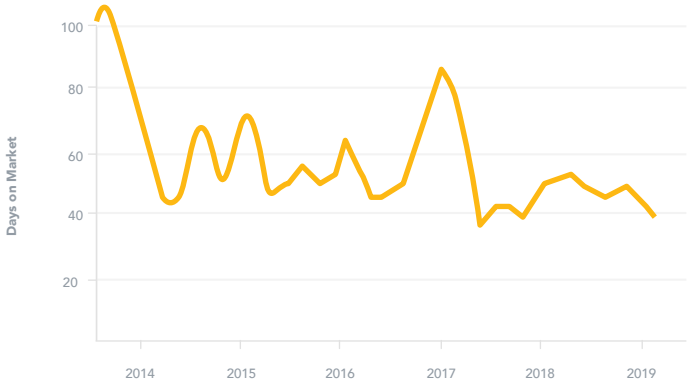
The subject neighborhood is generally considered to be suburban, with an approximate density of 400 SFRs per mile. Property values in the area have been increasing over the past year, approximately 6% over the year, with 3% growth occurring in the past 3 months. Demand and supply appear to be in balance, with average DOM of 95 days for transactions over the past 3 months. Sales of SFRs over the past year range from $355,000 to $485,600, with a median/predominate price of $390,000, and ranging in age from 1yrs to 57yrs old and a predominate age of 19yrs.

Months of Supply - ZIP



This month last year	This month
2.1	2.5

Days on Market - Sold or De-listed Properties



This month last year	This month
66	67

Competitive Closed Sales

	Subject	Sold 1	Sold 2	Sold 3	Sold 4
					
Street Address					
Miles to Subject	-	0.28	0.35	0.39	0.41
Subdvision	McDonald Ranch	McDonald Ranch	None	None	Missouri Ranch
Similarity	-	High	High	High	High
Sales Type	Active	Arms-Length	arms_length_sale	Arms-Length	Arms-Length
Location	-	Same	Same	Inferior	Superior
Year Built	2003	2005	1982	2004	2004
Gross Living Area	2,743 sf	3,184 sf	3,191 sf	3,184 sf	3,184 sf
Beds/Baths	4 / 3.0	5 / 3.0	3/ 2.0	4 / 3.0	4 / 3.0
Lot Size	17,424 asf	17,010 sf	32,465 sf	17,050 sf	19,396 sf
Basement	-	-	-	-	-
Garage/Parking	Attached Garage: 3, Driveway: 3	Garage: 4	Garage: 5	Garage: 3	Garage: 3
Pool	-	-	-	-	-
Condition	C4	C4	C4	C4	C4
List Date	01/22/2019	07/21/2018	06/07/18	06/01/18	06/22/18
List Price	$420,000	$424,000	$369,000	$449,000	$479,000
Sale Date / DOM	-	01/17/2019 / 275	07/31/2018 / 55	07/27/18 / 59	08/02/2018 / 4
Sale Price	-	$413,000	$360,000	$445,000	$462,000
Net Adjustment	-	-$20,000	$40,000	-$25,000	-$65,000
Adjusted Sale Price	-	$392,800	$400,000	$420,000	$397,000

Competitive Listings

	Subject	Active 1	Active 2	Active 3	Active 4
					
Street Address	[redacted]				
Miles to Subject	-	0.06	0.13	0.19	0.32
Subdvision	McDonald Ranch	Missouri Ranch	-	-	Missouri Estates
Similarity	-	High	High	Moderate	High
Sales Type	Active	Active	Active	Active	Pending
Location	Beneficial	-	-	-	-
Year Built	2003	2003	2002	2002	2005
Gross Living Area	2,743 sf	3,440 sf	3,440 sf	4,040 sf	2,884 sf
Beds/Baths	4 / 3.0	5 / 3.0	5 / 3.0	5 / 3.0	3 / 3.0
Lot Size (ac.)	17,424 sf	18,035 sf	19,131 sf	24,161 sf	17,264 sf
Basement	-	-	-	-	-
Garage/Parking	Attached Garage: 3, Driveway: 3	Unknown	Unknown	Unknown	Unknown
Pool	-	-	-	-	-
Condition	C4	C4	C4	C4	C4
List Date	01/22/2019	10/02/2018	12/11/2018	11/22/2018	11/21/2018
List Price	$420,000	$410,000	$395,000	$490,000	$440,000
Last Sale Date / DOM	07/03/2003 / 55	05/07/2014 / 103	04/04/2003 / 97	05/26/2003 / 40	12/13/2014 / 6
Last Sale Price	$251,790	$340,000	$390,000	$329,100	$315,000
Net Adjustment	-	-$33,766	-$34,186	-$83,762	-$24,679
Adjusted Sale Price	-	$306,234	$355,814	$245,338	$290,231

Conclusion

MLS Comments (Listing & Sold)

Sold - Comp 1

Beautiful 5 bedroom, 3 bath home is ready to move-in and available for immediate possession. New paint throughout and carpet is like-new. Yard shows pride of ownership and is great for entertainin with big back yard and privacy fence. Handsome kitchen cabinets and convenient laundry room for you. Master suite includes half-bath and his/her closets. Updated windows and clean siding in great shape. Garage is semi-finished and includes service door to the back yard. Must See!

Sold - Comp 2

Beautiful 3 bedroom, 2 bath home is ready to move-in and available for immediate possession. New paint throughout and carpet is like-new. Yard shows pride of ownership and is great for entertainin with big back yard and privacy fence.

Sold - Comp 3

Beautiful 4 bedroom, 3 bath home is ready to move-in and available for immediate possession. New paint throughout and carpet is like-new. Yard shows pride of ownership and is great for entertainin with big back yard and privacy fence. Handsome kitchen cabinets and convenient laundry room for you. Master suite includes half-bath and his/her closets. Updated windows and clean siding in great shape. Garage is semi-finished and includes service door to the back yard. Must See!

Sold - Comp 3

Beautiful 4 bedroom, 3 bath home is ready to move-in and available for immediate possession. New paint throughout and carpet is like-new. Yard shows pride of ownership and is great for entertainin with big back yard and privacy fence. Handsome kitchen cabinets and convenient laundry room for you. Master suite includes half-bath and his/her closets. Updated windows and clean siding in great shape. Garage is semi-finished and includes service door to the back yard. Must See!

Listing - Comp 1

Beautiful 5 bedroom, 3 bath home is ready to move-in and available for immediate possession. New paint throughout and carpet is like-new. Yard shows pride of ownership and is great for entertainin with big back yard and privacy fence. Handsome kitchen cabinets and convenient laundry room for you. Master suite includes half-bath and his/her closets. Updated windows and clean siding in great shape. Garage is semi-finished and includes service door to the back yard. Must See!

Listing - Comp 2

Beautiful 5 bedroom, 3 bath home is ready to move-in and available for immediate possession. New paint throughout and carpet is like-new. Yard shows pride of ownership and is great for entertainin with big back yard and privacy fence. Handsome kitchen cabinets and convenient laundry room for you. Master suite includes half-bath and his/her closets. Updated windows and clean siding in great shape. Garage is semi-finished and includes service door to the back yard. Must See!

Listing - Comp 3

Beautiful 5 bedroom, 3 bath home is ready to move-in and available for immediate possession. New paint throughout and carpet is like-new.

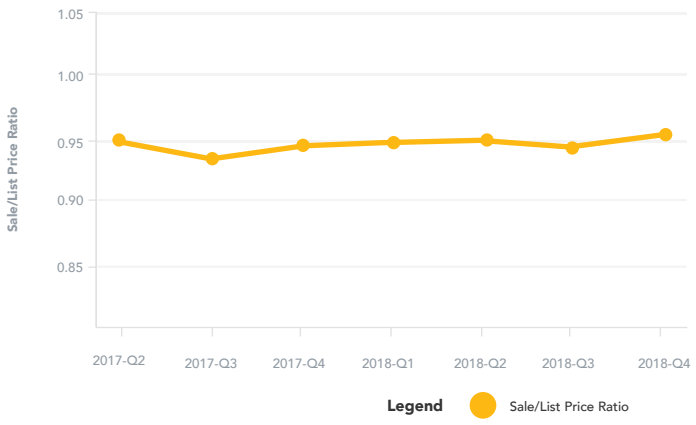
Listing - Comp 3

Beautiful 5 bedroom, 3 bath home is ready to move-in and available for immediate possession. New paint throughout and carpet is like-

Reconciliation Comments

A survey and analysis of comparable sales and listings in the subject's competitive market area suggests an ample number of highly similar sales exist in the market. Generally speaking, the predominate drivers of value in the subject area are: Location, GLA, and year built. Comparable sales presented in the grid were selected based on overall subject similarity, with primary consideration of characteristics that strongly influence value in the competitive area. In the final analysis, primary weight is placed on the adjusted sale prices of Comparable Sales #1, #3, and #4, due to overall similarity and gross adjustments warranted in equating to the subject. The price estimate conclusion falls within both the adjusted and unadjusted sale prices of comparable sales analyzed.

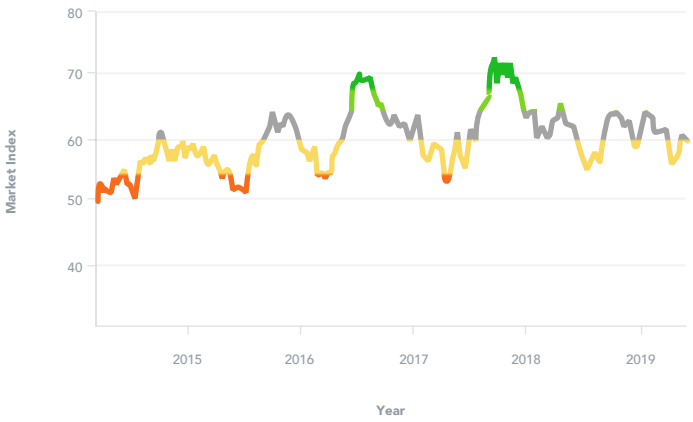
Sale/List Price Trend **Sale/List Price Ratio: 95%**



Final Value

Land Value	$140,169	Medium Conficdence	Market Rent Estimate	$2,425	Moderate Confidence
As Is List Price	$445,500				
Market Value Estimate	$445,500	High Confidence			
30-Day Value Estimate	$417,500				

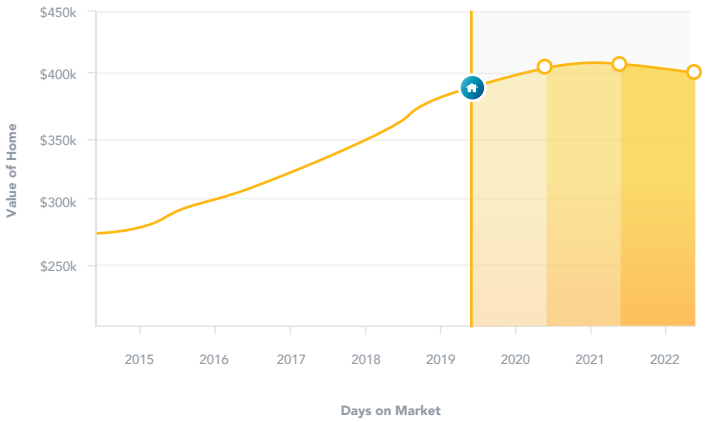
Market Index



This month last year	This month	Market Status
59.86	60.67	Seller's Market

Strong Seller's · Seller's · Neutral · Buyer's · Strong Buyer's

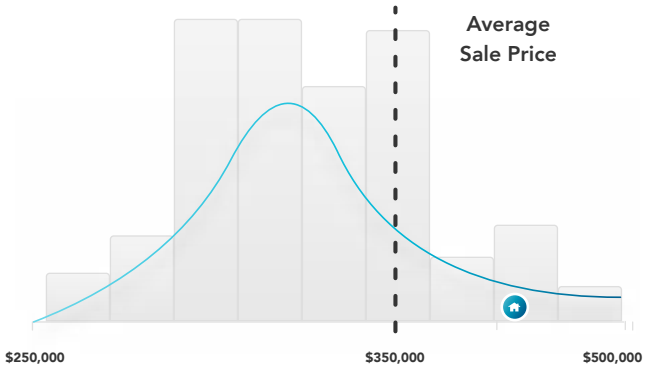
HouseCanary Forecast for Subject



3 Year Growth

1 Year	2 Year	3 Year
+5%	+5%	+3%
2020 • $443,327	2021 • $446,080	2022 • $436,814

Comparable Home Price Trend



Pricing Marketing Strategy Comments

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Sed lobortis mollis eros quis efficitur. Mauris aliquam risus vitae metus commodo varius. Vestibulum eget lobortis dolor. Nam a odio dui. Proin lobortis venenatis dui consequat pellentesque. Donec gravida interdum turpis ut dapibus. Ut quis suscipit nulla, eu tristique metus. Proin lobortis venenatis dui consequat pellentesque.

3rd Party Exterior Inspection

Single Family Home | Completed Inspection Date: 03/13/2019

Inspector comments

Overall, the subject is considered to be in average condition appears adequately maintained with no evidence of major repairs needed. The front is well-maintained and is average for the neighborhood.

Property Information

Evidence of Occupancy	Yes
	Cars In Driveway/Evidence Of Furniture/Window Coverings/Air Conditioner On/Smoke From Furnace/ Shoveled Walkway/Driveway/ Garbage Cans/Lawn Maintenance/ Name On Mailbox/Other
Property Viewable	Yes
Comment	
Attachment Type	Detached
PUD	No
Common Elements	Pool/Gym/Tennis Court/Basketball Court/Clubhouse/Dog Park/Golf Course/Recreation Area/Park/None/ Unknown/Other
Stories	1
Other Structures on Property	None Visible
Overall Condition	C4 Adequately maintained, some cosmetic damage and minimal repairs may be needed.
Neighborhood Description	Suburban/Urban/Rural
Locational Influences	Residential
Impact on Value	Neutral
Conform to Neighborhood	Yes
Comment	The subject property conforms to the surrounding neighbrood.
Non-Residential Use	No
Comment	
View Factors	None Notable
Impact on Value	Neutral/Beneficial/Adverse

Car parking (# spaces)	Driveway(3)/Attached Garage(2)/Built-in Garage/ Detached Garage/Carport/ Dedicated Off-Site Parking/None
Special Amenities	Solar Panel(s), Ornate Landscaping, Irrigation System, Graywater System, Water Collection System, Outdoor Kitchen, In-ground Pool, In-ground Hot Tub, Sport Court, Dock, Sauna, RV Parking, Orchard (hobby), Vineyard (hobby), Patio, Deck, Porch, Balcony, Fireplace, FrontYard, BackYard, Courtyard, Other | None
Comment	

Exterior Property Condition

Roof Condition	Poor/Fair/Average/Good/Very Good/ Excellent
Exterior Wall Condition	Poor/Fair/Average/Good/Very Good/ Excellent
Building damage by any of the following	Owner Neglect/Vandalism/Fire/Flood/ Tornado/Storm/Wind/Hail/Freezing/ Hurricane/Earthquake/Mudslide/ Landslide/Other | None Noted
Comment	
Adverse Site Conditions	Contamination, Failing secondary structure(s), Encroachments, Significant junk/trash, Sinkhole, Wetlands, Extreme slope that prevents development or impacts site utility, Other | None noted
Comment	There were no adverse site conditions noted during the exterior inspection of the subject property.

Photos - Inspection - Subject

Address Verification

Date
03/13/2019

Address Verification

Date
03/13/2019

Photos - Inspection - Subject

Street Left

Date
03/13/2019

Street Right

Date
03/13/2019

Photos - Inspection - Subject

Exterior Left

Date
03/13/2019

Exterior Right

Date
03/13/2019

Photos - Inspection - Subject

Front

Date
03/13/2019

Photos - MLS - Subject

SFARMLS | Listing ID #1234567 | Date: 05/02/2018

Front

Bedroom

Kitchen

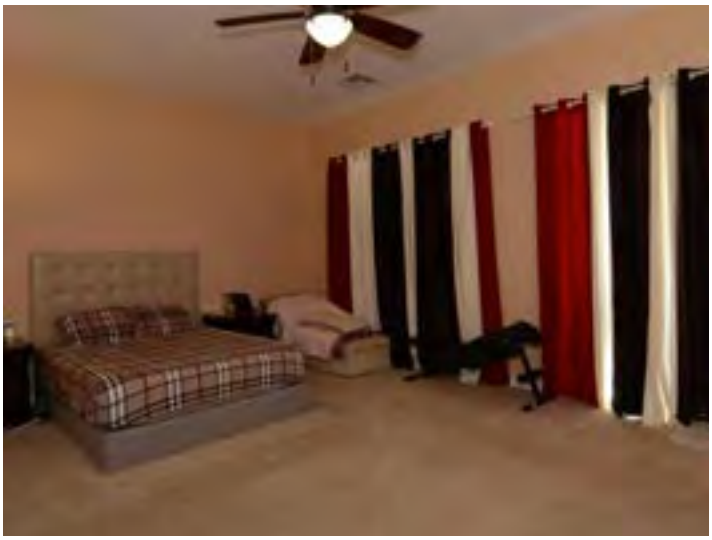
Bathroom

Only a few images from the MLS are displayed to give an assessment of the comparable. There maybe more images available on the MLS.

Comp 1 MLS Photos

SFARMLS | Listing ID #1234567 | Date: 05/02/2018

Front



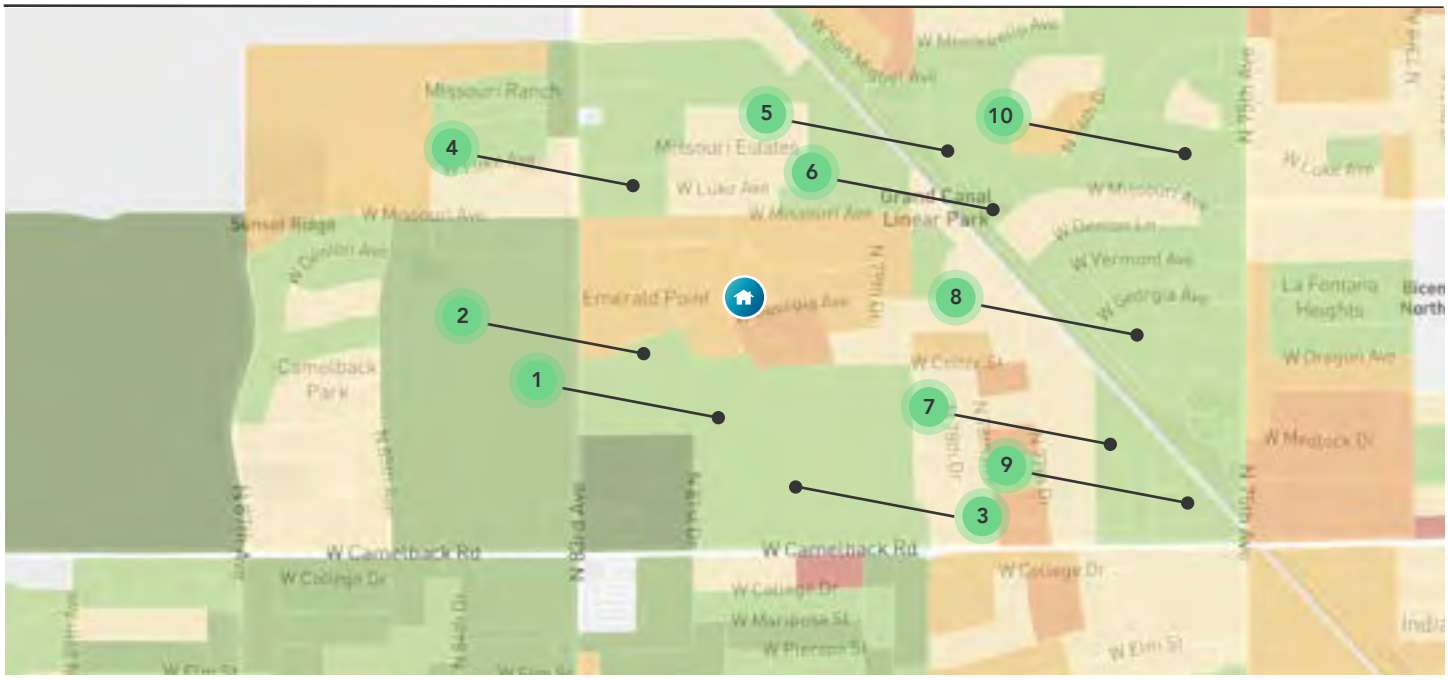
Bedroom

Kitchen

Bathroom

Only a few images from the MLS are displayed to give an assessment of the comparable. There maybe more images available on the MLS.

Recent Similar Sales



Similarity

High Similarity | Moderate Similarity | Low Similarity | Subject

$/Sq.Ft.

< $110	$110 to $124	$124 to $134	$134 to $143	$143 to $155	$155 to $180	> $180

#	Similarity	Distance	Property	Sale Price	Status	Sale Type	GLA	Beds	Baths	Age	Site Area
	Subject	-	[redacted]	-	-	-	**2760**	**4**	**3.6**	**16**	**17,424 sf**
1	High	0.28mi		$413,000	Sold 01/2019	Arms Length	3,184	5	3	14	17,010 sf
2	High	0.35mi		$360,000	Sold 07/2018	Arms Length	3191	4	3.67	37	32,465 sf
3	High	0.39mi		$445,000	Sold 07/2018	Arms Length	3,184	4	4	15	17,050 sf
4	High	0.41mi		$462,000	Sold 08/2018	Arms Length	3,184	4	3.67	15	19,396
5	High	0.66mi		$375,000	Sold 11/2018	Arms Length	2,769	4	3	17	12,999 sf
6	High	0.07mi		$365,000	Sold 08/2018	Arms Length	2,291	3	2.67	16	17,702 sf
7	High	0.4mi		$380,000	Sold 08/2018	Arms Length	3,184	5	3.67	15	17,344 sf
8	High	0.08mi		$389,066	Sold 07/2018	Arms Length	-	-	-	-	-
9	High	0.04mi		$360,000	Sold 05/2018	Arms Length	2,136	3	2	16	17,091 sf
10	High	0.3mi		$355,000	Sold 04/2018	Arms Length	2,494	3	3	14	17,010 sf

Addendum

Superfund Site

Within 0 miles: 0
Within 1 miles: 1
Detail 1:
- EPA Site ID: MOD007163108
- Link: http://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0700878
- NPL Status: Deleted from the Final NPL
- Site Name: NORTH-U DRIVE WELL CONTAMINATION
- Updated Name: 2010-05-26

Detail 2:
- EPA Site ID: MOD007163108
- Link: http://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0700878
- NPL Status: Deleted from the Final NPL
- Site Name: NORTH-U DRIVE WELL CONTAMINATION
- Updated Name: 2010-05-26

Within 4 miles: 0

Section: Neighborhood & Subject Marketability (page 2)

Glossary

Days on Market	The current days on market is the average number of days since listing for all current listings on the market for the given geography. The calculation represents a 13-week rolling average to minimize rapid swings in the data. Source: Local MLS, HouseCanary analysis
Market Rent Estimate	We value this property monthly rent at $1,727. The sales price will likely fall between $1,563 and $1,890. This is HouseCanary's estimated rental value for this home. It is not a formal appraisal. This estimate is based on our market knowledge, and it should be used as a starting point to determine a home's rent. Source: HouseCanary Analysis
Market Value Estimate	We value this property at $445,500. This is HouseCanary's estimated market value for this home. It is not a formal appraisal. This estimate is based on our market knowledge, and it should be used as a starting point to determine a home's value. Source: HouseCanary Analysis
Market Index	The market index is designed to measure supply versus demand at a local zip code level. The index ranges from 0-100 where values of 41-60 indicate a market in equilibrium (neutral). Values above 61 indicate that demand exceeds supply, and that the local area is a seller's market. Values below 41 indicate that supply exceeds demand, and that the local area is a buyer's market. Demand is measured using indicators such as sales volume, changes in listing prices, and days on market. Supply is measured using indicators such as inventory and the number of new listings. Source: Local MLS, HouseCanary analysis
Market Status	The market status is the summary conclusion on the market index. Specifically whether the market is currently classified as a buyer's market, seller's market or neutral. For more details see market index definition. Source: Local MLS, HouseCanary analysis
Months of Supply	The months of supply is a metric to reflect the pace at which listing inventory is turning over in the local market. The calculation reflects the total listings on the market divided by the 3-month rolling average of sales volume. Generally, less than 5 months of supply is considered inflationary due to the constrained nature of listings available for sale. A value greater than 7 months of supply is typically considered oversupplied and deflationary. Source: Local MLS, HouseCanary Analysis
MSA 1yr risk of decline	The one year risk of decline is a proprietary HouseCanary metric that measures the probability that this market's median home prices will be lower 12 months from now than the current market median price. This one-year chance of loss is derived through HouseCanary's multivariate time series models using a combination of fundamental and technical indicators. Source: Local MLS, HouseCanary Analysis
Comparable Properties	All nearby properties of the same property and sales type. Source: Public Record HouseCanary analysis

Glossary Continued

Non-disclosure state	In most non-disclosure states (or counties) both transaction sales price and date are not available to the general public. This data is not available because either the transaction details are not required or cannot legally be disclosed to the public. As a result, HouseCanary relies on different data to provide information such as comparable properties in our Agile Evaluation. When a request for a Agile Evaluation occurs in a non-disclosure area, HouseCanary uses listing information to populate comparable properties in the recent similar, active and historical sections of the report. Specific fields will change in these sections, for example in recent similar listings, sales price will be replaced with listed price. The following fourteen states are considered non-disclosure: Alaska, Idaho, Indiana, Kansas, Louisiana, Mississippi, Missouri (certain counties), Montana, New Mexico, North Dakota, Texas, Utah and Wyoming. Source: Public Record, MLS
Owner Occupancy	Owner occupancy indicates whether the owner of the home is the primary resident. Source: Public Record
Property Type	Property Type indicates the classification of the building based upon public record information. HouseCanary has normalized property type information into five groupings: Single Family Detached, Condominium, Townhouse, Manufactured/Mobile Home and Income Generating Property. Note that buildings that do not fall into these categories, i.e. apartment houses, highrise apartments, etc. will not be mapped into one of these categories. Source: Public Record
Recent Similar Sales	Similar comparables within a 1-year timeframe close to the subject property. Source: Public Record, HouseCanary analysis
Similarity Level	HouseCanary proprietary score calculated via multivariate analysis using a combination of geographic information and key property characteristics such as bedrooms, square footage, lot size, etc. The measure defines similarity of comparable properties relative to the subject property. Source: Public Record, MLS, HouseCanary analysis
Valuation Suitability Score	HouseCanary's valuation suitability score is measured in percentage terms relative to the estimated price. This score allows for comparison of accuracy on two or more properties regardless of the magnitude of the individual price estimates. Formally, if the Valuation Suitability Score is X and the estimated price is P, then the lower price bound approximately equals $P * (X/100)$ and the upper price bound approximately equals $P * (2-(X/100))$. Scores over 85 imply high model accuracy, scores between 70-85 imply average model accuracy, and scores below 70 imply low model accuracy Source: Public Record, Local MLS, HouseCanary analysis

Data Sources

HouseCanary accesses up-to-date data from county recorders and local MLS's. Recency of certain data is reflected by the effective date on the report. We use this data combined with HouseCanary proprietary analytics to bring you the most comprehensive, simple and accurate Agile Evaluation for every property.

For questions, please contact HouseCanary at support@housecanary.com.

Disclaimer

This report is designed to meet the requirements to be considered an evaluation as outlined in the 2010 Interagency Guidelines, which requires that an evaluation at a minimum:

- Identify the location of the property.
- Provide a description of the property.
- Provide an estimate of the property's market value in its actual physical condition, use and zoning designation as of the effective date of the evaluation (that is, the date that the analysis was completed), with any limiting conditions.
- Describe the method(s) the institution used to confirm the property's actual physical condition and the extent to which an inspection was performed.
- Describe the analysis that was performed and the supporting information that was used in valuing the property.
- Describe the supplemental information that was considered when using an analytical method or technological tool.
- Indicate all source(s) of information used in the analysis, as applicable, to value the property, including:
  - External data sources (such as market sales databases and public tax and land records);
  - Property-specific data (such as previous sales data for the subject property, tax assessment data, and comparable sales information);
  - Evidence of a property inspection;
  - Description of the neighborhood;
  - Local market conditions.

Data contained in this report was obtained from public records, such as tax assessment and recorder data, as well as private record sources, such as MLS and other such sources for the area (when available). Sources used for data in this report are considered reliable and customarily relied upon in the normal course of valuation practice.

As specified in Appendix B of the Interagency Guidelines, an evaluation can be based on analytic methods or technological tools. This report is an evaluation using those specified methods/tools. The methodology for the analytics can be found at: https://www.housecanary.com/property-valuation-method. Since the valuation of this property is not based on an appraiser's inspection, it is recommended that the client has the requisite expertise to manage and validate technological tools, as required by Appendix B of the 2010 Interagency Guidelines.

Unless indicated otherwise, the condition of the subject property is determined based on an inspector viewing and photographing the property from the street. An industry standard condition rating (C1-C6) is provided by the inspector. The property has not been inspected beyond the views provided in the photographs. For properties that are "exterior only", no interior inspection of the subject is performed. If a later interior inspection indicates a substantially different condition rating, a different valuation may result.

Condition Rating

Appendix D: Field-Specific Standardization Requirements of Fannie Mae and Freddie Mac Uniform Appraisal Dataset Specification.

C1

The improvements have been very recently constructed and have not previously been occupied. The entire structure and all components are new and the dwelling features no physical depreciation.
Note: Newly constructed improvements that feature recycled materials and/or components can be considered new dwellings provided that the dwelling is placed on a 100 percent new foundation and the recycled materials and the recycled components have been rehabilitated/re-manufactured into like-new condition. Improvements that have not been previously occupied are not considered "new" if they have any significant physical depreciation (that is, newly constructed dwellings that have been vacant for an extended period of time without adequate maintenance or upkeep).

C2

The improvements feature no deferred maintenance, little or no physical depreciation, and require no repairs. Virtually all building components are new or have been recently repaired, refinished, or rehabilitated. All outdated components and finishes have been updated and/or replaced with components that meet current standards. Dwellings in this category either are almost new or have been recently completely renovated and are similar in condition to new construction.
Note: The improvements represent a relatively new property that is well-maintained with no deferred maintenance and little or no physical depreciation, or an older property that has been recently completely renovated.

C3

The improvements are well-maintained and feature limited physical depreciation due to normal wear and tear. Some components, but not every major building component, may be updated or recently rehabilitated. The structure has been well-maintained.
Note: The improvement is in its first-cycle of replacing short-lived building components (appliances, floor coverings, HVAC, etc.) and is being well-maintained. Its estimated effective age is less than its actual age. It also may reflect a property in which the majority of short-lived building components have been replaced but not to the level of a complete renovation.

C4

The improvements feature some minor deferred maintenance and physical deterioration due to normal wear and tear. The dwelling has been adequately maintained and requires only minimal repairs to building components/mechanical systems and cosmetic repairs. All major building components have been adequately maintained and are functionally adequate.
Note: The estimated effective age may be close to or equal to its actual age. It reflects a property in which some of the short-lived building components have been replaced, and some short-lived building components are at or near the end of their physical life expectancy; however, they still function adequately. Most minor repairs have been addressed on an ongoing basis resulting in an adequately maintained property

C5

The improvements feature obvious deferred maintenance and are in need of some significant repairs. Some building components need repairs, rehabilitation, or updating. The functional utility and overall livability are somewhat diminished due to condition, but the dwelling remains useable and functional as a residence.
Note: Some significant repairs are needed to the improvements due to the lack of adequate maintenance. It reflects a property in which many of its short-lived building components are at the end of or have exceeded their physical life expectancy, but remain functional.

C6

The improvements have substantial damage or deferred maintenance with deficiencies or defects that are severe enough to affect the safety, soundness, or structural integrity of the improvements. The improvements are in need of substantial repairs and rehabilitation, including many or most major components.
Note: Substantial repairs are needed to the improvements due to the lack of adequate maintenance or property damage. It reflects a property with conditions severe enough to affect the safety, soundness, or structural integrity of the improvements.

Attachment D

The Agencies requested responses to 37 questions in its proposed rule.

As an AVM and an Evaluation provider, responses to many of the questions posed need to be made by bank and non-bank lenders, guarantors, and investors.

In addition, the recommendations we are making in our comment letter suggest an alternative approach than the one currently being proposed by the Agencies. Our recommendations provide solutions to a number of the questions the Agencies have asked.

Nevertheless, the following commentary provides our general responses to a number of questions asked by the Agencies.

AVM Usage:
In HouseCanary's perspective, the usage of AVMs should not be restricted to specific segments of mortgage market participants. Instead, AVMs should be accessible to all participants within the mortgage market. Limiting AVM usage could potentially create a competitive disadvantage for certain market participants.

Furthermore, restricting the use of AVMs may hinder the objective of establishing a seamless system that can be integrated throughout the entire mortgage process, from property listing to property investment or mortgage-backed securities. Embracing AVM technology across the board would promote efficiency and transparency, benefiting all stakeholders involved in the mortgage market ecosystem.

The critical requirement should be that the AVM (or Evaluation) meet the one set of high standards that should be required of all certified AVM providers. Furthermore, as recommended in our comment letter, the AVMs' systems should be continually tested by an independent third-party testing organization for both accuracy and bias.

Any organization that wants to use AVMs can then be assured that the AVM they choose to use, for whatever purpose, will produce accurate and unbiased valuations. Properly designed standards should also include standards for determining the confidence levels each AVM provider has in their valuations. Those AVM companies should be fully transparent about their levels of confidence so that users of their systems will be better informed about whether the AVM provider's system meets their needs.
AVMs, including Evaluations, are currently being used for multiple purposes, including Home Equity Lines of Credit (HELOC) lenders, mortgage insurers, institutional investors, and more.

AVM Testing:

All AVMs should be continually tested by an independent third-party testing organization regardless of the type of entity using the AVM. The responsibility for testing an AVM for both accuracy and bias should not be placed on the lender, either large or small. Smaller lenders would be especially disadvantaged by this requirement.

Instead, an independent third-party testing organization would guard against any potential conflicts of interest, thus ensuring that the AVM's systems are accurate and unbiased.

The ability of lenders and other mortgage market participants to use certified AVMs will greatly reduce compliance burdens, as well as increase the use of technology systems that deliver faster, more accurate, less expensive, and unbiased systems for many properties across the nation.

Quality Control:

As discussed in our comment letter, establishing high standards for all AVMs and Evaluations, and then continually testing the AVM and Evaluation systems will ensure that quality controls are in place and followed. AVM providers whose systems do not meet the standards will lose their certification and will, therefore, be unable to offer their services to mortgage market participants that need to use certified AVMs and Evaluations.