

**VEROVALUE**

# THE DATA-DRIVEN SUITE OF AVM SOLUTIONS

Understanding the VeroVALUE Approach



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# VEROVALUE™ INTRODUCTION

Launched in 2001, Verovalue™ Automation Valuation Model (AVM) has a strong reputation for model quality, unsurpassed hit rates in key areas of the U.S., as well as reliable, transparent value estimates and confidence scores that correlate with valuation accuracy. Verovalue combines sophisticated predictive modeling techniques and technology with quality data and industry expertise to create valuations with unrivaled reliability.

Verovalue and the related models in the Verovalue suite are developed and maintained by Veros Real Estate Solutions' (Veros®) in-house team of modelers, statisticians, economists, data scientists and industry experts. The Verovalue suite is regularly tested through Veros' rigorous internal testing approach, end-user customer testing, as well as through multiple independent third parties.

The core methodology responsible for the models' strength has remained at the center of Veros' AVM approach. All models are continuously updated with daily refinements. Veros refers to this as the "Care and Feeding" of our models and is an ongoing approach necessary to maintain and continually improve each model's performance relative to its industry peers.



# THE VEROS SUITE OF AVM SOLUTIONS

The suite of Veros' automated valuation model (AVM) products includes a number of analytic tools and supporting solutions. Each product is available via a web-based individual order platform, XML integration (both direct to the client or via integrations with various industry partners), portfolio or batch ordering, or through Veros' proprietary valuation management software systems.

## VEROVALUE AVM

The Verovalue™ AVM combines multiple predictive technologies with proven real estate fundamentals to provide extremely accurate property values with meaningful confidence scores and high, usable hit rates. Verovalue also features supplemental analytics designed to provide deeper insight into collateral such as price trend information.

Veros' Verovalue AVM reports now include property-specific information in regions that have been declared disaster areas as a value-added service and at no additional charge. Using satellite imaging and data analytics, the Disaster Vision data information is available within the Verovalue AVM report for the specific property. Property-specific monitoring data is available for most disasters and includes hurricanes, earthquakes, wildfires, windstorms, volcanoes, tornadoes, floods, storm surges and tsunamis.

## VEROVALUE PORTFOLIO

It is critical to maintain a strong watch on your portfolio while keeping costs under control. Verovalue® Portfolio gives users the power to quickly obtain the data needed to analyze multiple properties within a pool of loans. This batch portfolio review tool utilizes Veros' industry leading residential property valuation tool, Verovalue, for fast and accurate results, even in rapidly changing markets.

Portfolios can also be maximized through the incorporation of related analytics from the Veros suite including Veroforecast™ and Verovalue™ REO. When natural disasters strike Veros' Disaster Vision data is also available on a match and append basis and can be used to determine whether a specific property is located in or near the disaster area. Since this data is geocentric, it is much more granular and property-specific than county-level disaster information provided by the Federal Emergency Management Agency (FEMA).

## VEROVALUE PREFERRED

Verovalue™ Preferred applies strict standards on the AVM's approach to hit rates, market activity, and neighborhood analysis. The Verovalue Preferred AVM is a weighted balance between valuation accuracy and hit rate with a focus on accuracy. This is an excellent valuation tool for national use where accuracy is paramount over hit rates. Verovalue Preferred delivers the industry's top-performing AVM results and is commonly used in the first position in numerous AVM cascades.

## VEROMARK

VeroMARK™ is a highly cost-effective, marketing-grade AVM designed for sourcing large volumes of real estate property values. When precision and affordability matter, VeroMARK stands out as the go-to solution. It offers an easy setup, with pre-vetted options that are ready to order. Adhering to high-quality standards, VeroMARK undergoes rigorous due diligence and third-party validation to ensure reliability. With nationwide coverage, it achieves high hit rates across the U.S., making it a dependable choice. Designed to be fair and compliant, it maintains accuracy without bias while adhering to federal quality control standards. As the most economical AVM offering from Veros, it provides a cost-effective solution without compromising quality. Additionally, VeroMARK is highly scalable, delivering quick results for large volumes of properties.

## VEROVALUE REO

VeroVALUE™ REO is a critical tool for helping mortgage professionals practically and economically obtain realistic values for real estate-owned properties to improve the chances of a viable sale and mitigate potential losses. The product is designed to help address challenges brought about by distressed assets, rapidly increasing foreclosure rates, and ever-expanding REO portfolios, and to equip stakeholders from origination to the capital markets with the accurate information required to successfully manage troubled or at-risk loans.

## VEROINDEX PLUS

Among the methods used in VeroVALUE's blended model methodology is indexing. VeroINDEX™ Plus (VIP) applies the extremely accurate, in-house time indices that Veros utilizes within VeroVALUE AVM to provide time-based residential property valuations. VIP is an index-only based automated valuation solution that provides time-based residential property valuations derived from advanced analysis of local and regional market trends. With the inclusion of a previous sale and date of sale, hit rates close to 100 percent are likely. VIP is able to value almost any property.

## VEROPACE

VeroPACE™ simplifies the multiple AVM requirement for Property Assessed Clean Energy (PACE) lenders.

A solution for lenders specializing in PACE loans in the state of California, VeroPACE provides PACE lenders with a turnkey solution for valuing properties for PACE loans.

Available through Veros' proprietary VeroSELECT™ platform, VeroPACE generates a "cascade," through which up to ten AVMs may be run to obtain the requisite three AVMs. VeroPACE then analyzes, ranks, and reports the results of the three AVMs and calculates the midpoint of the high-low value range for the AVM with the highest confidence score, as required by California State Assembly Bill 1284 and companion State Senate Bill 242. The resulting information is delivered in an easy-to-read, single page format.

In those instances when three AVMs are not available, PACE lenders also can request and receive evaluations and full appraisals through the VeroSELECT platform, providing a complete valuation solution for PACE lending.





## THE VEROSELECT SYSTEM

VeroSELECT™ offers Accuracy and flexibility beyond AVM Cascade Management Technology.

With a built-in Application Programming Interface (API) for seamless communication, the VeroSELECT system is also accessible as a web-based ordering and management platform that provides instant, centralized access to a full suite of innovative property valuation solutions that includes more than twenty-five offerings from a growing list of more than fifteen top valuation and data providers.

Whatever the scenario, VeroSELECT gives you the perfect product for immediate insight into your local markets with the industry's most accurate AVM models, including Veros' top-performing flagship AVM VeroVALUE, Evaluation and Appraisal services, Broker Price Opinions (BPOs), and Property Condition Reports (PCRs).

With a VeroSELECT integration, all desired products are immediately available. Services are billed on a per-use basis with no ongoing fees or subscription requirements.

## CONFIDENCE SCORING & FORECASTED STANDARD DEVIATION

The Veros Confidence Score<sup>SM</sup> (VCS) is specifically designed to be an indicator of the subject's valuation accuracy and is based on a numeric score of 1 to 100 (the higher the better). It is important to recognize that the vast majority of the VeroVALUE valuations are generated with VCS greater than 90. This means that Veros is not only returning high hit rates but also highly accurate valuations! The VCS has proven to be highly correlated to the accuracy of the estimate of value.

Veros has an internal confidence score cut-off of 78. Anything below that score will not be returned. In addition to the Veros threshold, the client can create their own thresholds at any level they choose. Veros takes seriously the importance of not returning values that would be misleading or harmful to the end users.

Verovalue's Forecasted Standard Deviation (FSD) is derived from an analysis of the standard deviation of AVM errors in the internal and external evaluations of millions of properties. Veros interprets its FSD as an indicator of the expected standard deviation for the property in question. Thus, a customer can use whichever metric they prefer – VCS or FSD.

## DATA SOURCES

Veros' database is sourced and populated from multiple third-party aggregators and other publicly available data sources. Veros receives raw data updates, including property sales, from third-party data providers daily. Recorder data, including recent sales dates and sales prices, and real estate owned (REO) data, specifically, history of foreclosure data, are also part of the continual data feed supporting Veros' models.

Veros also receives raw data updates from county assessors which contain property characteristics and new construction information as it becomes available. Because each county assessor makes this available at various times of the calendar year, receipt of the information is ongoing, but is typically received not less than once per calendar year. This data includes tax assessment information, property characteristic update information and new construction characteristic information.

In addition to the above, Veros receives sales data updates from the county clerk / recorder offices (Recorded Deeds). These sales are made available to vendors as soon as they are recorded and made available from the county. Veros updates these sales daily as they become available in the dataset. To supplement the sales data, Veros also uses data coming from Multiple Listing Services (MLS) (which includes listing and sold prices in addition to property characteristics and agent remarks). This additional data source enables sales information to flow in daily and provides more real-time insight into a property's (and associated neighborhood's) potential value.

Verovalue is also fueled by the proprietary home price indexes Veros builds and maintains; and multiple third-party indices, including products from the National Association of Realtors® (NAR) and Federal Housing Finance Agency (FHFA).

## QUALITY CONTROL

Data from all sources undergoes a proprietary and rigorous raw data import and verification process (RDIV) that, among other things, analyzes, address verifies, cleans, matches, and resolves conflicts in the various data sources prior to loading in the Veros proprietary development and production database systems that are used to fuel the AVM engine. The RDIV system itself undergoes continuous development and enhancement. As a result, for optimal performance and in addition to customary handling procedures, Veros also undertakes full database reloads at least twice per annum.

Veros data managers continuously review the data provided by all data sources to ensure it complies with license agreements (e.g., receiving what is expected). The data Veros licenses in each county are also regularly validated

with checks for completeness, currency, and accuracy. In the event of any discrepancy, the data engineers work with the data provider to immediately resolve any potential issues.

Further, Veros ensures data quality, accuracy, and integrity continually as part of its own data integration process. Veros performs substantial data analysis, cleaning, scrubbing, and matching prior to the data being incorporated into the proprietary database that fuels the valuation engines. There is no blind or unchecked insertion of data into the valuation engine at any time. The data import and verification processes are included as part of every AVM update (weekly), in addition to smaller test databases that are run each morning.

## VEROVALUE'S METHODOLOGY

With the exception of VeroINDEX™ Plus and VeroPACE, the VeroVALUE suite is truly a “blended model” drawing upon a combination of hedonic, index, and various hybrid valuation methodologies. Each valuation method is backed by any number of predictive technologies including Neural Network, Linear and Non-Linear Regression, Econometric and Statistical Non-Regression-Based Time Trend, Data Mining, Statistical Discrete and Statistical Fuzzy Clustering, Probabilistic, Bayesian, and Optimization approaches. Utilizing multiple, and intentionally different proprietary valuation methods on any given subject property, Veros consistently produces one of the most accurate and reliable valuations on the market.

The blending approach recognizes that no one or two methods alone will ever be able to consistently produce accurate valuations. For example, a vendor who relies primarily on linear regression methods would be heavily dependent on complete and accurate information on all variables in their models such as square footage, number of bedrooms, year built, etc. In the event data was lacking for a particular property or geographic region, the linear regression method would either perform poorly or be rendered unusable. Further, if the linear regression method were only one of two approaches, the entire valuation would be dependent solely on a single remaining valuation method. This is a very risky approach. By recognizing that this situation is likely to occur in any imperfect database(s), Veros approaches each property valuation with numerous, distinctly

different methods. In more optimal (data-rich) situations, the system would obtain numerous valuations in tight agreement with one another indicating an extremely accurate prediction. However, even in a relatively data-poor scenario, the AVM would obtain valuations from enough of the methodologies to still produce a highly accurate valuation.

It is important to note that Veros' multiple valuation methods are all very different classes of methodologies. To simply have multiple neural network methodologies, for example, and then claim to have different valuation methods would be misleading. In such an example, there is really only one methodology, and the different neural networks would produce valuations that are highly correlated. For example, if one tended to drastically overvalue a property, they would all be likely to overvalue it. Veros' strategy is to use extensive expertise in these multiple predictive technologies to solve the valuation problem by attacking it from completely different approaches.

Before a property is processed through Veros' highly blended modeling approach, every address is processed through Veros' proprietary address standardization system, which will result in a one-to-one match for valid U.S. addresses. The goal is to ensure invalid addresses are not valued while maximizing the overall accuracy and total number of valuations produced. This address standardization system is the same system used by Fannie Mae and Freddie Mac within the Uniform Collateral Data Portal® (UCDP®) as well as by the Federal Housing Administration (FHA) within the Electronic Appraisal Delivery (EAD) portal.



## TESTING PROTOCOLS

Veros performs two types of internal testing on weekly and monthly schedules. On a weekly basis, Veros performs data updates of sales and assessment records. Veros continually ensures data quality, accuracy, and integrity as part of the data integration process. This data is received, scrubbed, matched, validated, and tested to ensure it is accurate and that all models are functioning properly. On a monthly basis, Veros tests against extremely large data sets with known benchmark values to validate the models and to gauge the accuracy of the output. Additionally, outside of internal testing and due diligence processes, Veros encourages frequent, “transparent” customer testing with ongoing dialog between the end-user and the individual AVM companies. Veros sincerely wants current and potential direct customers, as well as those who may access Veros’ services through third-party providers, to become familiar with the accuracy of Veros’ products in a real-

world testing environment. Veros believes that understanding critical factors such as gross hit rate, effective hit rate, confidence score correlation, valuation accuracy, model consistency, and other analytics are essential to making critical decisions related to the use and allocation of various automated collateral valuation and risk tools.

Veros’ testing policy is designed to ensure open communication and transfer of transparent and accurate information between all parties involved in the testing process. Performance testing not only provides an obvious benefit to end-users, but also benefits vendors/developers with valuable insights to customer needs and model performance. By understanding how the products are perceived to be strong or weak, Veros can further enhance the value of its products for its users.

## EXCLUDED PROPERTY / ADDRESS TYPES

The following property types are currently not valued through VeroVALUE at this time:

- Mobile Homes
- Manufactured Homes
- Cooperatives
- Commercial Properties
- Vacant Land
- Apartments
- Post Office Boxes

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