

SYSTEMIC RISKS
in RESIDENTIAL PROPERTY VALUATIONS



PERCEPTIONS and REALITY

The Collateral Assessment & Technologies Committee

The CATC was formed for the primary purpose of increasing the awareness of the merits of collateral assessment technologies and their derivatives in the context of our evolving and modern housing finance system. The CATC was founded by Basis100, Fidelity National Financial, First American RES, Fiserv CSW, Real Info, Inc., TransUnion Settlement Solutions, and Veros Software in March of 2004. Sustaining Members include representatives from the founding members as well as AVMax, Countrywide and Dataquick. CATC objectives include the exchange of information regarding the application of AVMs and related collateral valuation tools, standardization and best practices in the use and evaluation of collateral assessment technologies, providing education and other information resources to our members and others, and the proactive collaboration with leading industry trade groups and other parties interested in collateral assessment.

The CATC operates in partnership with the Real Estate Information Professionals Association (REIPA). REIPA provides an industry forum for the creative exchange of ideas and discussion of issues pertinent to real estate information providers and users. As the professional association representing the interests of those involved in REI commerce, REIPA is the nucleus for developing educational services and disseminating critical and timely information to its members nationwide. For more information, please visit www.reipa.org.



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Introduction

In recent months, the mortgage industry has heard many opinions concerning the performance of various collateral valuation methods, in particular, in the context of soft and weak real estate markets. Persistent and at times diametrically opposed, the viewpoints have a common motivation: those expressing them possess a sincere intent to facilitate identification, mitigation, and management of collateral valuation risks in the mortgage market. They also share a common goal: reducing the risk of loan losses driven by or resulting from inflated property valuations.

There is mounting concern regarding overvaluation risk in traditional, “full” appraisals as a result of transaction pressures and alleged collusion. The prevalence of pressures on appraisers to meet predetermined values is widely acknowledged, and there is little dispute that this problem elevates mortgage risk. However, precise measures of the resulting effects on appraisal values can be elusive, and this impact is commonly disregarded when these estimates are compared to those produced by alternative valuation processes.

Suspecting that “non-full” valuation processes can be more vulnerable to overvaluation than full appraisals, a major rating agency announced last year¹ that for loans secured by properties located in a “soft” or “weak” market², if the property valuation approach is *other than* a full appraisal, a discount would be applied to the home value estimate when determining credit enhancement levels for securitization. Although misunderstood by some, the announcement actually constituted both an implied endorsement of non-traditional valuation methods in most cases, *and* an opinion regarding geographic markets in which use of non-traditional valuation methods³ may increase risk. The premise of the opinion is that “data lag” in soft markets leads to inflated non-full valuation results, which in turn translates into incremental mortgage risk and loss exposure for mortgage-backed securities investors. However, the magnitude and impact of data lag in soft market conditions, the relative propensities of full appraisals and non-full appraisals to overvalue properties, the random nature of certain non-full valuation method errors, and if (and how) particular valuation methods correlate to heightened mortgage risk appear to have been overlooked.

The objective of this paper is to identify and explore: (i) the valid, but incomplete, context driving concerns about non-full property valuation methods, (ii) relevant facts and perspective largely absent thus far from the debate concerning the merits and vulnerabilities of the traditional appraisal process versus those of certain non-traditional property valuation methods, and (iii) perceived and real systemic risks posed by property valuation alternatives available to lenders today.

¹ See Appendix A, “The Full Monty Or Not? The Fitch Non-Full Appraisal Methodology,” April 2004

² In the interest of simplicity, most of the following text refers only to “soft” markets.

³ Fitch Ratings does not discount valuations derived from “non-full” valuation methods in any markets other than those they designate as “soft” or “weak”. The vast majority of homes are located in “stable” and “strong” markets, and therefore, Fitch does not discount values derived from non-full valuation methods in most cases.

Compelling empirical data - including the results from a groundbreaking test that required unprecedented coordination and careful execution by several automated valuation model (AVM) developers who are members of CATC - are introduced and summarized. The data and analysis support the following conclusions:

- At least one category of “non-traditional” valuations - automated valuation models (AVMs) – is immune to transaction pressures that regularly affect traditional appraisal processes. The absence of statistically significant bias in AVM values relative to market values (i.e., arms-length sale prices) in the vast majority of geographies - and regardless of model studied - confirms the independent nature of the values produced by these non-traditional valuation engines.
- In some cases, biases in full appraisal value opinions are pronounced. The observed biases are consistent with widely reported allegations of transaction pressures faced by appraisers in the normal course of business.
- Although AVMs have a lesser tendency to overvalue property, their overall accuracy (gauged via comparison to sale price benchmarks) can be less than that of full appraisals. However, credible data suggests that, in contrast to AVM values, a portion of full appraisals are biased by value estimates determined and communicated by property transaction parties and/or loan agents. This phenomenon makes defining and measuring “appraisal precision” difficult, and renders comparisons to (more readily verifiable) AVM performance challenging.
- In soft real estate markets, the effects of data lag are relatively muted for all types of property value estimates due to the “downward stickiness” of home prices.
- Mortgage market stakeholders can reap significant and unique benefits from both traditional and non-traditional valuation techniques - provided that they are deployed intelligently and monitored effectively.
- High quality AVM systems are proven solutions that are capable of bringing incremental objectivity, consistency, and controls to collateral valuation and risk assessment processes in our evolved and modern marketplace. They can do so in an efficient and cost-effective fashion that even the best-intended appraisal industry reforms or new regulations may be hard-pressed to match⁴.

⁴In a May 2005 whitepaper entitled “Residential Real Estate Appraisals in 2005”, the Consumer Mortgage Coalition stated, “By using statistical methods of pattern recognition, an automated valuation system can often detect a potentially inflated appraisal and can act as an important check on the validity of a manual appraisal, or, in appropriate cases, as a cost-effective substitute for the appraisal.” The Consumer Mortgage Coalition is a trade group comprised of national residential mortgage lenders and servicers.

Rapid Growth and Acceptance of “Non-Full” Appraisals: Context for Concern

There are several reasons why the rapid growth and acceptance of relatively new, “non-full” appraisals have led to some reflexive precaution and concern in the mortgage industry:

- *The mortgage market has come to accept home value estimates documented with full appraisal reports as “gold standard” valuations.*

Until relatively recently – with the advent of risk-based loan pricing technologies, new and improved property databases, real estate broker evaluation services, and automated valuation systems - there have been few acceptable alternatives to full appraisals for lending purposes. State appraisal licensure, training, and organization embodied within institutions such as the Appraisal Standards Board, the Appraisal Institute, the Appraisal Foundation and their Uniform Standards of Professional Appraisal Practices (USPAP) guidelines, have fostered mortgage industry acceptance of traditional appraisal techniques – often referred to as “the gold standard”. The emergence and growing popularity of “non-full” appraisals and valuation systems notwithstanding, these alternatives simply have not been in use long enough to be viewed as having withstood all of the same “tests of time” as full appraisals⁵. Furthermore, although the gold standard has been subjected to a fair share of criticism and regulation over the years, the focus has been on process reform and best practices. There has been relatively little industry concentration on, definition or acceptance of what constitutes acceptable appraiser performance, and currently, there is no industry-wide apparatus or regulatory framework in place that effectively detects or deters certain transaction agents’ abuses of the traditional appraisal process. These facts, coupled with a lack of widely accepted appraiser performance monitoring and measurement systems, result in gold standard valuations that have gone largely unchallenged and untested over time. Historically, another contributing factor to the inertia in valuation standards has been the relative dearth of clear regulatory guidance regarding lender use of non-traditional property valuations⁶.

- *Potential Valuation bias from Data Lag*

It is not uncommon for the most “up-to-date”, readily available property information used by appraisers, real estate brokers, and valuation modelers to be associated with weeks-old or even months-old transactions from public records sources. The resulting “data lag” problem is an issue for both traditional and non-traditional valuations. A host of factors conspire to create this dilemma, but the primary contributors include:

- ✓ Backlogs from mostly manual property transaction recording protocols at local deed recorder and county assessor offices
- ✓ Lack of uniform data standards with respect to content and format, (which makes geographically-diverse data sets more challenging to compile and control for quality), and

⁵ For a variety of reasons (some of which are described later), it is challenging to execute meaningful and conclusive performance tests of appraiser value opinion accuracy.

⁶ The most recent Interagency Guidance relevant to collateral valuation management (see OCC Bulletin 2005-22, May 16, 2005) provided useful and modern perspective on a variety of property valuation methodologies, including AVMs.

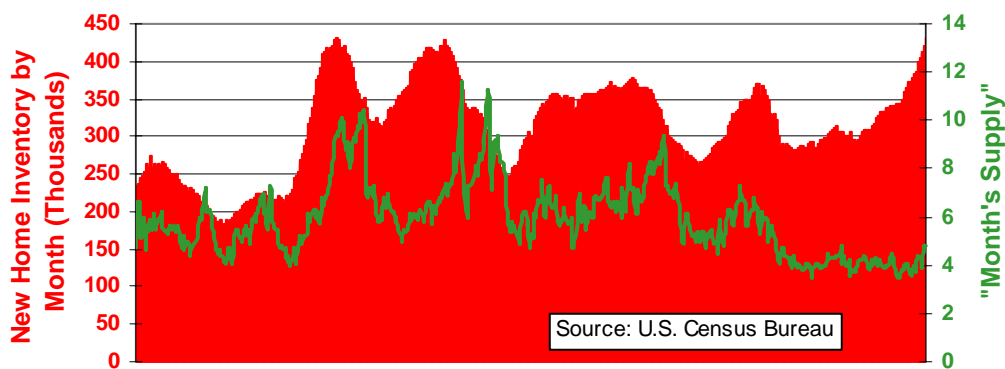
- ✓ Widely varying database management technology, expertise and resources across property data repository sources.

Individual appraisers can tap their network of local real estate market practitioners, access up-to-date, high-quality multiple listing services (MLS) data and other selected information sources for timely transaction information in the normal course of their business practice. As a result, appraisers typically can procure the most current property information available. Although non-traditional valuation services also can tap certain MLS and other private database sources, their developers may not possess the requisite licenses and relationships to access them widely throughout the country. Most national AVM vendors are a good example – the majority of AVM values delivered in the market today are dependent on property information culled from one or several large and geographically diverse public records database sources. Although these databases are becoming increasingly comprehensive, current and reliable, their size and scope invariably result in some portions of the information being relatively dated at any given point in time.

- *The “Housing Cloud”*

New home inventory, elevated by historical standards in 2004, is currently at an all-time high (see Figure 1)⁷. The National Association of Realtors® (NAR) reported that sales of second homes swelled in 2004⁸. The report, based upon two surveys, indicated that of all homes purchased in 2004, 23% were investment properties, and another 13% were vacation homes. Mounting new home inventory and the surge in second home purchases in 2004 are oft-cited as evidence of speculative activity and overheating real estate markets.

**FIGURE 1: New Home Inventory
1963 - 2004**

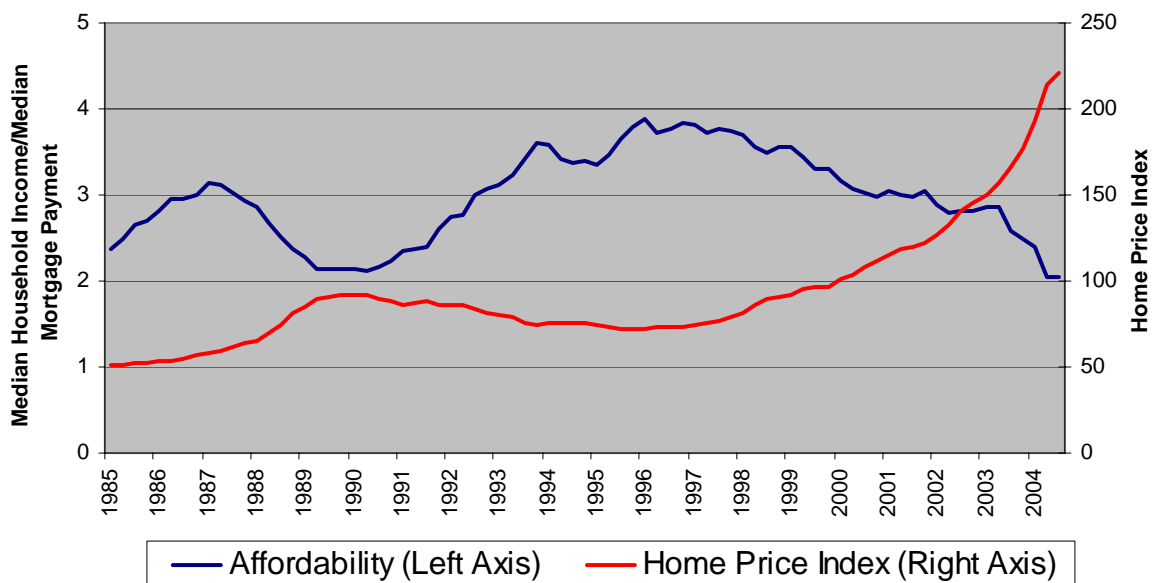


⁷ In contrast to actual homes for sale (inventory) data, the “Months Supply” data (plotted on the right-hand axis) is volatile, and can be misleading when cast as a proxy for home inventory when market fundamentals are changing. Note that “Month’s Supply” is near historical lows while actual inventory (440,000 units in April 2005, the most recent figure available at the time of this writing) remains very close to the February 2005 level of 443,000 units that broke through the peak levels established in August 1973. The denominator within the “month’s supply” calculation is the annualized volume of new home sales in the preceding month.

⁸ “Second-Home Market Surges, Bigger Than Shown in Earlier Studies”, National Association of Realtors®, March 1, 2005

Further, in certain residential real estate markets, measures of housing affordability have warranted concerns of potential market turns among mortgage risk managers (Figure 2). The increasing popularity of loan programs that are specifically designed to lower monthly payments (but have the effect of increasing the amount and/or lengthening the duration of consumer debt burdens), such as interest-only, 40-year term, negative amortization, and optional payment ARM loans, has also been cited as evidence of overheating real estate markets⁹. There are even reports of certain home buyers using bank-issued letters of credit in lieu of cash down payments to finance purchases of second homes¹⁰.

FIGURE 2: Orange County



Fueled by historically low interest rates, rising consumer confidence, growing household income, and record numbers of new homeowners, the demand for housing in the U.S. has surged in recent years. This unprecedented demand, coupled with an increasingly automated and friction-free mortgage finance system, has generated a spectacular and lasting nationwide “storm” of home price appreciation. The storm’s strength has, once again, elevated the intensity of the “housing bubble” debate.

This debate also highlights that concerns about property valuation quality and “safety” should not be limited to a soft markets context. Within a rapidly appreciating market - and in particular, to the extent that there is evidence of speculative activity - the quality of the data selected and analysis deployed to derive valuations is just as critical. A recent article in *The Wall Street Journal* stated, “There are fears overly generous appraisals will add fuel to a

⁹ The Mortgage Bankers Association’s Single-Family Mortgage Activity Survey released on May 2, 2005 indicated that adjustable-rate mortgages and interest-only products accounted for 63% of mortgage originations in the second-half of 2004. The denominator of the affordability measure presented in Figure 2 is based upon a quarterly data series that assumes that all borrowers hold fixed rate mortgages at the prevailing (30-year) rate.

¹⁰ “Hot Condos, for Just a Letter”, *The Wall Street Journal*, May 19, 2005.

speculative housing market by feeding expectations that prices will continue to rise rapidly.”¹¹ Also, amidst any extreme or changing real estate market conditions, home value stakeholders – e.g., homeowner, mortgage investor and mortgage insurer – should more carefully consider the *sustainability* of the home value estimate.

No matter what side of the housing bubble debate one subscribes to, it is hard to disagree with the following:

- ✓ Clouds have been building on the home price front.
- ✓ The stakes are high: U.S. residential housing is an asset class that has grown to over \$19 trillion in value.¹²
- ✓ The uncertainty that accompanies these clouds introduces risk to residential real estate stakeholders.
- ✓ Particularly as market conditions change, the effectiveness and adaptability of the people and systems entrusted to price residential housing and collateral risk should be carefully considered and monitored.

Concerns about housing clouds are well placed in the evolving collateral valuation environment. In late 2003, a major rating agency intended to open an umbrella for mortgage-backed securities investors by classifying 24 residential real estate markets as “soft” (see sidebar).

Cast among the housing clouds and concerns about data lag, the rapidly increasing acceptance and use of “non-traditional” collateral valuation methods within primary mortgage markets triggered a valid question within secondary markets: How might this trend, within an apparently changing real estate market environment, impact mortgage-backed security performance? This important question, in turn, sparked healthy debate about what constitutes safe and appropriate credit enhancement levels for securities backed (even in part) by loans created using non-traditional valuation approaches, and what pool concentration limits for such loans, if any, should be imposed upon issuers in order to mitigate unexpected MBS performance problems in the future.

Fitch Ratings classified twenty metropolitan areas and one Census Division (East South Central, which is comprised of four States) as “soft”; three metropolitan areas were classified as “weak”. Fitch defined “soft” real estate markets as those within which, relative to the annual average growth rate for the U.S. housing market, the annual rate of appreciation is greater than 2% but less than 5%, and “weak” markets as those within which, relative to the annual average growth rate for the U.S. housing market, the annual rate of appreciation is less than or equal to 2%. The set of 24 Fitch soft and weak markets was mostly unchanged in 2004. An analysis by Fiserv CSW of market-specific appreciation rates confirmed that these markets were “soft” or “weak” throughout 2004 according to the Fitch definitions.

¹¹ “Lenders Clamp Down On Inflated Appraisals”, *The Wall Street Journal*, May 26, 2005.

¹² Based upon a \$15.2 trillion estimate in the fourth quarter 2003 by The U.S. Federal Reserve Board and home price appreciation data from Fiserv CSW, Inc.

Factors Driving Industry Concerns: A Closer Look

Relative to alternatives, are “full appraisal” methods less likely to overvalue properties in soft markets, as has been implied or directly stated by some, and as many others throughout the mortgage industry may already believe?

To address this question, it is instructive (and relatively uncomplicated) to focus on a single class of full appraisal alternatives: AVMs. Among the “least full” varieties of appraisal alternatives available today, at times, AVMs seem to be the category most full of controversy. The efficacy of these automated, data-driven systems is continuously challenged. The vigor and intensity of the scrutiny tends to increase if the challenger’s perspective is limited to that described in the preceding pages.

However, from the limited context described thus far, can one conclude that utilization of AVMs necessarily translates into incremental risk for lenders and mortgage stakeholders when used in soft markets? Relative to those of full appraisals, do AVM values have a greater propensity to overstate true market prices for properties? To the extent that a particular AVM may be prone to producing a greater number of “outlier” valuations relative to the traditional appraisal method, does this necessarily translate into greater, or unmanageable, mortgage risk? To address these important questions, more information and relevant context is needed.

More Relevant Context for Collateral Valuation Policymaking in the 21st Century

- “Downward stickiness” of home prices mitigates effects of data lag in soft markets

Research and surveys indicate that home seller expectations are slow to adjust to market realities when the demand tide goes out.¹³ Intuition suggests that sale price expectations - hatched during an earlier period when prospective buyers had more purchasing power (e.g., times of lower interest rates, higher income growth and/or more rapidly-rising home prices) - may remain unrealistic for a relatively long period of time in the wake of an extended flood tide.

Downward stickiness, or rigidity, in home prices results from a home seller’s tendency - amidst a cooling real estate market - to resist adjusting price gain expectations downward, and to hold out for a bid that is not fully market-adjusted. It is not surprising that sellers would be stubborn in soft real estate markets – the majority have many complex emotional connections to their house, with most of their net worth tied to its value. Seller psychology, the predominant shelter benefit associated with the asset, and other market inefficiencies (e.g., high transaction costs) are all factors that likely contribute to price rigidity in soft housing markets. Indeed, it’s not uncommon for home sellers who are unable to command their original asking price to withdraw from the market and pull their home listing. Although downward stickiness in soft housing markets is a stimulus for wider bid-ask price spreads, slower turnover and higher inventory, historically, more often than not, the end result is that prices tend not to fall precipitously, at least not within very short time intervals.

The diversity of regional economies and residential real estate markets, coupled with the market inefficiency of downward price stickiness, should dampen fears that many people have expressed about concurrent and sudden real estate bubble bursts. With respect to property valuations, a more subtle, but important implication of downward stickiness is that in soft markets, current period sale transaction values are unlikely to be uniformly (let alone significantly) lower relative to “lagged” sales of recent days, weeks, or in some cases, even months. In other words, the inherent pricing inefficiencies of residential real estate are more pronounced in soft market conditions, and as a result, repress ill effects of data lag on property valuation processes - particularly when the lag time is limited to a few weeks or months (see sidebar).

In soft market environments, there is less data (e.g., “comps”) available to inform valuation estimates - regardless of methodology deployed to derive them. In any market with limited data, including a soft market, the discipline and consistency with which information is selected in order to determine an estimate, as well as the manner and extent to which the selected information is subsequently adjusted, should be well understood.

In real estate markets where prices are appreciating, research suggests that home prices are not as sticky. As a result, data lag would tend to have a more tangible impact on valuation processes in the context of rapidly rising markets. For example, most AVMs today produce results that are biased lower than prevailing market value when used to price homes located within very strong/hot markets. Although in certain cases this bias may introduce challenges to operational and production efficiency, relative to using AVMs in less heated markets, collateral valuation risk is actually diminished for lenders.

¹³ Case, Karl E., and Robert J. Shiller. 1988. “The Behavior of Home Buyers In Boom and Post-Boom Markets.” *New England Economic Review*, November/December.

Relative to the data lag phenomenon, the foregoing considerations should be of at least equal importance to collateral risk managers and policymakers in addressing valuation quality for properties located in soft markets.

- *Improving Property Databases and Valuation Technology*

In recent years, investments in electronic technology and data compiler systems by county recorder offices have accelerated property data collection processes and improved information quality.¹⁴ Data aggregation companies collect, filter and homogenize “raw” property data from hundreds of sources with increasing efficiency, and are more attuned than they ever have been to the needs of an evolving property valuation industry.

The reliability of AVMs will continue their steady improvement¹⁵ as more and higher quality property data becomes available, and developer algorithms are refined and augmented with GIS and market forecasting technologies.

- *Over-Valuation Errors in Traditional Appraisals: Positive Correlation to Mortgage Default Risk*

Although all property valuation methods are naturally prone to producing some percentage of price estimates that are higher than prevailing market value, the contributing causes of high valuations are different across valuation methods. This is an important consideration for mortgage risk managers evaluating the merits of using one property valuation method versus another.

In contrast to those associated with human appraisal processes, the “inflation factors” for AVMs are independent of the underlying transaction¹⁶. For example, the most significant overvaluation errors in full appraisals are likely a result of transaction exigencies or even fraud, while the most significant overvaluation errors in AVMs result from random factors - typically incomplete or errant data elements.

Thus, it stands to reason that the most pronounced overvaluation errors associated with full appraisals are more highly (positively) correlated with default risk than are the most pronounced overvaluation errors associated with AVMs. In addition to anecdotal accounts of the positive correlation between inflated appraisal values and default risk, empirical data supports this relationship. According to one study¹⁷, the risk of mortgage default at any time during the life of a loan increases by 2% to 3% for each percentage point of upward appraisal bias. A more recent analysis by CitiMortgage illustrates that the tendency for full appraisal values to equal or exceed sale prices increases when those appraisals are performed in connection with borrowers who have higher credit risk profiles.¹⁸

¹⁴ Broward County, Florida is one example of a county with an integrated, electronic recording process. See <http://www.gfoa.org/services/dfi/bestpractices/Broward-Doc.pdf>

¹⁵ *Automated Valuation Models Are Becoming More Accurate*, Standard & Poors, October 14, 2004.

¹⁶ There are versions of AVMs that enable users to manipulate and/or supplement the data driving the model. Such functionality is typically disabled for automated underwriting and quality control applications. It is commonly enabled for desktop valuation applications, however.

¹⁷ Lacour-Little and Malpezzi. *Journal of Real Estate Finance and Economics*, 27:2, 211-233, 2003.

¹⁸ Bradley and Beardsell, *Automated Valuation Models Provide Better Protection In Soft Markets*, Secondary Marketing Executive, April 2005, Table 1.

- *The Full Appraisal “Bias Virus”*

“The role of the appraiser is to provide objective, impartial and unbiased opinions about the value of real property—providing assistance to those who own, manage, sell, invest in and/or lend money on the security of real estate.”¹⁹

History shows that full appraisals do not always protect financial institutions against improper valuations. Losses endured by our financial system from the 1980’s savings and loan crisis have been attributed, in part, to inflated appraisals, some of which were performed in soft markets of that era. In two separate reports in 1986²⁰ and 1988²¹, the Government Operations Committee of the U.S. House of Representatives warned of faulty and fraudulent appraisals, citing a lack of objectivity, among other factors, contributing to mounting industry loss exposure from inflated appraisals. These concerns were a stimulus for the appraisal reform section (Title XI) of The Financial Institutions Reform, Recovery and Enforcement Act of 1989 (FIRREA), which sought to regulate the appraisal industry by requiring appraiser certification and licensing at the state level. In addition to introducing state licensure and more rigorous educational requirements, appraisers were explicitly forbidden to perform their work based upon predetermined opinions and conclusions, or to be influenced by any party with an interest in the transaction relating to the appraisal assignment.

In current times, the credibility of traditional appraisal processes continues to be scrutinized amidst a backdrop of sporadic episodes of appraiser fraud, ongoing allegations by appraisers of lender-applied “deal pressure”, and lender suggestions that as a transaction fiduciary, appraisers should “just say no” if and when they feel pressured. Regardless of one’s opinion as to the origins and primary carriers of appraisal bias viruses, there is little disagreement that the reliability and consistency of the traditional appraisal process is routinely challenged within today’s mortgage finance system. In a February 2004 news release concerning its National Appraisal Survey, October Research Corporation noted that more than half of the survey respondents felt pressure to overstate values (41% of the time, by up to 20%, and 8% of the time by more than 20%). The growing need for mortgage stakeholders to verify the valuation results within full appraisal reports in a systematic and cost effective fashion has been another stimulus to the growth and acceptance of non-traditional valuation methods in recent years.

Empirical evidence exists (some follows) confirming the presence of overvaluation biases and how they can transform ostensibly objective and independent full appraisal processes. The resulting hidden mortgage risks are virulent regardless of real estate market conditions, but are clearly more pronounced when housing clouds emerge and loan-to-value ratios for mortgage loan products migrate higher.

¹⁹ www.appraisalinstitute.org, Commonly-Asked Questions (“What is the role of the appraiser?”)

²⁰ *Impact of Appraisal Problems on Real Estate Lending, Mortgage Insurance, and Investment in the Secondary Market*, House Committee on Government Operations, 99th Congress, 2nd Session, H.R. 99-101, pgs 4-6.

²¹ *Real Estate Appraisal Reform Act of 1988*, House of Representatives, 100th Congress, 2nd Session, H.R. 100-1001, Part 1, September 28, 1988.

The full appraisal bias virus tends to manifest itself in two distinct ways, depending on the nature of the valuation assignment (i.e., loan transaction type). The following two sections of this paper provide insights into how one can:

- Detect, quantify, and interpret biases in full appraisal value opinions made in connection with (i) purchase transactions and (ii) refinance transactions, and
- Make valid inferences about valuation tendencies of full appraisals relative to one class of non-full property valuations: AVMs.

Full Appraisal Bias - Purchase Transactions

In the vast majority of cases, full appraisal values for homes that are part of a purchase transaction are equal to or greater than the sale price negotiated between the buyer and seller.

Figure 3 shows that value opinions from full (purchase) appraisals are:

- Exactly equal to the negotiated purchase price about 40% of the time
- Within 1% of the negotiated purchase price more than 60% of the time, and
- Equal to or greater than the negotiated purchase price more than 97% of the time.

FIGURE 3: Full Appraisal Bias - Purchase Appraisals

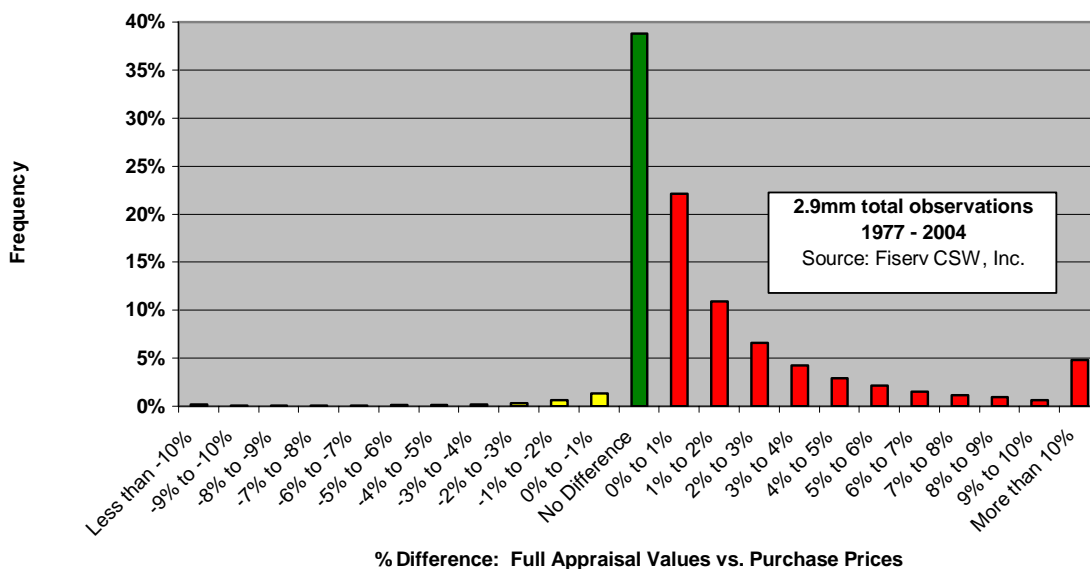


Figure 3 is based upon a sample of almost three million full appraisal values associated with residential mortgage purchase transactions since 1977²². Mortgage market institutions with access to large samples of purchase price (and corresponding full appraisal) data can replicate the picture presented in this graph by plotting a histogram of their own loan origination information. The sample that was used to plot the histogram in Figure 3 is comprised of an unfiltered variety of purchase transactions, including those associated with foreclosure sales²³. The frequency with which full appraisal values equal or exceed sale prices, coupled with the infrequency with which they are less than corresponding sale prices, is remarkable. The chart confirms that in the majority of cases, value opinions within full appraisals may be at least

²² With respect to this sample, it is interesting to note that the frequency of observations where the full appraisal value was exactly equal to the corresponding sale price increased from 30% in 1989 (the year that The Financial Institutions Reform, Recovery and Enforcement Act – “FIRREA” - was enacted) to in excess of 40% for every origination year between 1998 - 2004.

²³ In the interest of reporting on a representative and unfiltered national sample of full purchase appraisals, foreclosure transactions were included. Had a foreclosure transaction filter been applied to the data, the summary statistics would likely reflect even fewer appraisal value observations with values lower than the corresponding transaction price. The 2003 HMDA data cited on the following page is consistent with this notion.

partly dependent on the prices underlying property transactions that are negotiated between buyer and seller counterparties (see sidebar).

It may be tempting to suggest that this data is misleading because it only reflects information associated with appraisals for purchase loans that were approved and funded. However, the frequency of “transaction value not supported” outcomes is relatively rare. According to 2003 Home Mortgage Disclosure Act (HMDA) data, purchase appraisal opinions that are less than the purchase price occur *less than 1% of the time*²⁴ when all loan applications – including those that do not eventually close – are taken into consideration.

There is wide acceptance of the notion that arms-length sale transaction prices are generally the most reliable indicators of market value for residential properties. The systematic bias displayed in Figure 3 and supported further within the HMDA data suggests that, more often than not, the subject property value opinions within these full appraisal reports are dubious contributors to the cumulative intelligence brought to bear on loan approval and pricing decisions, and to collateral risk management protocols that are significantly reliant upon them²⁵.

The majority of full appraisal values procured in connection with purchase money transactions are not truly comparable to values that are consistently objective and/or derived in an unambiguously independent fashion, such as those delivered by certain “non-full” methods - most notably, AVMs. Thus, any conclusions or inferences one might be inclined to make about the

The *Uniform Standards of Professional Appraisal Practice* (USPAP) Standards Rule 1-5(a) mandates that the appraiser analyze all agreements of sale, options, or listings of the subject property current as of the effective date of the appraisal. The FIRREA recognizes USPAP as the generally accepted appraisal standards and requires USPAP compliance for appraisers in federally related transactions. State Appraiser Certification and Licensing Boards, federal, state, and local agencies, appraisal services, and appraisal trade associations require compliance with USPAP. One could argue that, as presently constructed, USPAP Rule 1-5(a) appears inconsistent with the goal of promoting independent, unbiased property valuations – well intended as it may be. Recent (March 22, 2005) guidance published as OCC Bulletin 2005-6 was intended to clarify parts of the Interagency Appraisal and Evaluation Guidelines dated October 27, 1994 and a subsequent “independence statement”. With respect to “Selecting and Ordering an Appraisal”, the agencies indicated the following: “The regulated institution may also provide a copy of the sales contract for purchase transactions. However, the information provided by the regulated institution should not unduly influence the appraiser or in any way suggest the property’s value.” This guidance might be construed as a requirement by the federal banking agencies that regulated institutions “white-out” the sale price information within purchase contracts in advance of providing them (per USPAP) to assigned appraisers. Even more recent (May 16, 2005) regulatory guidance published as OCC Bulletin 2005-22, indicated, among other things, that an institution should “ensure that an expected or estimated value of the property is not communicated to an appraiser or individual performing an evaluation.” Although this most recent guidance was cast in the context of credit risk management for home equity lending (in this arena, a current sale price is not available unless a “piggy-back” second lien or line of credit is originated simultaneously with the first mortgage), the spirit of the advice is clearly intended to promote appraiser independence and objectivity.

²⁴ Sources: Federal Financial Institutions Examination Council, Inside Mortgage Finance. The 2003 HMDA data is the most recent available as of this writing, and reflects approximately 8 million purchase applications (\$1.3 trillion worth of purchase mortgage financing applications were made over the course of 2003, and the average loan size for completed home purchase transactions was approximately \$163,500).

²⁵ This is not intended to suggest that the valuation opinion component of full appraisals is never useful, or that other components of full appraisals (e.g., current photographs, physical condition assessments and other property data) have no value.

“accuracy of (full) appraisal values” that are associated with purchase transactions - or the market value estimation proficiency of appraisers who report them – are questionable²⁶.

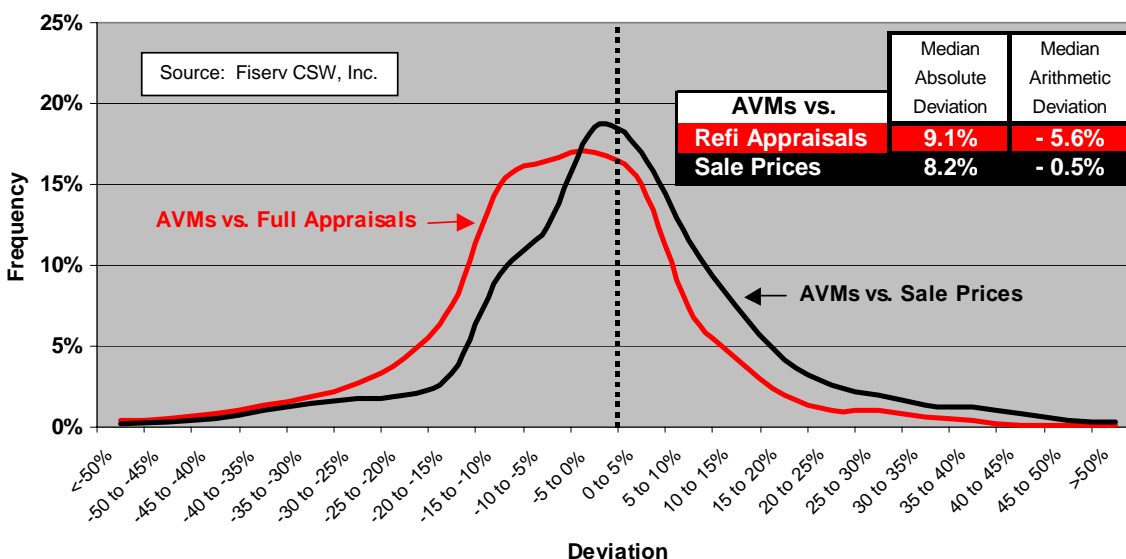
²⁶ Other research corroborates the notion that certain residential appraisals are performed not to establish an independent and objective market value estimate, but to justify a loan amount. (Ferguson, J.T., After-Sale Evaluations: Appraisals or Justifications? *Journal of Real Estate Research*, 1988, 3, 19-26).

Full Appraisal Bias - Refinance Transactions

A different, less uniform, and more difficult to directly observe strain of bias infects full appraisals used in connection with refinance transactions²⁷. To gain insight into the relative bias of full appraisals and “non-full” alternatives, one can compare the art of “full” appraisal values to the science of automated valuation systems for refinance transactions. A meaningful comparison is possible because:

- There is no current or pending sale transaction value pertaining to the subject property for the appraiser to be influenced by; and,

FIGURE 4: Full Appraisal Bias - Refinance Transactions



- AVMs are calibrated for accuracy using arms-length sale prices; as a result, overall, AVMs do not exhibit statistically significant bias when compared to sale prices²⁸. Figure 4 depicts a typical distribution of AVM value deviation with respect to (i) “full” refinance appraisal values (the red curve) and (ii) sale prices (the black curve), as well as representative summary statistics for accuracy and bias²⁹. What’s striking in comparing the distributions is that the “Full Appraisal Curve” is shifted to the left relative to the “Sale Price Curve”.

²⁷ In recent years, there has been an increase in the number of “recycled” (versus new, “full”) appraisal values used as part of streamlined refinance programs that require only a certification by the lender that the property being refinanced has not declined in value relative to the previous appraisal for the subject property. Such recycled appraisal values, reportedly biased low relative to prevailing market value (they were recently cited as a contributor to bias in certain home price indexes produced by The Office of Federal Housing Enterprise Oversight), are not “full” refinance appraisals.

²⁸ +/- 1% median arithmetic deviation is typical when comparing values from a quality AVM to sale prices in stable markets.

²⁹ Median absolute deviation is a commonly used summary statistic to measure AVM accuracy; median arithmetic deviation is a commonly used summary statistic to measure bias. This data and curves within Figure 4 reflect all AVM hits, regardless of confidence score.

- Since results from AVMs tend not to be biased with respect to arms-length sale prices³⁰, one can conclude that the leftward juxtaposition of the full appraisal (red – AVMs vs. Full Appraisals) curve is evidence that the refinance appraisal values upon which the red curve is based have overvaluation bias relative to both prevailing market value and AVM values³¹.

In consideration of the three preceding points and Figure 4, risk managers can gain valuable insight regarding full appraisal risks and biases when AVM systems are used as part of appraisal quality control protocols. Specifically, high quality AVMs can be used to effectively detect and quantify valuation biases in full appraisals and other alternative valuation types.

Over the normal course of business – which includes a multitude of AVM accuracy tests for which some lenders use appraisals associated with refinance transactions as the performance benchmarks - AVM developers observe and quantify overestimation bias in these full valuation methods³². Lenders and others who perform valid AVM tests can confirm this phenomenon in connection with their ongoing scrutiny of valuation model performance.

³⁰ In this example, this is illustrated by the black (AVMs vs. Sale Prices) curve in Figure 4 and the corresponding median arithmetic deviation of AVM values with respect to sale prices being equal to -0.5% .

³¹ Under a blind assumption that refinance appraisal values are derived in an independent fashion and are not biased, one would likely be inclined to assume that the red (AVMs vs. Full Appraisals) curve and the corresponding median arithmetic deviation of -5.6% in Figure 4 are evidence of significant undervaluation bias by AVMs. Although AVM values can have a tendency to understate prevailing market value, one can infer from the combination of the two curves in Figure 4 that, relative to market value, there can be significant overvaluation bias in refinance appraisals. Figure 4 also suggests that overvaluation bias in refinance appraisals tends to be more significant in magnitude than the (undervaluation) bias of AVM values.

³² Although the degree of bias can vary significantly by lender origination and appraisal quality control practices, loan channel, loan type, loan purpose (e.g., rate-term refinance vs. “cash-out” refinance) and real estate market conditions, the direction of refinance appraisal bias is consistent.

Full Appraisal Bias – Are Federal Legislation and New Regulations Viable Antidotes?

The vulnerability of traditional appraisal processes to external influences has proven significant enough to warrant the attention of Congress - again. Most recently, the “Responsible Lending Act of 2005” (H.R. 1295), a bipartisan bill sponsored by Reps. Ney and Kanjorski, was introduced to the House of Representatives on March 15, 2005. Although the centerpiece of the proposed legislation is federal preemption of state predatory lending statutes and mitigating liabilities for assignees of high cost loans³³, Title IV of the new bill, “Appraisal Activities”, suggests changes to Title XI of the FIRREA of 1989. According to the Appraisal Institute, the changes would “enhance appraiser independence and oversight by establishing a new federal standard to abate appraiser intimidation and protect the independence of the appraiser.”

Only time will tell if the appraisal reform provisions of H.R. 1295 will become law, and if so, whether this (or other potential reforms and attempts to police the existing process) will prove more effective than FIRREA Title XI. Regardless of the fate of this particular bill, even the best-intended regulations will prove ineffective if they do not have the effect of:

- Insulating appraisal professionals at transaction pressure points, *and*
- Holding unscrupulous appraisers accountable for compromising the integrity and independence of their work product³⁴.

In the context of our society’s modern and rapidly evolving communications and mortgage finance systems, an expectation that effective insulation can be created and maintained via regulation may be unrealistic for fundamental structural and practical reasons. For example, assuming that new regulations intended to enhance appraiser independence become law, in order to be effective, they must come with unambiguous federal commitments to:

- Build pervasive industry-wide monitoring and reporting systems,
- Establish broad and consistent enforcement capability vis-à-vis all parties to appraisal fraud – not just appraisers, and
- Consistently impose serious penalties for violators.

Less biased and more accurate property values would emanate from an appraisal regime that ensures a universally consistent and independent process, and consumers and mortgage investors would benefit from incremental safety and security. However, the funding commitments required in order to produce these desired effects via legislation and/or regulation would be substantial. Pervasive adoption of automated appraisal quality control systems may prove to be a more practical, cost effective and efficient means of detecting and controlling abuses of the traditional appraisal process. It is likely that a combination of technology and modernized regulations will be two essential ingredients of the ultimate recipe for industry-wide reform.

³³ Residential mortgage loans with interest rates, points or fees exceeding statutory limits.

³⁴ The penalties proposed under H.R. 1295 apply only to those parties who order appraisals.

No matter what controls are imposed or adopted, establishing and preserving true independence in the traditional appraisal process throughout the mortgage lending industry will have a profound impact on the mechanics of our modern mortgage finance system. For example, a historically rare form of friction would be introduced to home loan transactions. The less than uniformly independent traditional appraisal regime currently in place “greases” a homeownership and asset production engine that is driven to maximize throughput by avoiding speed bumps and potholes for consumers riding the road to loan approval. In other words, our huge and complex mortgage finance system hums as well as it does, in part, due to the uncanny frequency with which property values gleaned from traditional appraisals meet or exceed negotiated transaction prices and loan-to-value parameters of mortgage loan and insurance products.

It is safe to assume that loan application denials resulting from lower than expected property appraisal opinions would increase dramatically if all appraisers were able to suddenly and staunchly maintain their independence³⁵. Among other possible outcomes, a much larger portion of mortgage loan applications would entail multiple appraisals, would be significantly

³⁵ David Callahan (“Home Insecurity: How Widespread Appraisal Fraud Puts Homeowners at Risk”, Demos Briefing Paper #4, March 2005, 6-8) highlights that allegedly common perpetrators of appraisal fraud - mortgage brokers - are not subject to federal regulations, and makes a compelling case that more stringent regulation of appraisers alone is not a credible means to establish and preserve appraiser independence. The majority of mortgage loans generated today are via lenders’ third-party origination channels, including mortgage broker networks.

Testing the Validity of the Soft Markets Concern

This CATC study was deliberately focused on bias measurement to directly address the misimpression that full appraisals are less likely than available and readily measurable alternatives to overvalue property. The analysis is limited to an examination of the overall and soft market-specific overvaluation tendencies of only one class of non-full valuations (AVMs) relative to full appraisals. The test approach and results are intended to stimulate constructive debate, further analysis, and a more complete framework for evaluating the merits of proposed policies concerning property valuation alternatives within our modern and evolved mortgage finance system.

From numerous, valid tests spanning diverse geographies throughout the U.S., various loan types and origination vintages, individual AVM developers, The CATC, lenders and others possess compelling empirical evidence that in general, value opinions within full appraisals are biased high relative to AVM value estimates. Figures 3 and 4 display typical patterns. Indeed, the tendency of AVMs to generate “overvaluations” is actually lower than that of full appraisals in the context of both refinance and purchase transactions (see sidebar).

One critical question remains, however, in addressing the validity of the original concern articulated by several mortgage market players: when deployed for property valuations *where the subject homes are located in soft markets*, do AVMs tend to “overvalue” properties more frequently than full appraisals? The short answer is “no”; this question is thoroughly addressed by a groundbreaking project organized among CATC AVM developer members.³⁶

Although AVM overvaluation error is independent of default risk and occurs less frequently relative to full appraisals, the magnitude of AVM valuation outliers tends to be greater, particularly when values corresponding to the full range of confidence scores (i.e., AVMs with both high and low predicted error) are considered. However, there is evidence that, in contrast to AVM values, appraiser overvaluations are positively correlated to mortgage default risk, and that a significant portion of full appraisals are biased by valuations determined by property transaction parties and/or loan agents. The latter phenomenon makes defining and measuring “appraisal precision” difficult, and renders comparisons to (more readily verifiable) AVM performance challenging.

³⁶ Please refer to Appendix B on page 24 for a description of the project and study observations.

Summary Conclusions

The concern about the integrity of valuations within soft markets (or any market where pricing dynamics are changing) is legitimate. The analysis herein, including results of the CATC study described in Appendix B, suggests that the concern should extend to full/traditional appraisal methods.

The impact of transaction biases on full appraisal values should be of *at least* equal concern to risk managers as the perceived impact of data lag on AVMs and other non-full appraisal approaches.

In soft markets, the impact of data lag on all property valuation methods is muted by the downward stickiness of home prices; the impact on non-traditional methods is further diminished as a result of new and improving algorithms, property databases and related technologies. It stands to reason that the data lag phenomenon poses the greatest challenges to the property valuation industry when home prices in a local market are appreciating very rapidly. In such market conditions, the propensity of AVMs to value property at lower prices relative to traditional appraisals is even more pronounced as a result of a more tangible data lag effect (home prices are not as sticky upward as they are downward). Of course, to the extent that a valuation method is materially affected by data lag in strong real estate markets, its relatively conservative outputs will tend not to introduce incremental risks to mortgage collateral stakeholders.

Overall, relative to AVMs, full appraisals tend to value properties higher more often. One implication of this fact: to the extent that data lag contributes to any systematic inflation of AVM values in soft markets, it is less significant in magnitude than the biases that tend to infect full appraisal processes. This conclusion is validated by empirical evidence that, regardless of market conditions, “full” appraisal values tend to (a) equal or exceed sale prices in the context of the vast majority of purchase transactions and (b) more often than not, exceed AVM values in the context of refinance transactions. Further, logic and available empirical data suggest that the most pronounced overvaluation errors associated with full appraisals are more highly (positively) correlated with default risk than are the most pronounced overvaluation errors associated with AVMs.

Mortgage market stakeholders can reap significant and unique benefits from both traditional and non-traditional valuation techniques - provided that both are deployed intelligently and monitored effectively. High quality AVM systems are proven solutions that are capable of bringing incremental objectivity, consistency, and controls to collateral valuation and risk assessment processes. They can do so in an efficient and cost-effective fashion that even the best-intended appraisal industry reforms or new regulations will be hard-pressed to match. Particularly as housing clouds gather, the attributes and improving performance of AVMs demonstrate that non-full valuations can be compelling complements, if not outright alternatives, to a gold standard process tarnished by its inherent vulnerabilities to chronic infection within our modern and still evolving mortgage marketplace.

THE FULL MONTY OR NOT?? THE FITCH NON-FULL APPRAISAL METHODOLOGY

Fitch Ratings-New York-April 15, 2004: Fitch Ratings announces that it has revised its rating criteria for residential mortgage backed securities (RMBS). Fitch is most concerned with the use of non-full appraisals to value properties in declining markets during the funding process. The largest component of mortgage loss upon default results from decline in the value of the property. Therefore, under certain weakening housing conditions, Fitch has identified property valuation type as an additional factor in assessing credit risk of underlying collateral.

Property valuation methods other than full appraisals are growing in popularity in the mortgage loan origination process. Such alternative valuation tools include, but are not limited to, automated valuation models (AVMs), drive-bys, and desktop review appraisals. While these tools have long been employed in post-origination processes, such as post-funding quality control, originators have generally limited pre-funding use to mortgages that do not heavily rely on property value as a lending criterion, such as home equity lines of credit extended to the most creditworthy of borrowers.

As potential borrowers demand expedited loan application processing, lenders strive to become the low cost provider of choice, and as these alternative valuation methods demonstrate their reliability, mortgage originators have begun to rely on such valuation tools to fund loans. However, Fitch is concerned that, under certain weakening housing conditions, any valuation method other than a full appraisal is likely to overestimate property value.

As it relates to AVMs, Fitch believes that the risk of property overvaluation is particularly great in declining markets. In Fitch's opinion, such risk is paramount when alternative valuation methods are employed because of the time lag in the underlying data collection process. Non-full appraisal techniques, such as AVMs, rely on public data that is ordinarily several months old. In rising markets, AVMs rely on housing price data that is slightly lower than current market conditions. However, in declining markets, the AVM may overestimate property values given current market conditions. It is also true for desktop review appraisals to the extent that they rely on older, higher-priced comparables and that the reviewer is unaware of currently declining housing prices. Finally, drive-by valuations are by nature very limited in scope, which hinders the accuracy of the price opinion.

Fitch determines quarterly a list of regions that face declining property values relative to the aggregate United States from regional home price data compiled by Case Schiller Weiss, a third party vendor. Fitch computes average annual rates of change for home price indices over current and previous year time periods. If the rate of change for geographic regions underperforms the aggregate U.S. housing market index, Fitch classifies such regions as 'weak' or 'soft' based on the relative difference to the national level. Conversely, regions that perform and exceed the national index, Fitch categorizes as 'stable' or 'strong' based on the relative difference to the national level.

Accordingly, Fitch will decrease the values of mortgaged properties for loans with non-full appraisals that originate in 'weak' or 'soft' markets in RMBS pools. Currently, 'weak' is defined as less than or equal to 2% and 'soft' is defined as greater than 2% but less than 5% relative to

the annual average growth for the U.S. housing market. The discount to property value may be 10% or 15%, thereby increasing the loan to value ratio (LTV) of such loans. Because LTV is one of the primary drivers in Fitch's RMBS credit enhancement model, an increase in the LTV will likely lead to higher levels of required credit enhancement for that loan. Fitch will not adjust the value of mortgaged properties located in regions that Fitch deems 'stable' or 'strong,' regardless of valuation method.

All Fitch-recognized regions and alternative valuation types will be monitored in an on-going effort to form appropriate credit opinions. As part of its effort to understand the underwriting standards and procedures for mortgage originators, Fitch has reviewed alternative methods of property valuation but has not engaged in any comparative tests of AVM models or insured valuation products. Currently, Fitch does not differentiate between vendors of alternative appraisals and AVMs nor does Fitch express preferences regarding alternative valuation tools as a secondary valuation type.

The quarterly list of declining market regions Fitch considers 'weak' and 'soft' for data as of December 2003 are listed below:

The Fitch-recognized areas considered 'weak' are: Salt Lake City-Ogden, UT; San Jose, CA; and Denver, CO.

The Fitch-recognized areas considered 'soft' are: Memphis, TN-AR-MS; Charlotte-Gastonia-Rock Hill, NC-SC; Albuquerque, NM; Atlanta, GA; Grand Rapids-Muskegon-Holland, MI; East South Central, Detroit, MI; Cincinnati, OH-KY-IN, Dallas, TX; Greenville-Spartanburg-Anderson, SC; Akron, OH; Indianapolis, IN; Dayton-Springfield, OH; Cleveland-Lorain-Elyria, OH; Columbus, OH; Toledo, OH; Baton Rouge, LA; San Francisco, CA; Columbia, SC; Tulsa, OK; and Houston, TX.

CATC SOFT MARKETS TEST FRAMEWORK & RESULTS

- *Establish Test Sample Criteria*

After executing appropriate non-disclosure and confidentiality agreements to ensure data security, each participating AVM developer scanned its database for any property data records meeting all of these criteria:

1. Subject home is a single family residence located in one of the Fitch soft markets³⁷.
2. The effective date of the valuation must have a 2004 date to align with the period during which Fitch considered the subject’s housing market “soft”.
3. The underlying transaction type (i.e., purchase or refinance), benchmark value type (e.g., sale price, traditional/full appraisal) and benchmark value date must be known/available for all property records submitted.

- *Collect & Compile Data*

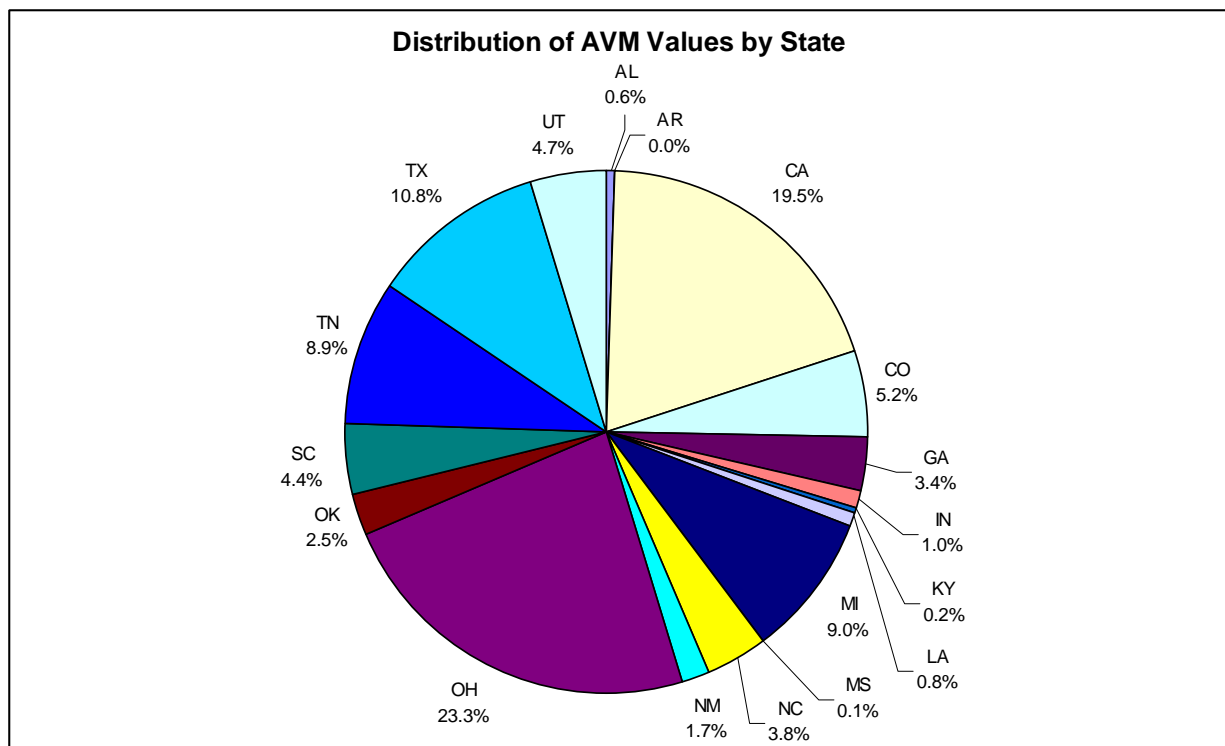
The AVMs and their respective developer companies that were able to contribute a sample of properties from their databases (meeting all of the above criteria) are listed in the table below³⁸.

CATC Soft Markets Test Sample: AVM Contributors	
AVM Brand	AVM Developer Company
CASA [®]	Fiserv CSW, Inc.
CMV	TransUnion
i-Value	Real-Info
PowerBase 6	First American
ValueFinder SM	Countrywide / LandSafe
ValuePoint 4	First American
ValueSure	Fidelity
VeroVALUE	Veros Software

³⁷ In addition to specific metropolitan statistical areas (MSAs) and consolidated metropolitan statistical areas (CMSAs), Fitch identified the East South Central Census Division (ESCD) as a “soft” market. The ESCD includes the entire States of Kentucky, Tennessee, Mississippi and Alabama; thus, available data from any metro area from within the foregoing states was also included in the CATC sample.

³⁸ With a view towards augmenting the test sample, CATC attempted to procure soft markets test benchmark data from sources other than CATC members, but this effort to acquire data from multiple lenders did not bear fruit during the relatively short data gathering phase of the study.

CATC then compiled and de-duplicated all of the test benchmark data³⁹ submitted. As expected, most of the data that the AVM developer companies had ownership of (and rights to share for the purposes of this study) related to purchase transactions, and several hundred-thousand sale price records pertaining to the same property transactions were detected after merging all of the individual samples. After eliminating duplicate property addresses from the starting data set of over 637,000 records, a master test sample



comprised of a total of 93,232 unique records was left for the study. Of the total sample, most (77,708) records were sale price benchmarks, and the remainder (15,524) were full appraisal values associated with refinance transactions. The pie chart above depicts the geographic composition of returned AVM values by state. (Please refer to Exhibits 1 and 2 on pages 30 and 31 for geographic distribution tables by metro area).

- **Generate AVM Values**

1. A copy of the master test sample was disseminated to AVM developers who had executed an appropriate confidentiality agreement, and had the requisite permission and resources at the time to meet the test requirements. To be eligible, participating AVM developers had to be able to generate retrospective valuation estimates at the individual property level (i.e., value each property as of the date associated with each sale price or appraisal benchmark), and deliver their completed AVM results data files within a six business day turnaround timeframe.

³⁹ Over 637,000 individual records pertaining to 2004 valuation estimates from soft/weak markets were collected.

Eight AVM model developers were able to meet the minimum criteria above. A total of 575,976 AVM values were generated across the eight models. No accuracy filters were applied (i.e., AVM results with even the lowest confidence scores were used in this study), and no outlier results were eliminated.⁴⁰

2. CATC's designated data compiler organized the data returned from the eight developers into a consistent format, and shared them with the CATC data analysis team in order to facilitate the following analysis.

- *Conduct Analysis*

Members of the CATC data analysis team took the following analytical approach to the test data:

1. Separated the universe of data into two distinct sets: one comprised of properties for which the transaction/benchmark type was purchase/sale price, the other comprised of properties for which the transaction/benchmark type was refinance/full appraisal.
2. For each property in both data sets, compared the value estimate from each of the eight AVMs to the corresponding (sale or full appraisal) benchmark.
 - ✓ The comparison of AVM values to sale prices was intended to confirm whether or not AVM values (by model, by soft market, and overall) exhibit any significant and consistent biases with respect to prices of homes sold in soft markets.
 - ✓ The comparison of AVM values to full appraisals was intended to examine whether or not AVM values (by model, by soft market, and overall) are biased high or low with respect to traditional appraisals in soft markets.

- *Quality Control the Analysis*

The leaders of the data analysis team - comprised of experienced CATC professionals from different member companies - performed separate, independent analyses on the detailed data and generated relevant summary statistics. The statistics and results produced in each of the separate studies were then reconciled, and proved to be completely consistent. Less than 0.07% of the sample included data from markets not designated by Fitch as "soft" or "weak".⁴¹

⁴⁰ Since the focus of this study is the relative propensity to over- or under-value properties, outlier analysis and errant benchmark filtering was not necessary because it would have little impact on the bias study.

⁴¹ Only 378 of the total 575,976 AVM values produced for this study related to sampling error resulting from the AVM developers inadvertently contributing addresses from markets not identified by Fitch as weak or soft. 359 of the 378 total (95%) were records pertaining to properties located in Canton, OH.

- *Reach and Share Conclusions*

AVMs: Overall, not biased when compared to sale prices⁴²; tendency to overvalue less often than full appraisals - even in soft markets

In its study of soft real estate markets, CATC found that, overall, AVM values have little bias (+0.8%) relative to sale prices, which are widely accepted as the best market value indicators. This finding is consistent with intuition, since AVMs are calibrated with arms-length sale prices (e.g., AVM developers use millions of previously-recorded sale price observations to build models to predict market value). Exhibit 3 provides a list of the individual soft markets ranked by AVM bias with respect to sale prices.

Full appraisals demonstrated more significant and consistent overvaluation bias (+3.6%) relative to AVM values, data lag concerns notwithstanding (assuming no bias correlation with AVMs, the study results suggest that full appraisal overestimation bias is closer to +4.4% with respect to soft market sale prices)⁴³. For all soft market geographies combined, *none* of the eight AVMs tested demonstrated a tendency to overvalue properties more often than full appraisals. In all three of the Fitch “weak” markets, the composite bias⁴⁴ measurement for AVM values relative to full appraisals was negative, indicating that even in these softest (i.e., riskiest) markets, full appraisals tend to overvalue property more often than AVMs:

Weak Market	Composite Bias (AVM vs. Full Appraisal)
Denver, CO	-3.72%
Salt Lake City – Ogden, UT	-6.64%
San Jose, CA	-0.83%

An analysis by individual soft market revealed a similar theme: for the vast majority of them, full appraisal values exceeded corresponding AVM values more often than not. Exhibit 4 provides a list of the individual soft markets ranked by AVM bias with respect to full appraisal values. A separate CATC analysis of the data by individual AVM demonstrated that full appraisal values tended to be higher than corresponding AVM values more than 85% of the time (please refer to Exhibits 5 and 6).

⁴² Note that the AVM developers contributed retrospective valuations as a requirement of the study, to address concerns that model performance for this test might otherwise be invalid by incorporating or not discounting the corresponding (sale price) benchmark within the valuation calculations.

⁴³ The CitiMortgage analysis presented by Bradley and Beardsell (“*Automated Valuation Models Provide Better Protection In Soft Markets*”, Secondary Marketing Executive, April 2005, Table 2) recorded overvaluation bias of approximately 2% and 5% for rate-term and cash-out refinance appraisals, respectively, with respect to AVM values, and concluded that “AVM values tend to be less (than full appraisals) for both purchase and refinance transactions in both soft and non-soft markets, indicating that AVMs promote more conservative underwriting.” Bradley and Beardsell also found “no evidence that AVM performance deteriorates in soft markets”, and that the rate of overvalued appraisals is higher in soft markets than in not-soft markets.

⁴⁴ To derive composite bias measurements, for each property, the value estimates produced by all eight of the models were segregated by soft market and compared to the corresponding benchmark (sale price or refinance appraisal). The deviations (between every AVM value and corresponding benchmark value) were then grouped by individual soft market and benchmark type. Finally, median arithmetic deviations were calculated for each group.

AVMs: Consistent patterns, but performance does vary

AVM performance varies according to not only geography, but property price segment, property type, AVM developer modeling techniques, chosen performance benchmarks, test structure and other factors. Across AVM developer companies, property databases are not updated with uniform methods or frequency, and different sources and combinations of property data are utilized. Additionally, “raw data” quality control procedures vary, as do the underlying AVM algorithms, calibration methods and frequencies. The foregoing factors and the need for careful data sampling make performance testing challenging, and have resulted in requests in the mortgage marketplace for the creation of AVM testing and content standards. CATC is involved in such endeavors, and will continue to do its part to promote best practices and development of feasible standards. Notwithstanding the complexities of AVM validation testing and resource requirements for effective performance monitoring, these processes are vital to ensure that both loan production and risk management functions can continuously benefit from and optimize deployment of high quality automated valuation models.

The CATC test analysis indicated that the overall performance of AVMs as a class relative to the test benchmarks was consistently objective - even in most of the soft markets, and before application of any filters for outlier benchmarks and/or observations that had low AVM confidence scores.

AVMs: Some notable lackluster results

Among other expectations, CATC hopes that this study will dispel the hyped controversy that AVMs render traditional appraisals worthless. Without human intervention, AVMs are incapable of assessing the current condition of subject homes. Also, current AVM coverage is not comprehensive. In the CATC study, the overall hit rate was approximately 77% - i.e., an AVM could not be relied upon to deliver a property valuation more than 20% of the time. In certain real estate markets where data is available - but there is a relative dearth of it - AVM developers continue to face significant challenges. It is not surprising to observe that the three markets with the most lackluster AVM results were located within so-called non-disclosure states (Arkansas, Indiana, and Texas), where real estate transaction data is not widely available from traditional public record sources:

- ✓ Arkansas was poorly represented in the sample (only 8 properties). Although the valuation results from the CATC study for this state are not statistically meaningful due to the small sample size (across the 8 AVM models, only 27 values were returned for the 64 Arkansas AVM value requests⁴⁵), AVM coverage continues to be weak in Arkansas among the major AVM developer companies.
- ✓ Generally, properties located in Indiana continue to pose challenges for AVM developers as a group. Of all of the markets studied, AVMs were least accurate and

⁴⁵ Sixty-four requests: eight Arkansas properties times eight AVMs.

most biased in Indianapolis, where they exhibited their most pronounced overestimation tendency relative to full appraisals (+4.6%). This performance warrants close attention by the AVM industry and lenders utilizing the technology for loans secured by properties in Indiana.

- ✓ Texas is a state where AVM developers have made some impressive strides in recent years. Although the composite bias measurement for AVM values in Dallas was 0.0% relative to full appraisals, in Houston this measure was material (+3.6%), and indicates a greater tendency for most AVMs, relative to full appraisals, to overvalue property in this market.

San Francisco and Biloxi-Gulfport-Pascagoula⁴⁶ (Mississippi) were the only other two soft markets where the composite bias measurement for AVM values was positive (+2.3% and +1.4%, respectively) relative to full appraisals.

⁴⁶ The AVM sample size was small for Biloxi-Gulfport-Pascagoula, MS. Of the eight AVMs contributing test data, only three produced (a total of 70) values there, and two of those produced fewer than thirty values. The composite bias with respect to full appraisals for all AVM values produced for properties located across the State of Mississippi (355 observations) was 0.0%.

EXHIBIT 1: CATC DATA SAMPLE GEOGRAPHIC DISTRIBUTION (ALPHABETIC – SALE PRICES SAMPLE)

Composite AVM Bias vs. Sale Prices: Entire Sample

+0.8%

Metro Area	Market Class	# of Sale Values	# of AVM Values	% of AVM Values	Bias** AVM vs. Sale Prices
Akron, OH	Soft	15,784	11,948	2.48%	1.67%
Albuquerque, NM	Soft	11,944	7,518	1.56%	-0.54%
Anniston, AL	Soft	232	9	0.00%	-5.06%
Atlanta, GA	Soft	11,848	8,990	1.86%	1.01%
Baton Rouge, LA	Soft	8,520	4,486	0.93%	0.72%
Biloxi-Gulfport-Pascagoula, MS	Soft	696	84	0.02%	6.21%
Birmingham, AL	Soft	760	451	0.09%	2.45%
Boulder-Longmont, CO	Soft	104	85	0.02%	1.53%
Brazoria, TX	Soft	24	13	0.00%	3.08%
Canton-Massillon, OH *	n/a	680	359	0.07%	0.38%
Charlotte-Gastonia-Rock Hill, NC-SC	Soft	25,928	18,920	3.92%	2.37%
Chattanooga, TN-GA	Soft	792	537	0.11%	2.95%
Cincinnati, OH-KY-IN	Soft	6,696	5,803	1.20%	0.58%
Clarksville-Hopkinsville, TN-KY	Soft	360	224	0.05%	0.71%
Cleveland-Lorain-Elyria, OH	Soft	38,936	35,675	7.40%	1.08%
Columbia, SC	Soft	16,160	13,512	2.80%	2.21%
Columbus, GA-AL	Soft	24	-	0.00%	0.00%
Columbus, OH	Soft	48,856	39,571	8.20%	0.80%
Dallas, TX	Soft	25,968	16,866	3.50%	1.28%
Dayton-Springfield, OH	Soft	16,288	14,027	2.91%	0.95%
Decatur, AL	Soft	112	8	0.00%	-1.78%
Denver, CO	Weak	21,064	19,185	3.98%	1.51%
Detroit, MI	Soft	51,920	36,673	7.60%	1.66%
Dothan, AL	Soft	224	17	0.00%	-3.09%
Evansville-Henderson, IN-KY	Soft	136	-	0.00%	0.00%
Florence, AL	Soft	528	15	0.00%	11.52%
Gadsden, AL	Soft	288	12	0.00%	2.10%
Galveston-Texas City, TX	Soft	440	246	0.05%	2.12%
Grand Rapids-Muskegon-Holland, MI	Soft	11,264	6,504	1.35%	0.76%
Greenville-Spartanburg-Anderson, SC	Soft	12,088	7,159	1.48%	2.31%
Hamilton-Middletown, OH	Soft	16	15	0.00%	2.08%
Houston, TX	Soft	58,056	38,566	8.00%	0.39%
Huntington-Ashland, WV-KY-OH	Soft	56	-	0.00%	0.00%
Huntsville, AL	Soft	328	30	0.01%	0.00%
Indianapolis, IN	Soft	7,112	3,164	0.66%	16.32%
Jackson, MS	Soft	712	119	0.02%	1.69%
Jackson, TN	Soft	80	55	0.01%	3.27%
Johnson City-Kingsport-Bristol, TN-VA	Soft	552	347	0.07%	2.50%
Knoxville, TN	Soft	800	461	0.10%	1.40%
Lexington, KY	Soft	656	143	0.03%	4.27%
Louisville, KY-IN	Soft	784	205	0.04%	1.56%
Memphis, TN-AR-MS	Soft	44,040	40,529	8.40%	1.62%
Mobile, AL	Soft	792	367	0.08%	1.66%
Montgomery, AL	Soft	728	340	0.07%	0.03%
Nashville, TN	Soft	752	536	0.11%	2.09%
Owensboro, KY	Soft	304	49	0.01%	0.97%
Salt Lake City-Ogden, UT	Weak	28,936	21,346	4.43%	-0.98%
San Francisco, CA	Soft	39,608	36,701	7.61%	0.00%
San Jose, CA	Weak	71,024	67,226	13.94%	-0.63%
Santa Fe, NM *	n/a	32	7	0.00%	-5.69%
Toledo, OH	Soft	11,960	10,497	2.18%	2.30%
Tulsa, OK	Soft	14,272	12,578	2.61%	0.94%
Tuscaloosa, AL	Soft	352	119	0.02%	-1.71%

* Sampling error

** Bias is the median absolute deviation of AVM values as of the loan origination date with respect to the corresponding sale prices

EXHIBIT 2: CATC DATA SAMPLE GEOGRAPHIC DISTRIBUTION (ALPHABETIC - FULL APPRAISAL SAMPLE)

Composite AVM Bias vs. Full Appraisals: Entire Sample

-3.6%

Metro Area	Market Class	# of Apprsl Values	# of AVM Values	% of AVM Values	Bias** AVM vs. Full Appraisal Values
Akron, OH	Soft	1,680	1,318	1.6%	-8.86%
Albuquerque, NM	Soft	4,496	2,472	3.1%	-4.66%
Anniston, AL	Soft	224	3	0.0%	-11.11%
Atlanta, GA	Soft	8,832	6,303	7.8%	-4.13%
Baton Rouge, LA	Soft	888	265	0.3%	-3.00%
Biloxi-Gulfport-Pascagoula, MS	Soft	624	70	0.1%	1.40%
Birmingham, AL	Soft	1,808	1,171	1.5%	0.00%
Charlotte-Gastonia-Rock Hill, NC-SC	Soft	5,088	3,627	4.5%	-4.55%
Chattanooga, TN-GA	Soft	688	476	0.6%	-3.16%
Cincinnati, OH-KY-IN	Soft	5,416	4,053	5.0%	-4.27%
Clarksville-Hopkinsville, TN-KY	Soft	208	146	0.2%	-4.05%
Cleveland-Lorain-Elyria, OH	Soft	4,056	3,545	4.4%	-5.60%
Columbia, SC	Soft	1,056	767	1.0%	-2.63%
Columbus, GA-AL	Soft	32	-	0.0%	0.00%
Columbus, OH	Soft	4,432	3,495	4.3%	-3.81%
Dallas, TX	Soft	4,096	2,617	3.3%	0.00%
Dayton-Springfield, OH	Soft	3,104	2,653	3.3%	-6.00%
Decatur, AL	Soft	200	11	0.0%	-12.38%
Denver, CO	Weak	10,296	9,465	11.8%	-3.72%
Detroit, MI	Soft	8,672	5,876	7.3%	-6.45%
Dothan, AL	Soft	144	8	0.0%	11.30%
Evansville-Henderson, IN-KY	Soft	104	-	0.0%	0.00%
Flint, MI	Soft	8	4	0.0%	-20.31%
Florence, AL	Soft	240	9	0.0%	-19.76%
Gadsden, AL	Soft	184	11	0.0%	7.76%
Grand Rapids-Muskegon-Holland, MI	Soft	4,248	2,268	2.8%	-4.97%
Greenville-Spartanburg-Anderson, SC	Soft	2,112	987	1.2%	-5.71%
Houston, TX	Soft	4,904	3,232	4.0%	3.56%
Huntington-Ashland, WV-KY-OH	Soft	72	-	0.0%	0.00%
Huntsville, AL	Soft	488	36	0.0%	-4.14%
Indianapolis, IN	Soft	6,536	2,317	2.9%	4.55%
Jackson, MS	Soft	1,184	250	0.3%	0.00%
Jackson, TN	Soft	360	189	0.2%	-5.21%
Johnson City-Kingsport-Bristol, TN-VA	Soft	320	187	0.2%	-4.00%
Knoxville, TN	Soft	1,480	921	1.1%	-4.81%
Lansing-East Lansing, MI *	n/a	8	4	0.0%	14.41%
Lexington, KY	Soft	680	123	0.2%	-0.81%
Louisville, KY-IN	Soft	1,464	385	0.5%	-4.79%
Memphis, TN-AR-MS	Soft	3,568	2,732	3.4%	-3.44%
Mobile, AL	Soft	920	404	0.5%	-1.04%
Montgomery, AL	Soft	504	209	0.3%	0.00%
Nashville, TN	Soft	2,392	1,841	2.3%	-3.33%
Owensboro, KY	Soft	152	18	0.0%	-7.07%
Provo-Orem, UT *	n/a	8	6	0.0%	-4.06%
Salt Lake City-Ogden, UT	Weak	7,032	5,111	6.4%	-6.64%
San Francisco, CA	Soft	1,920	1,834	2.3%	2.34%
San Jose, CA	Weak	6,111	5,936	7.4%	-0.83%
Shreveport-Bossier City, LA *	n/a	8	2	0.0%	-5.86%
Toledo, OH	Soft	1,256	1,136	1.4%	-7.22%
Tulsa, OK	Soft	2,232	1,838	2.3%	-4.84%
Tuscaloosa, AL	Soft	144	80	0.1%	-4.09%

* Sampling error

** Bias is the median absolute deviation of AVM values as of the loan origination date with respect to the corresponding full appraisal values

EXHIBIT 3: CATC DATA SAMPLE BIAS RANKING (BIAS OF AVM VALUES WITH RESPECT TO SALE PRICES)

Composite AVM Bias vs. Sale Prices: Entire Sample

+0.8%

Metro Area	Market Class	# of Sale Values	# of AVM Values	% of AVM Values	Bias** AVM vs. Sale Prices
Tuscaloosa, AL	Soft	352	119	0.02%	-1.71%
Salt Lake City-Ogden, UT	Weak	28,936	21,346	4.43%	-0.98%
San Jose, CA	Weak	71,024	67,226	13.94%	-0.63%
Albuquerque, NM	Soft	11,944	7,518	1.56%	-0.54%
Huntsville, AL	Soft	328	30	0.01%	0.00%
San Francisco, CA	Soft	39,608	36,701	7.61%	0.00%
Montgomery, AL	Soft	728	340	0.07%	0.03%
Canton-Massillon, OH *	n/a	680	359	0.07%	0.38%
Houston, TX	Soft	58,056	38,566	8.00%	0.39%
Cincinnati, OH-KY-IN	Soft	6,696	5,803	1.20%	0.58%
Clarksville-Hopkinsville, TN-KY	Soft	360	224	0.05%	0.71%
Baton Rouge, LA	Soft	8,520	4,486	0.93%	0.72%
Grand Rapids-Muskegon-Holland, MI	Soft	11,264	6,504	1.35%	0.76%
Columbus, OH	Soft	48,856	39,571	8.20%	0.80%
Tulsa, OK	Soft	14,272	12,578	2.61%	0.94%
Dayton-Springfield, OH	Soft	16,288	14,027	2.91%	0.95%
Owensboro, KY	Soft	304	49	0.01%	0.97%
Atlanta, GA	Soft	11,848	8,990	1.86%	1.01%
Cleveland-Lorain-Elyria, OH	Soft	38,936	35,675	7.40%	1.08%
Dallas, TX	Soft	25,968	16,866	3.50%	1.28%
Knoxville, TN	Soft	800	461	0.10%	1.40%
Denver, CO	Weak	21,064	19,185	3.98%	1.51%
Boulder-Longmont, CO	Soft	104	85	0.02%	1.53%
Louisville, KY-IN	Soft	784	205	0.04%	1.56%
Memphis, TN-AR-MS	Soft	44,040	40,529	8.40%	1.62%
Detroit, MI	Soft	51,920	36,673	7.60%	1.66%
Mobile, AL	Soft	792	367	0.08%	1.66%
Akron, OH	Soft	15,784	11,948	2.48%	1.67%
Jackson, MS	Soft	712	119	0.02%	1.69%
Nashville, TN	Soft	752	536	0.11%	2.09%
Galveston-Texas City, TX	Soft	440	246	0.05%	2.12%
Columbia, SC	Soft	16,160	13,512	2.80%	2.21%
Toledo, OH	Soft	11,960	10,497	2.18%	2.30%
Greenville-Spartanburg-Anderson, SC	Soft	12,088	7,159	1.48%	2.31%
Charlotte-Gastonia-Rock Hill, NC-SC	Soft	25,928	18,920	3.92%	2.37%
Birmingham, AL	Soft	760	451	0.09%	2.45%
Johnson City-Kingsport-Bristol, TN-VA	Soft	552	347	0.07%	2.50%
Chattanooga, TN-GA	Soft	792	537	0.11%	2.95%
Jackson, TN	Soft	80	55	0.01%	3.27%
Lexington, KY	Soft	656	143	0.03%	4.27%

* Sampling error.

** Bias is the median arithmetic deviation of AVM values as of the loan origination date with respect to the corresponding sale prices.

Markets with fewer than 30 sample observations excluded.

**EXHIBIT 4: CATC DATA SAMPLE BIAS RANKING
(BIAS OF AVM VALUES WITH RESPECT TO FULL APPRAISALS)**

Composite AVM Bias vs. Full Appraisals: Entire Sample

-3.6%

Metro Area	Market Class	# of Apprsl Values	# of AVM Values	% of AVM Values	Bias** AVM vs. Full Appraisal Values
Akron, OH	Soft	1,680	1,318	1.6%	-8.86%
Toledo, OH	Soft	1,256	1,136	1.4%	-7.22%
Salt Lake City-Ogden, UT	Weak	7,032	5,111	6.4%	-6.64%
Detroit, MI	Soft	8,672	5,876	7.3%	-6.45%
Dayton-Springfield, OH	Soft	3,104	2,653	3.3%	-6.00%
Greenville-Spartanburg-Anderson, SC	Soft	2,112	987	1.2%	-5.71%
Cleveland-Lorain-Elyria, OH	Soft	4,056	3,545	4.4%	-5.60%
Jackson, TN	Soft	360	189	0.2%	-5.21%
Grand Rapids-Muskegon-Holland, MI	Soft	4,248	2,268	2.8%	-4.97%
Tulsa, OK	Soft	2,232	1,838	2.3%	-4.84%
Knoxville, TN	Soft	1,480	921	1.1%	-4.81%
Louisville, KY-IN	Soft	1,464	385	0.5%	-4.79%
Albuquerque, NM	Soft	4,496	2,472	3.1%	-4.66%
Charlotte-Gastonia-Rock Hill, NC-SC	Soft	5,088	3,627	4.5%	-4.55%
Cincinnati, OH-KY-IN	Soft	5,416	4,053	5.0%	-4.27%
Huntsville, AL	Soft	488	36	0.0%	-4.14%
Atlanta, GA	Soft	8,832	6,303	7.8%	-4.13%
Tuscaloosa, AL	Soft	144	80	0.1%	-4.09%
Clarksville-Hopkinsville, TN-KY	Soft	208	146	0.2%	-4.05%
Johnson City-Kingsport-Bristol, TN-VA	Soft	320	187	0.2%	-4.00%
Columbus, OH	Soft	4,432	3,495	4.3%	-3.81%
Denver, CO	Weak	10,296	9,465	11.8%	-3.72%
Memphis, TN-AR-MS	Soft	3,568	2,732	3.4%	-3.44%
Nashville, TN	Soft	2,392	1,841	2.3%	-3.33%
Chattanooga, TN-GA	Soft	688	476	0.6%	-3.16%
Baton Rouge, LA	Soft	888	265	0.3%	-3.00%
Columbia, SC	Soft	1,056	767	1.0%	-2.63%
Mobile, AL	Soft	920	404	0.5%	-1.04%
San Jose, CA	Weak	6,111	5,936	7.4%	-0.83%
Lexington, KY	Soft	680	123	0.2%	-0.81%
Montgomery, AL	Soft	504	209	0.3%	0.00%
Jackson, MS	Soft	1,184	250	0.3%	0.00%
Birmingham, AL	Soft	1,808	1,171	1.5%	0.00%
Dallas, TX	Soft	4,096	2,617	3.3%	0.00%
Biloxi-Gulfport-Pascagoula, MS	Soft	624	70	0.1%	1.40%
San Francisco, CA	Soft	1,920	1,834	2.3%	2.34%
Houston, TX	Soft	4,904	3,232	4.0%	3.56%
Indianapolis, IN	Soft	6,536	2,317	2.9%	4.55%

** Bias is the median absolute deviation of AVM values as of the loan origination date with respect to the corresponding full appraisal values
Markets with fewer than 30 sample observations excluded

EXHIBIT 5: CATC DATA SAMPLE

MODEL BIAS ANALYSIS: NUMBER OF MODELS (BY STATE & BENCHMARK TYPE)

8 AVMs Total				
Benchmark Set ----->	FULL APPRAISALS		SALE PRICES	
State	# AVMs with Values*	# AVMs not Higher**	# AVMs with Values*	# AVMs not Higher**
AL	8	7	8	1
CA	8	5	8	5
CO	8	8	8	0
GA	8	8	7	0
IN	5	2	5	0
KY	7	7	3	0
LA	5	4	5	3
MI	8	8	7	1
MS	3	1	3	1
NC	8	8	8	0
NM	7	5	7	3
OH	8	8	8	1
OK	8	8	8	0
SC	8	8	8	1
TN	8	8	8	1
TX	8	4	8	4
UT	8	7	8	4
All States	115	99 86.1%	109	24 22.0%

* For an AVM to be counted within a State tally, a minimum of 30 returned values was required.

** Number of models (with at least 30 values returned within a given State) that generated values with bias of less than or equal to 0.00%. Bias measured with the median arithmetic deviation of AVM values with respect to corresponding benchmark values.

CATC Soft Markets Test Sample: AVM Contributors	
AVM Brand	AVM Developer Company
CASA®	Fiserv CSW, Inc.
CMV	TransUnion
i-Value	Real-Info
PowerBase 6	First American
ValueFinder SM	Countrywide / LandSafe
ValuePoint 4	First American
ValueSure	Fidelity
Vero Value	Veros Software

**EXHIBIT 6: CATC DATA SAMPLE
MODEL BIAS ANALYSIS vs. FULL APPRAISALS
NUMBER OF MODELS (BY INDIVIDUAL SOFT MARKET)**

Metro Area	Market Class	# of AVM Values	Bias** AVM vs. Full Appraisal	8 AVMs Total	
				# AVMs with Values***	# AVMs not Higher****
Akron, OH	Soft	1,318	-8.86%	7	7
Albuquerque, NM	Soft	2,472	-4.66%	7	7
Atlanta, GA	Soft	6,303	-4.13%	8	8
Baton Rouge, LA	Soft	265	-3.00%	5	4
Biloxi-Gulfport-Pascagoula, MS	Soft	70	1.40%	1	0
Birmingham, AL	Soft	1,171	0.00%	8	2
Charlotte-Gastonia-Rock Hill, NC-SC	Soft	3,627	-4.55%	8	8
Chattanooga, TN-GA	Soft	476	-3.16%	7	6
Cincinnati, OH-KY-IN	Soft	4,053	-4.27%	8	8
Cleveland-Lorain-Elyria, OH	Soft	3,545	-5.60%	8	8
Columbia, SC	Soft	767	-2.63%	8	6
Columbus, OH	Soft	3,495	-3.81%	7	7
Dallas, TX	Soft	2,617	0.00%	8	5
Dayton-Springfield, OH	Soft	2,653	-6.00%	8	8
Denver, CO	Weak	9,465	-3.72%	8	8
Detroit, MI	Soft	5,876	-6.45%	8	8
Grand Rapids-Muskegon-Holland, MI	Soft	2,268	-4.97%	6	6
Greenville-Spartanburg-Anderson, SC	Soft	987	-5.71%	8	8
Houston, TX	Soft	3,232	3.56%	8	3
Indianapolis, IN	Soft	2,317	4.55%	5	3
Jackson, MS	Soft	250	0.00%	3	1
Jackson, TN	Soft	189	-5.21%	2	2
Johnson City-Kingsport-Bristol, TN-VA	Soft	187	-4.00%	2	2
Knoxville, TN	Soft	921	-4.81%	8	8
Lexington, KY	Soft	123	-0.81%	2	2
Louisville, KY-IN	Soft	385	-4.79%	3	3
Memphis, TN-AR-MS	Soft	2,732	-3.44%	8	8
Mobile, AL	Soft	404	-1.04%	6	4
Montgomery, AL	Soft	209	0.00%	5	3
Nashville, TN	Soft	1,841	-3.33%	8	8
Salt Lake City-Ogden, UT	Weak	5,111	-6.64%	8	7
San Francisco, CA	Soft	1,834	2.34%	8	4
San Jose, CA	Weak	5,936	-0.83%	8	6
Toledo, OH	Soft	1,136	-7.22%	8	8
Tulsa, OK	Soft	1,838	-4.84%	8	8
				228	194
					85.1%

** Bias is the median arithmetic deviation of AVM values as of the loan origination date with respect to the corresponding full appraisal values

*** For an AVM to be counted within a State tally, a minimum of 30 returned values was required.

**** Number of models (with at least 30 values returned within a given State) that generated values with bias of less than or equal to 0.00%. Bias measured with the median arithmetic deviation of AVM values with respect to corresponding benchmark values.