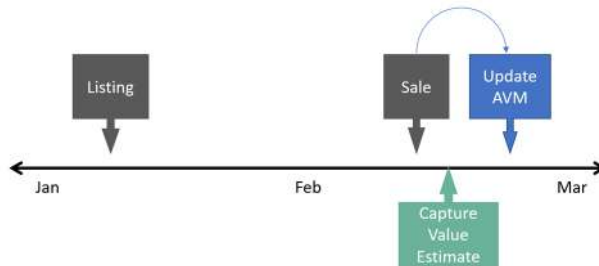


Proof of Concept Study: AVM Testing Methodologies

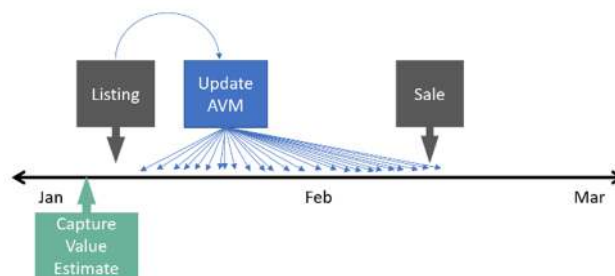
Overview

AVMetrics has developed a new approach to testing AVM accuracy. Originally, accuracy testing consisted of comparing transaction values to AVM estimated values. When data updates were done in batches and processing time was expensive, this method was quite reasonable, because models took time to incorporate recent sales transactions into their estimation algorithms.



1 Original Testing Method: Sale then Value Estimate and then AVM Update

However, it eventually became apparent that certain controls would be necessary to ensure models had not already incorporated the transaction value into their algorithms. Data has become more available and much closer to real time, and computer processing power has expanded, allowing models to recalculate much more frequently. However, the big change is the use of Multiple Listing Services' data in the value estimation process by AVMs. This presents a whole new challenge, because MLS data may be available to models long before the transactions are posted. AVMetrics' solution is to capture the value estimate before the listing date.



2 MRD™ Testing Method: Capture Value Estimates first, prior to Listings and AVM Updates. Sales, which are the basis for evaluating the estimates, occur last.

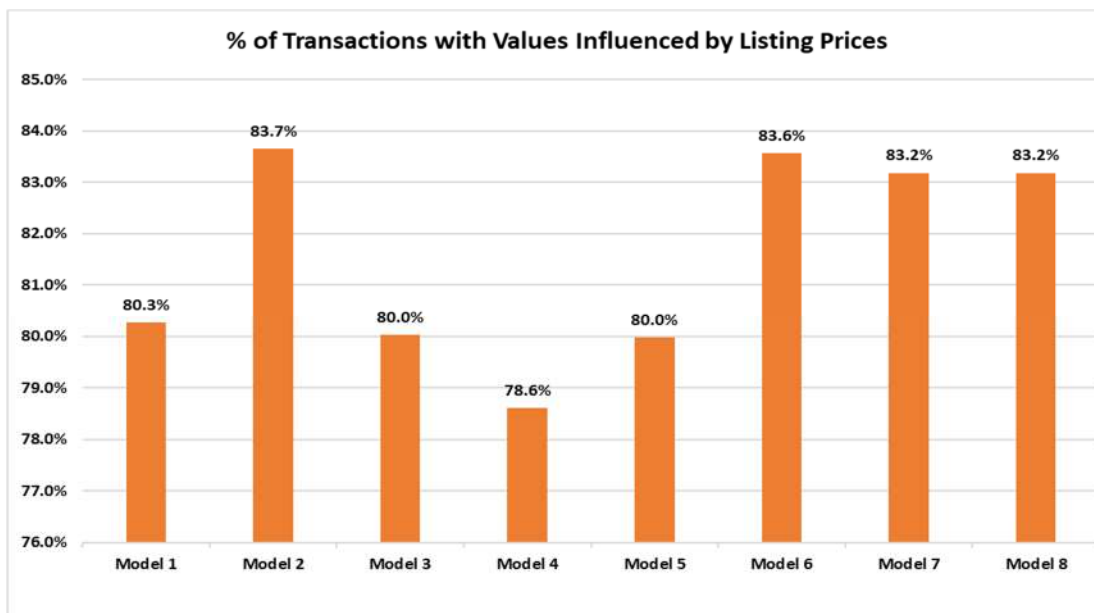
The challenge with this approach is knowing which homes will be listed and sold ahead of time. To circumvent this problem, we capture every valuation of every residence in the United States from every model in testing. The fundamental issue being addressed is that the conditions of testing should match the conditions of use in the real world. Currently, testing conditions almost always include a listing price that may be known by the models. However, the real-world uses of AVMs often include valuing collateral for HELOCS and refinance or supporting quality assurance on appraisals of properties with no MLS data. To be useful for those applications, an AVM needs to be accurate in the absence of MLS data. An AVM that performs well only after it is informed of a property characteristic, or more significantly, of a property's listing price, is not as valuable as an AVM that can perform in the absence of such leading data.

Proof of Concept

To demonstrate how important this new approach is, we collected valuations from 8 models for the second quarter of 2021. We analyzed how the models were adjusting their valuation estimates for properties after a listing price was published. Not surprisingly, the data shows the models do respond quite unmistakably to listing data. During this period of rising prices, model values lagged behind, and then when listing data became available, model estimates of value jumped up significantly. This behavior reflects the models' response to being "informed" of the listing data and "anchoring" on the listing price instead of relying entirely on their estimation techniques.

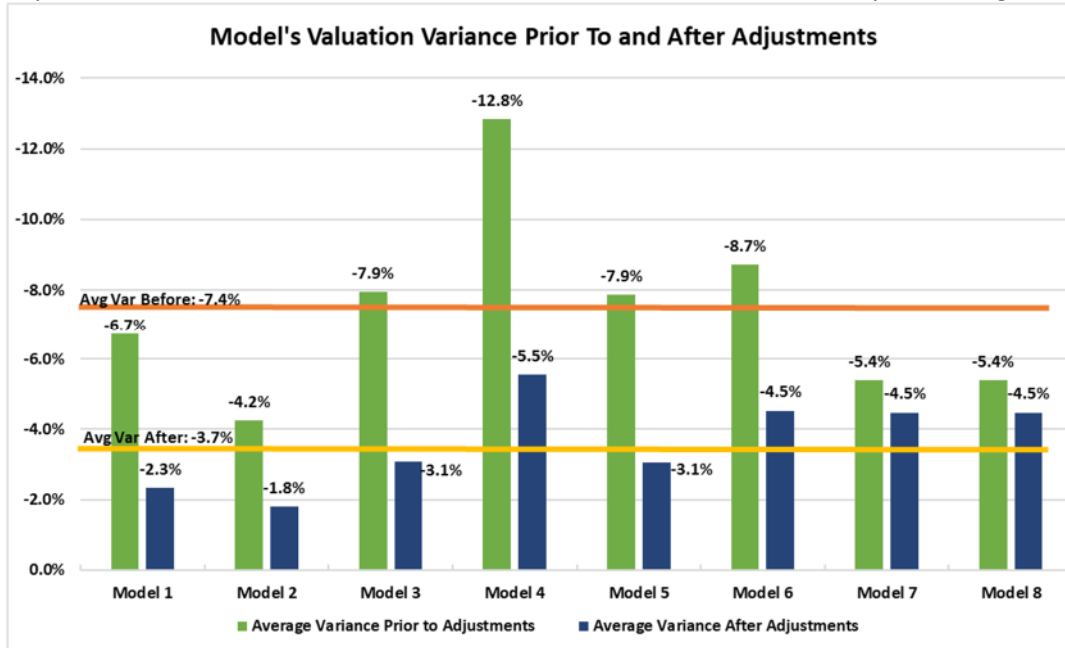
In the preliminary testing of our new MRD™ testing system, we focused the analysis on the State of California during the Q2 testing cycle. The test sample size was ~120,000 arms-length sales transactions. Eight (8) models from our current testing process were used for the comparison analysis. Data shows all of the models were influenced in varying degree by the MLS listing data and "anchored" to the listing price. The most influenced (by listing price) model showed adjustments to their model value estimates for 83.7% of the properties in this ~120,000 cohort. The least influenced model showed adjustments attributed to listing price 78.6% of the time (see Figure 3).

3 Most models reflected listing adjustments in 70-80% of Valuations.

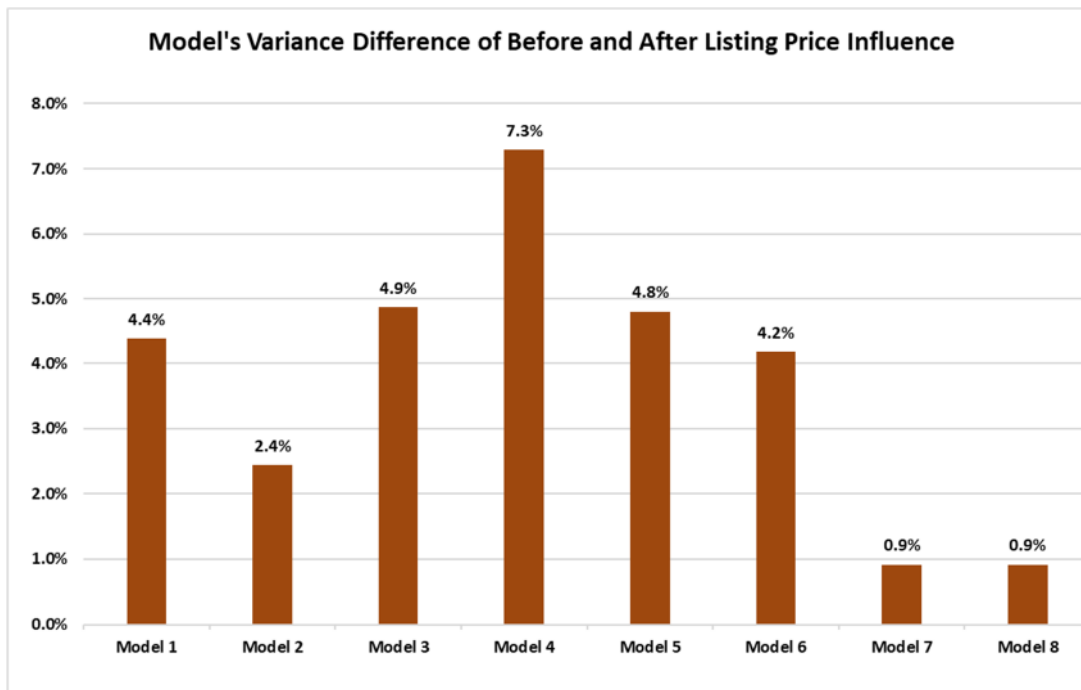


AVMETRICS NEW TESTING METHODOLOGY

When comparing model performance before and after (the listing data is available), the difference in accuracy is significant. The average variance of value estimate to sales price prior to list price influence is -7.4%. The variance drops to just -3.7% when the model is influenced by the listing price (*see figure 4*). On average there is an improvement of about 3.7 percentage points in prediction accuracy when the model “anchors” to a listing price. This can also be expressed as a 50% reduction¹ in the real error of the models achieved by anchoring on the listing price.



4 Accuracy improvements after model adjustments.



5 Magnitude of model adjustments: from 0.9% to 7.3%.

While all the models made an adjustment the majority of the time, their adjustments differed in magnitude. The average adjustments ranged from a low of 0.9% to a high of 7.3% (*see figure 5*).

¹ 3.7 percentage points is 50% of the overall difference of 7.4 percentage points.

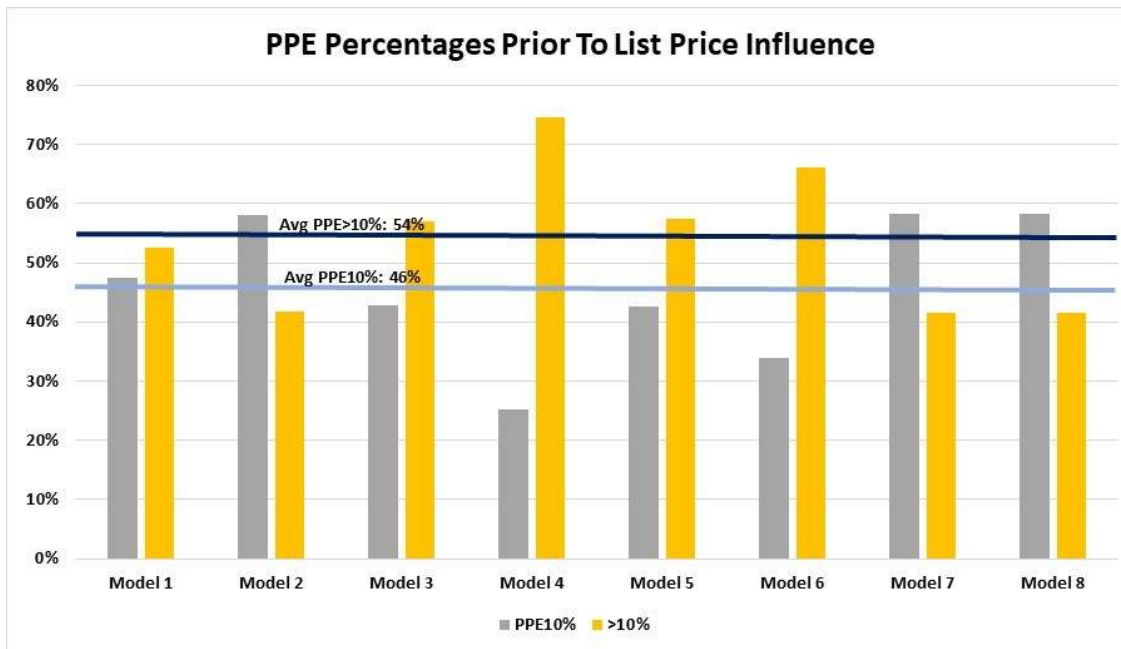


Figure 6 PPE percentages prior to adjustments

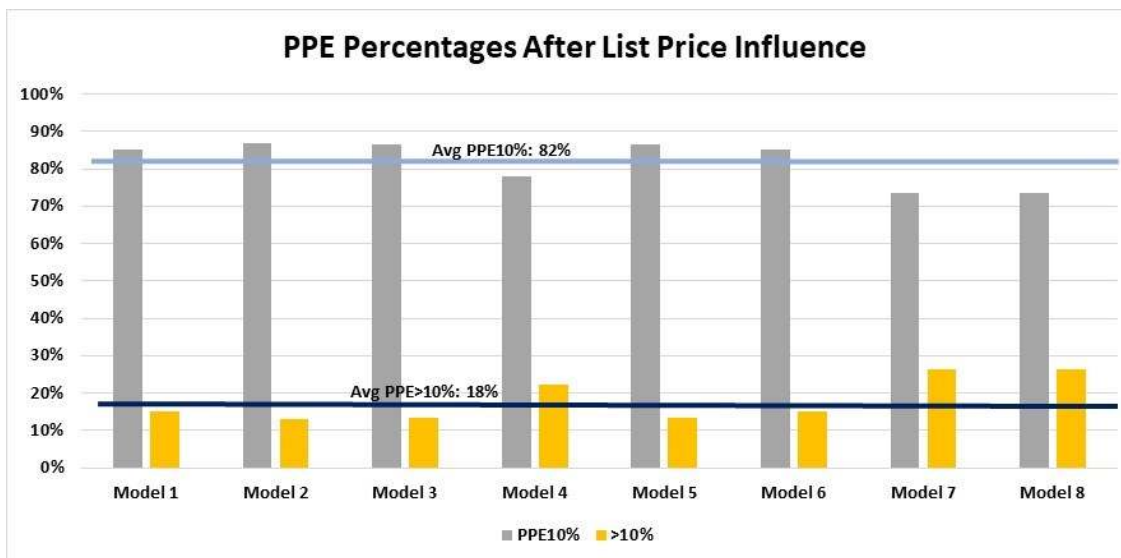


Figure 7 PPE percentages after adjustments reflect significant improvements.

The above graphs demonstrate how anchoring to the MLS listing price affects the model outcomes. The “Within PPE 10%” bucket in Figure 6, for example, is just 46% on average without the anchor point. It jumps to 82% in figure 7, within 10% when anchored. That is almost an 80% increase. The >10% error rate in figure 6 drops from 54% to just 18% in Figure 7 when anchored.

Conclusion

Current testing practices utilize available best practices to build and maintain a qualified set of transactions that satisfy benchmarking standards, including back-end filtering methodologies. And yet, the practices still allow models to be informed and influenced by listing values, thereby skewing testing metrics and making models appear more accurate than if the benchmark standards included the prohibition of MLS listing price influence. Furthermore, the data shows different models are more willing and able to leverage the MLS data, creating an uneven playing field.

This first review of the new test methodology clearly shows it can remove the influence of MLS list price information being used by the models. The average variance of -7.4% of these models in California before being anchored is still very respectable considering the double-digit appreciation rates most California markets experienced in Q2. The informed variance of -3.7% is not realistic for these market conditions. As we expand our testing analysis to a national scope, we expect to see similar results with variations based upon each model's access to MLS by geography.

At AVMetrics, our mission is to support the AVM industry through effective, independent testing, and we believe that this innovation advances that mission in two important ways. First, it levels the playing field for AVM builders, some of whom have more access to or reliance on listing data. Second, this new testing methodology supports a higher standard of care and best practice for valuation tool(s) assessment.