# CONTRACT PRICE CONFIRMATION BIAS: EVIDENCE FROM REPEAT APPRAISALS

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**ABSTRACT**

For at least two decades appraisers have valued homes at or above purchase price for over ninety percent of GSE transactions, leading to suggestions of confirmation bias. Reforms following the 2008 housing crisis attempted to improve the independence and accuracy of appraisals, and some early research indicated these reforms were marginally successful, with the percent of transactions confirmed falling from a high of 98% in 2007 to 94% in 2009. However, with confirmation rates drifting up again, this paper attempts to answer once and for all if and how the purchase contract is influencing the appraised value. Prior efforts to analyze this could only argue theoretically that the appraisal distribution above and below transaction should be symmetric, as researchers typically have neither had the benefit of a second benchmark appraisal uncolored by a contract nor a true market value distinct from the transaction. This empirical concern is addressed in the current paper by using a unique database of residential properties that were appraised twice within 6 months between 2012 and 2015, where one of the appraisers was uninformed of the contract price. Significant differences were found between the two appraisals, where the appraiser aware of the contract price used a different set of comparable transactions, price adjustments, and weights of adjusted values of comparable transactions to justify appraised values which confirmed contract price. Potential economic costs of confirmation bias by appraisers and recommendations for further reforms are discussed in the conclusion.

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## I. INTRODUCTION

Home mortgage lenders require an independent appraisal to verify the value of the property that will serve as collateral to the loan. This is because the probability the borrower will default on the loan is directly related to the ratio of loan balance to collateral value (see for instance Foote et al. (2008), Kelly (2008), Mayer et al. (2009), Bhutta et al. (2010), Elul et al. (2010), and An et al. (2012)). Earlier research has also indicated borrowers have financial incentives to misrepresent its value in order to increase their leverage, or decrease their borrowing costs (Agarwal, Ben-David, and Yao, 2015). The accuracy and independence of appraisals were questioned during the housing boom and bust of the 2000s, which prompted several subsequent reforms of the process (Agarwal, et al. 2015; Calem, et al., 2015; Ding and Nakamura, 2016). In this paper, a novel data series for residential properties that were appraised twice, once just before contract and once just after, is used to show appraisers still target contract price even after those reforms.

Cho and Megbolugbe (1996) first illustrated a striking statistical feature of the appraised values of residential properties: 65% of appraisals in 1993 were above the purchase price, and 30% were exactly at the purchase price.[2] Both of these values were significantly higher than what the authors claimed would be reached through an independent and unbiased distribution of value. One offered explanation of their results was that appraisers were informed of the stated contract price, which usually became the sale price, and had financial incentives to justify that amount.[3] The systematic difference between the appraised value and the true market price has subsequently been termed appraisal bias (Chinloy, et al., 1997).[4]

Figure 1 illustrates Cho and Megbolugbe's result was not an anomaly unique to 1993. It shows appraisal price compared to purchase price for 17 million loans intended for home purchase guaranteed by

[2] Horne and Rosenblatt (1996) also report a similar pattern.

[3] Appriasals below contract are about twice as common as appraisals below transaction price, though in our coverage period, both are typically well below ten percent. When an appraisals is low, the purchase price is often renegotiated down to appraisal, or, to a lesser extent, the sale does not proceed. Data on appraisal v. contract are available, so far as we know, only in the present paper and Ding and Namaura (2016).

[4] Chinloy et al (1997), Fout and Yao (2016) present evidence that appraised values are on average 2% higher than purchase prices over their sample of GSE purchases mortgages from 1975 through 1993. For a detailed literature review on appraisal bias see Yiu, et al. (2006).

Fannie Mae between 1992 and 2015. The orange portion in the figure represents the 64.5% of appraisals were above transaction price. The tan area represents appraisals *exactly* equal to the transaction: 32.3%. The narrow green area – less than four percent overall - represents appraisals below purchase price. Immediately before large declines in house price associated with the Great Recession in 2008, over 98% of appraisals were equal to or exceeded the purchase price.

The economic cost of biased appraisals is potentially quite large. LaCour-Little and Malpezzi (2003) first provided evidence that borrowers were more likely to default on loans associated with upwardly biased appraisals. More recently, Agarwal et al. (2015) demonstrated that appraisals for cash-out refinance loans between 1990 to 2011 often valued homes above the authors' estimate of value, and that over-valued homes were more likely to subsequently default. Other potential costs of bias include an exaggeration of the procyclicality of housing booms and busts (Calem et al., 2015; Nakamura 2010; Ding 2014), information loss to borrowers who could potentially renegotiate or walk away from sales (Ding and Nakamura 2016; Fout and Yao 2016), and distortions in the valuation of mortgage investments.[5]

A key reform that went into effect in 2009 was the Home Valuation Code of Conduct (HVCC) as a result of a joint agreement between Fannie Mae, Freddie Mac, the Federal Housing Finance Agency, and the New York State Attorney General. The HVCC primarily aimed to separate the financial incentives and independence of appraisers from the loan origination process for loans purchased by Fannie Mae and Freddie Mac (Agarwal and Ben-David, 2012; Ding and Nakamura, 2016). Dodd-Frank (2010) codified the HVCC and applied it to all loan originations. Recent research illustrated the reforms were associated with a small, immediate reduction in estimated appraisal bias, but the degree of bias that remains is unclear (Shi and Zhang, 2015; Ding and Nakamura, 2016). For example, Figure 1 illustrates that appraisal confirmation purchase price fell to approximately 94% of transactions in 2009, but confirmation rates had subsequently risen back to nearly average pre-reform rates by 2015.

[5] Ding (2014b) focuses on the costs of appraisals that come in below contract price (potentially due to downward bias in the wake of increased appraisal requirements) including the increased probability of delayed and canceled sales.

An empirical challenge to estimating the degree of bias in appraisals has been that when the appraisal is associated with a purchase loan application, the appraiser has foreknowledge of the contract price; and when the appraisal is associated with a refinance applications, there is no reliable market value for comparison. Earlier research has compared appraisals to model-based estimates of market value, either using local average house price increases anchored to transactions (Agarwal, et al., 2015; Shi and Zhang, 2015; Fout and Yao, 2016) or cross-sectional model values (Lacour-Little and Malpezzi 2003; Calem, Lambie-Hanson and Nakamura, 2015). While these methods often indicate significantly different estimated values than appraisers, it is unclear whether those alternative estimates are themselves biased.[6]

We are able to study confirmation bias in purchase money appraising without identification concerns by using a unique data series of 8,533 Fannie Mae foreclosure properties, which were appraised twice within 6 months, with no alterations to the property between appraisals. The first appraisal, which we define as the "pre-contract appraisal," was the result of Fannie Mae hiring a local appraiser to determine the market value of the property after a foreclosure to assist in marketing the property.[7] The second appraisal occurred after contract, on behalf of the prospective buyer seeking a mortgage to complete the purchase. We compare the stated subject property attributes, selected comparable transactions (comps), adjustments for differences between subject and comps, and reconciliations of the pre-contract appraisers to those of the second appraiser who is provided with the contract, i.e., the "post-contract appraisal."[8] The pairs were selected without regard to final approval or closing, avoiding any concern that low second appraisals were omitted because they may have produced fewer closings.

[6] In general model-based methods can encompass hedonic models (Lacour-Little and Malpezzi 2003) or other econometric frameworks (Calem, et al., 2015) aimed at isolating some measure of the underlying collateral value.

[7] In addition, the pre-contract appraiser helped determine the 8,533 properties were in adequate condition and conducted no repairs on the property before the property was marketed to potential buyers. A larger sample of properties with repeat appraisals where some properties had repairs completed show similar patterns.

[8] The appraisal from the post-contract appraiser was obtained from the Uniform Appraisal Dataset (UAD). The UAD is a component of the Uniform Mortgage Data Program, an initiative undertaken by Fannie Mae and Freddie Mac. UAD specifically focuses on real estate appraisals and consists of a set of standard rules for classifying appraisal data, and a standard set of abbreviations to use in most common types of appraisal reports. It also specifies a new XML electronic format for delivering appraisals, based on the Mortgage Industry Standards Maintenace Organization (MISMO) standard

Despite having the same unaltered subject, significant differences were found between the two appraisals; and several of these differences appeared to be strongly influenced by appraisal knowledge of the contract price for the second appraisal. First, post-contract appraisers were more likely than pre-market appraisers to select comparable sales which sold for average prices above contract. Second, post-contract appraisers adjusted comparable values more positively than did pre-contract appraisers, particularly when comparable sales had average values below contract. Third, post-contract appraisers applied more weight to higher valued comparable transactions if an average of all comparables would have resulted in an appraised value less than contract price. At every stage post-contract appraisals showed non-symmetric moves toward the contract or above it, in a tighter and tighter validation of contract. Finally, the post-contract appraisal was on average 4.2% higher than the pre-contract appraisal for the identical property, after controlling for differences in local home price index between when the two appraisals were completed. Even the data descriptions of the same subject could differ between the two appraisals. To a small extent this could be explained by more favorable average description of the subject in the second appraisal, but numerous differences appeared to reflect industry confusion about GSE condition and quality categories.[9]

The analysis continues by expanding the external validity of the research. In particular, a larger sample of all 3,751,547 post-contract purchase appraisals available to Fannie Mae during the same time period were shown to be similar to the post-purchase appraisals of foreclosed properties in all critical steps. Again, all available appraisals were used, without regard to ultimate approval or delivery to Fannie Mae. As with the foreclosure analysis, the average prices of comparables were more often above the contract and peaked just above contract. Adjustments were made so the average price of adjusted comparables were even more likely to be above contract than the average price of unadjusted sales, and even more peaked just above contract. Finally, appraisers also applied more weight to higher valued comparable transactions when the average

[9] The two appraisals agreed on quality for only 60.1% and agreed on condition even less - 55.9% of the time.The quality score ranges from Q1-Q6, where Q1 indicates the property is "architect designed" and Q6 corresponds to "substandard." The possible condition score ranged from C1 to C6, with C1 indicating "new construction" and C6 being "uninhabitable."

would have resulted in an appraised value less than contract for the larger sample – leading to a distribution severely skewed with a large mass exactly at contract.

Our research shows that despite recent reforms to the appraisal process, systematic biases of appraisers to confirm the contract price persist. We discuss potential sources of biases leading to this result in the next section, and make specific policy reforms to counter these documented biases in the conclusion.

## II. BACKGROUND

The Real Estate Appraisal Reform Act of 1987 requires a standardized and written appraisal conducted by an independent and qualified appraiser for all federally related mortgage loans.[10] The purpose of the appraisal is to verify the stated value of collateral that a borrower pledges to the mortgage lender in exchange for receiving a home loan. Earlier research has documented the likelihood a borrower defaults on a loan is directly related to their loan balance divided by collateral value (i.e., loan-to-value (LTV)), so mortgage lenders and secondary mortgage market institutions, like Fannie Mae, use the lower of purchase price or appraised value in determining interest rates charged to borrowers. The independence of the appraisal from the buyer and seller is important because they have incentives to collude to inflate appraised value to increase leverage, or equivalently decrease borrowing costs of the buyer (Ben-David, 2011). The independence of the appraisal from the lender is important due to potential agency issues between the lender and either its employees or investors in the loans.

Appraisals are required both for home loans associated with an initial purchase and for refinancing of an existing loan. The focus of the current study are appraisals associated with a purchase, that are initiated after the buyer and seller agree to a future purchase price (i.e., the contract price), and the buyer subsequently applies for a mortgage loan. Appraised values below the offered contract price often result in borrowers

[10] A federally related mortgage loan includes home purchase loans, refinancing, lender approved assumptions, property improvement loans, equity lines of credit, and reverse mortgages defined by the Consumer Financial Protection Bureau (CFBP) under the Real Estate Settlement Procedures Act (RESPA).

needing to increase down payments, pay higher interest rates, or pay for private mortgage insurance (Fout and Yao, 2016).[11]

Prior to 2009, lenders could directly select qualified appraisers and there was widespread evidence that some appraisers would lose their preferred status, and therefore future business, for reporting appraised values below the contract price. In response to evidence that appraisal bias and alleged collusion in appraisal values, then New York Attorney General Andrew Cuomo sued eAppraiseIT, an appraisal management company working with Washington Mutual, for forcing its appraisers to provide appraisal values in support of inflated contract prices. To help eliminate these types of appraisal practices, the GSEs and the Federal Housing Finance Agency agreed to adopt the HVCC, which became effective in May 2009 and codified into law by Dodd-Frank a year later.[12] The reforms implemented within the adoption of the HVCC were designed to enhance the independence and accuracy of appraisal values by, for instance, prohibiting lenders and other third parties from influencing the appraisal reporting process, requiring separation of an originator's lending and appraising functions, and requiring lenders to share the appraisal report with borrowers in a timely fashion.

The requirements to become a licensed appraiser vary across states, but most states require a combination of coursework and apprenticeships to be licensed. Most states, and all federally-related mortgage loans, also require the appraiser to adopt the Universal Standards of Professional Appraisal Practice (USPAP) in reaching their estimated value. The comparable sales method of valuation is the universally adopted approach used by appraisers to value residential property. This method of valuation is composed of the following four steps:

1. Describe quantitative and qualitative attributes of the property subject to the appraisal
2. Find comparable sales that best match subject in characteristics, proximity, and recentness of sale
3. Adjust for differences between comparable and subject to get adjusted comparable sales

[11] For example, a borrower would have to pay a much higher effective interest rate if they contributed less than 20% of the pledged collateral amount as a down payment due to the requirement to additionally purchase private mortgage insurance in order for the loan to meet eligibility requirements to be sold to a Government Sponsored Enterprise (i.e., Fannie Mae or Freddie Mac).

[12] For more details on the HVCC, see http://www.fhfa.gov/Media/PublicAffairs/Documents/HVCCFinalCODE122308_N508.pdf. For more details on the Dodd-Frank rule as it relates to appraisals, see http://www.federalreserve.gov/newsevents/press/bcreg/20101018a.htm

4. Reconcile adjusted price of comparable properties to arrive at a final appraised value of subject property

Based on the above steps, the appraiser is asked to provide their appraised value of the subject to the exact dollar value. Even with near perfect data on the subject property and comparable transactions, this is problematic because rarely do adjusted prices of comparable transactions agree to the exact dollar and require the appraiser to apply their own weights to those transactions during the reconciliation (i.e., the fourth) step of the process. The reality is perfect data rarely exists, and appraisers are often required to provide an exact dollar estimate of the market value even when their own confidence interval of such an estimate is quite large.

Given appraisers are unaware of the precision of their own estimates, one possible explanation for observed "appraisal or confirmation bias" in the earlier literature is that it takes less personal effort to confirm the buyer is purchasing the property at the correct price. A number of works in the literature discuss the asymmetric outcomes in the lending process as it relates to the appraised value relative to contract (Nakamura, 2010; Ding and Nakamura 2016). In particular, if an appraisal comes in at or above contract price, there will be no direct impact on the seller or lender. If the appraisal comes in below contract price, it may inform the purchaser to renegotiate the purchase price, but risk cancelation of the contract if the seller is unwilling to negotiate or the purchaser is constrained in the amount of their initial equity. The incentive to raise appraised values to at least contract price exposes lenders and buyers to additional and undisclosed default risk.

Several recent studies have illustrated HVCC and related Dodd-Frank reforms have had at least a temporary marginal effect on reducing the number of appraisals equal to or above contract price (Agarwal, et al., 2015; Shi and Zhang 2015; Caleb, et al., 2015; Ding and Nakamura 2016). Caleb et al. (2015) showed that appraisals affected by the HVCC rule were 80% less likely to come in at the contract price immediately after the rule was implemented, but even after this reduction the great majority of appraisals differences attenuated over time in a pattern consistent with Figure 1. The long-term effect of these reforms on actually reducing appraisal bias and how much continues to exist post-reforms remains unclear as discussed in the next section.

## III. DATA AND METHODS

A limitation of earlier research is that no appraisals unconnected to the contract are available and the true market value of the appraised property is unobserved. Researchers attempt to remediate this deficit by producing their own estimate of the underlying property's value. They then compare their estimated value of the property to the appraiser's value, and attempt to claim any differences between the two estimates were due to "appraiser bias." In reality, observed differences between the appraiser and researcher's estimate of a property's value could arise from several alternative sources. For example, differences in estimates could arise from omitted variables of the subject or comparable properties, volatile markets, or even any underlying lack of precision of either estimate.

One approach used by earlier researchers uses cross-sectional linear regression and transaction price of properties that have sold in the local market to estimate shadow prices of individual attributes of those properties. They then use the derived shadow prices and the attributes of the subject property to forecast its value. This valuation approach is reliant on relatively strong identification assumptions, including data availability, functional form, stability of parameters, and observing all relevant determinants of value for both subject and comparable properties. For example, the presence of a swimming pool may be known to the appraiser but not the researcher, leading to the appraiser having consistently higher, and more accurate, estimates.

Another valuation approach requires earlier transactions of the same property. The researcher then assumes the property appreciated at the same rate as the average property in their local market between transactions as measured by differences in the housing price index (HPI). While potentially an improvement over cross-sectional methods due to differencing away time-invariant attributes, this method requires the strong assumption that time-variant differences in property attributes, and the values placed on them by the marginal buyers, are similar to the average property in the local market.

The solution offered in the current research is to focus on a subset of properties that were appraised twice within 6 months between 2012 and 2015, where only one appraiser was informed of the contract price and no alterations to the property occurred between appraisals. These properties were appraised twice because Fannie Mae owned the property following a foreclosure, and they hired a local appraiser to provide an independent assessment of market value to assist with their marketing the property for sale. The second appraisal was lender-triggered when a contract price was agreed upon and a buyer applied for a mortgage loan. This empirically enables the identification of contract price bias from other potential sources of bias as both appraisers used comparable valuation methods and data, but only one was informed of the contract price.

The data used in the analysis originates from the Uniform Appraisal Data (UAD) series consisting of appraisals submitted to Fannie Mae and Freddie Mac from January 2012 until December 2015.[13] The database contains information on 3,751, 547 appraisals associated with a home purchase loan application over this time period. The appraisal information in the database includes contract price, appraised value, objective (e.g., bedrooms, square footage, etc.) and qualitative (e.g., quality and condition) property attributes of both the subject property of the appraisal, and comparable properties selected by the appraiser. The first column of Table 1 illustrates the average attributes for these properties. The average age of the structure of the appraised property was 34.5 years old, had 3.3 bedrooms, and 2.0 full baths. The average appraised value for these properties was $313,580, with an average contract price of $310,308.

Given our focus on repeat appraisals, the full sample of appraisals is initially restricted to the 8,533 properties that were previously appraised by Fannie Mae and which were not altered between the two appraisal dates. The average age of these subset of properties were similar in age to the larger sample (35.1 years since construction), but were smaller (1,669 square feet) and had fewer bedrooms (3.0) and full bathrooms (1.8). The average appraised value for these properties was $161,547, and the average contract price was $156,359.

[13] The UAD is a standard for data entry for residential apraisals, required by Fannie Mae and Freddie Mac after Septmber 1, 2011. UAD data is collected according to the Fannie Mae 1004 form and forwarded electronically via the Uniform Collateral Data Portal (UCDP) to Fannie Mae and/or Freddie Mac.

Two main challenges to properly interpreting any differences in estimates and practices between appraisals as attributable to confirmation bias exist. The first challenge to properly interpreting our results is if changes to the condition of the property occurred between the two appraisal dates. In particular, it is not uncommon for foreclosures to be under-maintained or left in poor condition by the previous inhabitants. In these regards, all Fannie Mae foreclosures were cleaned to a habitable standard before the first appraisal was conducted, and properties where the appraiser felt the property needed further repairs to make them habitable were excluded from the sample. Properties were then cleaned at least monthly by a contractor hired by Fannie Mae. However, as no repairs were conducted in the period between appraisals (up to six months), there could be physical depreciation (e.g., paint fading) which could cause the second appraiser to provide a lower estimate of value.

The second challenge to identification is from changes in market prices. In particular, post-contract appraised values in our sample of repeat appraisals could be higher because market housing prices have increased in the local market. On average, there were 81.6 days between when the appraisals were completed and local housing markets increased on average 1.6% during that period. The median property was located in a market with 0.9% appreciation. Slightly less than the majority of the properties (44.4%) though were in markets within plus or minus 1% change in HPI between appraisal dates, and 16.0% in markets with declining prices.

*A priori*, it is unclear how best to adjust for known changes in market conditions between appraisal dates. Changes in markets conditions could be reflected in post-contract appraised values through two ways. First, changes in market conditions could be represented by the post-contract appraiser using more recent comparable transactions where the sales price of those properties already reflects price differences. Second, the post-contract appraiser may use a similar set of comparable transactions as the pre-contract appraiser, but make a direct adjustment for market conditions when calculating the adjusted sales price of the comparable transaction. To account for known changes in market conditions, we will present two sets of results. The first set will be unadjusted for market conditions, and represent the actual appraised values. The second set

will deflate post-contract appraised values by changes in the market conditions between appraisals as measured by changes in the local HPI measured at the zip code level. For example, if the HPI was 100 when the pre-contract appraisal was completed and rose to 102 by the post-contract appraisal data, the post-contract appraised value was multiplied by 100/102. This implicitly assumes subject properties either appreciated or depreciated in value at the same rate as the average property in their zip-code.

## IV. Are Appraisal Practices different When Contract Price is Known?

The main empirical interest of the analysis is if differences in appraisal practices and estimated market value occur when appraisers are informed of the contract price. Since virtually all appraisers use the comparable sales approach to value residential property, the results are organized by testing for differences in practice by pre- and post-contract appraisers during each of the four steps of the appraisal.

*Characteristics of Property Subject to the Appraisal*

Both the pre-contract and post-contract appraiser visited the subject property and reported the attributes of the subject property required by the 1004 Fannie Mae appraisal form. These attributes included objective measures such as location, number of bedrooms, bathrooms, half-baths, square footage of living area, basement size, percent of basement finished, lot size, and year of construction. It is important to emphasize that since the same individual property is being appraised twice within a relatively short-time period and no changes were known to be made to the property between those appraisals, the expectation is that the physical and qualitative attributes should be similar.

The top part of Table 2 illustrates differences in stated property attributes for the sample by appraisal type. The first column lists the average value for the post-contract appraisal for each attribute, and the second column lists averages for the pre-contract appraisal. The third column represents average post- minus pre-contract appraisal differences, with the fourth column indicating the p-value of a t-test that the two values are the same. With the exception of age, no statistical or economically meaningful differences in average stated objective physical attributes were found between the two appraisals. Although only relatively small differences in average objective attributes of a subject property were observed, it was not unusual for differences to occur between the two appraisals for these property attributes despite their objective nature. In particular, 8.7% of post-contract appraisals had a different indicated number of bedrooms, 59.4% had a greater

than a +/- 1% difference in square footage of living area, and 26.9% had a greater than +/- 1% difference in square footage of lot size.

During the visit to the property, the appraisers were also required to assess four key qualitative fields: (quality, condition, view, and location). Quality and condition are both categorized on six point scales, C1-C6 and Q1-Q6, with lower numbers indicating higher quality or better condition.[14] View and location are on three point scales, where one indicates "beneficial," two indicates "neutral," and three "adverse."[15] We do not focus on view and location here since view is rated neutral for over 87% of homes and location for over 90%. Table 3A and 3B illustrates the cross tabulation of the two appraisals for quality and condition, which are more diverse. The first column of panel A illustrates the distribution of the five quality scores assigned by the pre-contract appraiser. The most common quality category assigned by pre-contract appraisers was that the property was a standard tract home (72.5%), followed by high-quality tract home (17.8%), and inexpensive tract home (9.0%). The second through sixth columns of Panel A illustrate the distribution of quality assigned by the post-contract appraiser conditional on the pre-contract assigned quality. The value in the shaded diagonal portion of those columns would be equal to 100 if the appraisers always agreed on the quality of the property. For example, of the 766 properties indicated as an inexpensive tract home by the pre-contract appraiser, the post-contract appraiser indicated: 8.0% were an inexpensive tract home, 73.6% were a standard tract home, 18.0% a high-quality tract home, and 0.4% a custom home.

Surprisingly, the two appraisers overall agreed on the quality of the home only 60.1% of the time, and most often if the property was a standard tract home (71.6%). As indicated by the bottom part of Table 2, the post-contract appraisal averaged a 0.1 lower (that is, better) quality score for the same property, a difference statistically significant at the 1% level. This indicates that post contract appraisals had a slightly positive bias but that bias does not explain most of the divergence, which goes in either direction: the post-contract

[14] C1, brand new, never appears in foreclosures. C6, uninhabiltable, is also not included in the data as those properties required repairs.

[15] The full definitions can be found at http://www.freddiemac.com/singlefamily/sell/docs/uadreqs.pdf.

appraiser provided the worse rating almost as often as the pre-contract appraiser. Table 3B repeats the analysis for condition of property assigned by each appraiser, with similar inconsistency. In particular, the two appraisers only agreed on the condition of the property 55.9% of the time. On average, the post-contract appraiser assigned a score that was 0.3 lower (better condition) than their pre-contract counter-part, a difference statistically significant difference from 0 at the 1% level. Again, the bias did not explain much of the divergence. It would appear that that UAD definitions are either not clear or not being followed, otherwise appraisers would rate the very same properties more similarly.

*Measurement and Selection of Comparable Transactions*

The sales comparison method of valuation next requires appraisers to select recent transactions of similar properties (i.e., comparable properties). Table 4 illustrates the average attributes of comparable properties selected by the appraiser. The first column illustrates average attributes selected by the post-contract appraiser, while the second column illustrates the average attributes of the pre-contract appraiser. The third column is the post- minus pre- difference, with the fourth column indicating the p-value of a t-test of the statistical difference. The first row of the table indicates that the number of comparable properties used by the pre-contract appraisers was 68% greater, indicating that post-contract appraisers have filtered the comparable pool much more. Pre-foreclosure and post-foreclosure comparables of the two appraisals were on average relatively similar to the subjects, except the post-contract appraiser selected comps that were on average slightly further away (0.08 miles).

Panel A of Figure 2 illustrates the distribution of the pre-contract average comparable prices as a percent of contract price. Without adjustments or any over-weighting of sales, the average sales value of comparables would be the appraised value. Pre-contract appraisers selected comparable sales with widely spread-out average values (less than half within ten percent of contract), with 67.7% of average comparables above the ultimate contract price and mean comparable value 8.4% above contract. The comparables sold higher than contract (usually the sale price of the subject) because many of the foreclosed subjects were the

lowest valued in their neighborhood and had to be matched to higher valued homes. Panel A of Figure 3 illustrates the post-contract distribution of average comparable prices as a percent of contract price. The comparable sales price average of post-contract appraisers were more smoothly arranged around contract price, with half as many far to the left or right of contract as for pre-contract appraisers, and with a clear bunching just to the right of contract price. The mean of that distribution was very close to that of the pre-contract appraisals but, with contract known, 65.1% were within ten percent of it and 81.7% of average comparables above contract.

*Price and Market Adjustment of Comparable Sales*

After the selection of comparable sales, the next step of the appraisal process is to adjust the price of each individual property based on observable differences from the subject. Correct adjustments should bring adjusted sale prices closer to the contract price on average, by lowering the price of properties superior to the subject and raising the adjusted values of inferior comparables. This is what happened for the pre-contract appraisals, as seen in Panel B of Figure 2. The distribution of pre-contract adjusted sales prices shifted sharply to the left after adjustment and took on the shape of a normal distribution, reflecting appraiser awareness that most comparables were superior to the foreclosed subjects. The mean of the difference between average adjusted price and contract dropped to 2.3%, the median to 1.1%, and the percent within ten percent of ultimate contract rose to 59.3%. The percent of average adjusted values above contract was reduced to nearly half, as one would expect from an unbiased estimate – to 44.1%.

Post-contract appraisers adjusted differently: the comparables (Panel B of Figure 3) did not settle over contract instead but took on a sharper peak to the right of contract. The new mean and median difference from contract, at 5.9% and 3.9%, became more positive than for the average adjusted prices of pre-contract appraisals. The distribution also tightened further, with 75.4% within ten percent of known contract, and the percent above contract continued to grow, to 82.2%.

*Reconciliation of Adjusted Values*

The final step of the appraisal process is to reconcile differences in adjusted values of the comparable properties. In other words, each appraiser applies his own weights in how the adjusted sales prices of each individual comparable sale contributes to the final appraised value of the subject property. One potential set of weights is that each adjusted price of a comparable sale contributes equally to final appraised value of the subject property. In that case the appraisals would be distributed identically to Panel B of Figures 2 and 3. However, it makes sense that when adjusted average comparables are above contract, the lower-valued ones are at least slightly more likely to be the better matches, and visa versa when adjusted comparables averaged below contracts. Recognizing greater similarities with higher weight in reconciliation will pinch the distribution and move appraisals toward contract, but symmetrically. This is what occurred for pre-contract appraisals.

Panel C of Figure 2 shows the distribution of pre-contract appraised values as a percentage of the eventual contract price negotiated by the buyer and seller. The mean of that distribution was -1.0%, with 3.0% at zero exactly. Appraised prices were widely dispersed around contract, with more below than above, and 60.6% within ten percent of ultimate contract. Panel C of Figure 3 shows the post-contract appraisers reconciled to a distribution of values even more skewed to the right of contract, 92.7%, with a mean 4.0%, above contract - and 84.3% within ten percent of contract. Appraisals were an order of magnitude more likely to exactly correspond to the contract price when it was known in advance (19.2%).

Panel A and B of Figure 4 illustrate a stark difference in reconciliation practices between pre-contract and post-contract appraisers around contract value. The horizontal axis in each figure represents the reconciled value as a percentage of contract price, which would result from an equal weighting of adjusted sales price of comps. Thus zero indicates that the average adjusted sales prices are exactly equal to contract price. Positive implies average adjusted value is higher, negative lower. The vertical axis represents the probability that the reconciliation is higher than average adjusted sales – that is, the final appraised value is higher than the average adjusted sales. Looking first at Panel B of Figure 4, post-contract appraisers were

nearly always content with equal weighting of adjusted sales values (at most) - so long as that gave an appraised value at least equal to the contract (at or to the right of zero). But moving right to left, at zero there was a discontinuous leap to nearly one hundred percent in the probability of reconciliations above average adjusted price – in other words, nearly every time reconciling up was needed to confirm contract, it was done. When not needed, it was rarely done. In Panel A of Figure 4, pre-contract appraisers showed no similar break in practice. Generally, there was a continuous decrease in overweighting of higher valued comparables, as average prices rose relative to the contract price.

## V. Are Appraised Values different When Contract Price is Known?

The previous section showed appraisers behaved differently when contract price was known. In this section, how those differences in practices ultimately affect appraised values are quantified. Table 5 provides estimates of the average difference in pre- and post-contract appraised values. The dependent variable in each column is the natural log of appraised value, and the data is organized as a longitudinal panel with a separate intercept for each property and parameters were estimated using Ordinary Least Squares. The first column of estimates represents the unadjusted and unconditional difference in appraised value. On average, post-contract appraisals were 5.7% higher than their pre-contract counterparts. The standard error of the estimate, which is adjusted for possible non-independence of errors for the same property, is reported in parentheses below each estimate. That standard error is 0.2% and indicates the difference between the two estimates is significantly different from 0.

The estimate reported in the second column of Table 5 explicitly adjusts for market-wide differences in housing values between when the two appraisals were conducted. In particular, it multiplies the post-contract appraised value by the inverse of any differences in local market prices as measured by the housing price index (HPI) according to when the two appraisals occurred. When this adjustment is made, the difference between the pre- and post-contract appraised values decreases to 4.2%, which is still statistically different from 0 at the 1 percent level.

The third and fourth columns of estimates in Table 5 attempt to explain whether differences in subject attributes reported by each appraiser describes the difference in reported values. The third column does not adjust for differences in local market prices, while the fourth column does in a manner similar to column 2. The difference between the two appraisals remains significantly different than 0 even after controlling for differences in stated attributes and qualitative scores. The difference for post-contract appraisals is 4.7% without a market adjustment, and 3.1% with a market adjustment. The small differences in these estimates suggest differences in stated attributes plays at most a small role in explaining eventual differences in appraised values.

## VI. Are Values and Practices Unique to Repeat Appraisals?

Sections IV - V overcame previous identification concerns in the prior literature by focusing on differences in appraised value and practices by appraisers of a sample of 8,533 that were appraised twice between 2012 and 2015. These properties were appraised twice because they were previously foreclosed and an independent appraisal was commissioned before the property was marketed. The purpose of this section is to illustrate the observed practices were not unique to the sample of properties.

Figure 5 shows the distribution of 3,751,547 purchase money appraisals submitted to GSEs via the Uniform Collateral Data Portal (UCDP) between 2013 and 2015, for loans closed and unclosed. The appraisals were submitted to the portal in many cases because the lender was considering delivering the loan to Fannie Mae, but many of the closed loans were ultimately delivered to Freddie or FHA, and some were retained by the lender. Panel A of Figure 5 illustrates the distribution of unadjusted sale price of comparable transactions as a percent of contract price, Panel B is the average adjusted sale price of comparable transactions as percent of contract price, and Panel C is the final appraised value as a percent of contract price.

The key result of these figures is they look remarkably similar to the distributions of Figure 3 for post-contract appraisals that were previously appraised due to being a foreclosure. In Panel A of Figure 5, 70.9% of the larger sample had an average unadjusted sales price of comparable properties that exceeded the contract

price as compared to 80.7% of the restricted sample in Panel A of Figure 3.[16] The distribution also similarly became visibly skewed to above contract price based on attributes adjustment with 75.9% of adjusted values exceeding contract price in Panel B of Figure 5 as compared to 82.2% of the restricted sample in Figure 3. Finally, reconciliation moved the two distributions almost on top of each other, with 92.4% of the larger set at contract or above and 92.7% of post-foreclosure appraisals at or above contract. Both are extraordinarily peaked in a tight band bounded precisely on the left by contract; entirely different in distribution than for pre-contract appraisals. This pattern is similarly observed during the reconciliation in comparing the probability of an upward adjustment in Panels B and C of Figure 4. In summary, the patterns observed for post-contract appraisals, the sample of properties used in the analysis that were appraised twice, appear to generalize to the larger sample.

[16] Foreclosures are on the low end of the market so will be more often matched to superior homes, even if only modestly superior. The set of all purchases shown to Fannie are relatively representative of the whole market, and would not have the same average skewing of unadjusted comparable sales.

## VIII. Policy Implications and Conclusion

Reforms following the boom and bust of housing values in the 2000's attempted to alter the incentives of appraisers to produce more accurate appraised values. Recent research has shown these reforms were coincidental with marginally more appraisals that came in below contract for a period, but 96% of appraised values in 2015 were equal to or exceeded the target transaction value. Concerns therefore persist over whether appraisers are simply confirming the purchase price of less informed buyers, and therefore leaving the housing market exposed to price volatility in the future.

A fundamental identification concern in the prior literature as to whether appraisers were producing biased estimates was that there was no way to compare the appraised value to either the "true" value (which was unobserved) or to an appraisal done without benefit of the contract price. This concern is addressed in the current research by focusing on 8,533 repeat appraisals of the same property between 2012 and 2015. The first appraisal was commissioned to assist in marketing the property following a foreclosure. The second appraisal was commissioned through the loan origination process associated with the purchase of the property. The use of repeat appraisals addresses previous identification concerns because the initial appraiser is uninformed of the eventual contract price. We find the post-contract appraiser was more likely than the pre-contract appraiser to select comparables with average values at or above known contract, to then adjust so that average adjusted values were even more likely to be at or above contract, and finally to reconcile (weight adjusted sales values) so that the final appraisal was far more likely to be at or above contract than if the contract were not already available to him. We also find a remarkable difference in either direction of the two appraisers' assessment of condition and quality, even though the home is unchanged between the two visits, separated by a median period of 81 days.

Two caveats of the research are important to disclose. First, the sample is restricted to properties that have previously been foreclosed and there are reasonable questions about how it generalizes to non-foreclosed properties. While distributions of average comps and appraised values relative to the contract price of all purchase appraisals strongly resembled the post-contract foreclosure appraisals, it is possible to question

whether foreclosure appraisals can perfectly reproduce field conditions faced by appraisers of normal sales. The second caveat is that period of the analysis is restricted to appraisals conducted between 2012 and 2015. This period had relatively stable residential price appreciation following the Great Recession of 2008. It is anticipated that larger differences between transaction dependent and independent appraised values would occur in more volatile markets, although independent effects of market conditions would be difficult to separately identify.

The economic cost of biased appraisals is possibly large. During the large run-up in residential home prices in the mid-2000's, nearly all borrowers could count on their contract price being confirmed. Removing or reducing the highest bids relative to recent market prices for similar homes would likely have slowed the rise and moderated the subsequent recession. The policy implications of this research is that further reform is required. Four adjustments to the appraisal process could mitigate the problems seen in our analysis. One is to require over-all symmetric weighting of high and low comparable properties in reconciliation. A second effort could be to overhaul the UAD definitions (including pictures and more specific language) so that different appraisers who can both observe a property have reasonable consistency in categorizing qualitative attributes (quality, condition, view, location). Third, investors should consider releasing appraisers from the unrealistic requirement to arrive at a single value and instead provide a value band within which a home might reasonably transact. Finally, if appraisers were not provided with nor allowed to use the contract price, this would eliminate a necessary element for confirmation bias.

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TABLE 1. AVERAGE PROPERTY ATTRIBUTES FOR APPRAISALS WITH AND WITHOUT A PRE-CONTRACT APPRAISAL

| | All Appraisals | w/ Pre-Contract Appraisal |
|---|---|---|
| Age of Structure | 34.5 | 35.1 |
| Number of Bedrooms | 3.3 | 3.0 |
| # of Full Baths | 2.0 | 1.8 |
| # of Half Baths | 0.4 | 0.3 |
| Living Area (square feet) | 1,984.7 | 1,669.5 |
| Lot Size (square feet) | 28,402 | 31,665 |
| Condition Score | 3.0 | 3.6 |
| Quality Score | 3.5 | 3.8 |
| Contract Price | 310,308 | 156,359 |
| Appraised Value Post-Contract | 313,580 | 161,547 |
| Appraised Value Pre-Contract | . | 155,150 |
| Observations | 3,751,547 | 8,533 |

*Notes*: The sample in the first column is the full set of properties appraised between 2013 and 2015 associated with a home purchase. The sample in the second column is restricted to properties with a pre-contract appraisal from 2012 to 2015.

TABLE 2. DIFFERENCE IN APPRAISER STATED ATTRIBUTES OF SUBJECT PROPERTY BY APPRAISAL TYPE

| | Post-Contract | Pre-Contract | Difference | P-Value of Difference |
|---|---|---|---|---|
| Age of Structure | 35.1 | 34.8 | 0.3 | < 0.001 |
| Number of Bedrooms | 3.0 | 3.0 | 0.0 | 0.974 |
| # of Full Baths | 1.8 | 1.8 | 0.0 | 0.803 |
| # of Half Baths | 0.3 | 0.3 | -0.0 | 0.164 |
| Living Area (square feet) | 1,669.5 | 1,665.7 | 3.8 | 0.006 |
| Lot Size (square feet) | 31,665 | 40,318 | -8,653 | 0.331 |
| Quality Score | 3.8 | 3.9 | -0.1 | < 0.001 |
| Condition Score | 3.6 | 3.9 | -0.3 | < 0.001 |
| Observations | 8,533 | 8,533 | | |

*Notes*: The first column contains the average stated property attributes by appraisers without a contract price. The second column contains the average stated property attributes for the same properties after a contract price is known. The third column contains the average difference between appraisal type, and the fourth column is the p-value of a t-test on whether the difference is statistically different from 0.

TABLE 3A. DIFFERENCES IN APPRAISER STATED QUALITY OF CONSTRUCTION BY APPRAISAL TYPE

| Pre-Contract Quality Score | Frequency (n) | Quality of Construction Assigned by Post-Contract Appraiser | | | | |
|---|---|---|---|---|---|---|
| | | Inexpensive Tract Home | Standard Tract | High-Quality Tract | Custom | Architect Designed |
| Q1: Architect Designed | 1 | 0.0 | 0.0 | 100.0 | 0.0 | 0.0 |
| Q2: Custom Home | 58 | 0.0 | 24.1 | 67.2 | 8.6 | 0.0 |
| Q3: High-Quality Tract Home | 1,521 | 1.6 | 54.9 | 41.5 | 1.9 | 0.0 |
| Q4: Standard Tract Home | 6,187 | 4.3 | 71.6 | 23.7 | 0.4 | 0.0 |
| Q5: Inexpensive Tract Home | 766 | 8.0 | 73.6 | 18.0 | 0.4 | 0.0 |
| Total Properties | 8,533 | | | | | |
| *Avg Pre-Contract Score 3.9* | | | | *Avg Post-Contract Score 3.8* | | |

*Notes:*This table compares the consistency of appraisers in the stated quality of properties subject to appraisal. The first column illustrates the distribution of quality assigned by appraisers before a contract price is known. The second through fifth columns illustrate the percent of a pre-contract appraisal quality assigned a post-contract appraisal quality value indicated by the column, where the shaded diagonal would be equal to 100 if the two appraisals always had the same stated quality. For instance, 67.2% of pre-contract appraisal Q2 properties were labeled as Q3 in the post-contract appraisal.

TABLE 3B. DIFFERENCES IN STATED CONDITION OF PROPERTY BY APPRAISAL TYPE

| Pre-Contract Condition | Frequency (n) | Condition of Property Assigned by Post-Contract Appraiser | | | |
|---|---|---|---|---|---|
| | | Obvious Deferred Maintenance | Deferred Maintenance | Well-Maintained | Good as New |
| C2: Good as New | 92 | 0 | 17.4 | 66.3 | 16.3 |
| C3: Well-Maintained | 1,983 | 0.3 | 36.1 | 59.3 | 4.3 |
| C4: Deferred Maintenance | 5,549 | 1.6 | 63.4 | 33.8 | 1.2 |
| C5: Obvious Deferred Maintenance | 909 | 6.9 | 77.5 | 15.5 | 0.1 |
| Total Properties | 8,533 | | | | |
| *Avg Pre-Contract Score 3.9* | | | *Avg Post-Contract Score 3.6* | | |

*Notes:* This table compares the consistency of appraisers in the stated condition of properties subject to appraisal. The first column illustrates the distribution of condition assigned by appraisers before a contract price is known. The second through fifth columns illustrate the percent of a pre-contract appraisal condition is assigned to a post-contract appraisal condition value indicated by the column, where the shaded diagonal would be equal to 100 if the two appraisals always had the same stated condition. For instance, 36.1% of pre-contract appraisal C3 properties were labeled as C4 in the post-contract appraisal.

TABLE 4. DIFFERENCES IN AVERAGE ATTRIBUTES OF COMPARABLE PROPERTIES SELECTED BY APPRAISER

| | Post-Contract | Pre-Contract | Difference | P-Value of Difference |
|---|---|---|---|---|
| # of Comparable Properties | 3.8 | 6.4 | -2.6 | < 0.001 |
| Age of Property | 35.7 | 35.6 | 0.1 | 0.263 |
| Number of Bedrooms | 3.1 | 3.1 | -0.0 | < 0.001 |
| # of Full Baths | 1.8 | 1.8 | -0.0 | 0.016 |
| # of Half Baths | 0.3 | 0.3 | -0.0 | 0.336 |
| Living Area (square feet) | 1,632.1 | 1639.5 | -7.4 | < 0.001 |
| Lot Size (square feet) | 29,703 | 28,051 | 1,650 | 0.003 |
| Quality Score | 3.7 | 3.9 | -0.2 | < 0.001 |
| Condition Score | 3.4 | 3.5 | -0.1 | < 0.001 |
| Proximity to Subject (miles) | 1.34 | 1.26 | 0.08 | < 0.001 |
| Market Adjustments | 201.8 | -506.2 | 708.0 | < 0.001 |
| Sale Price of Comparable | 166,528 | 165,842 | 686 | 0.001 |
| Adj Sale Price of Comparable | 164,143 | 158,400 | 5,743 | < 0.001 |
| Observations | 8,533 | 8,533 | . | . |

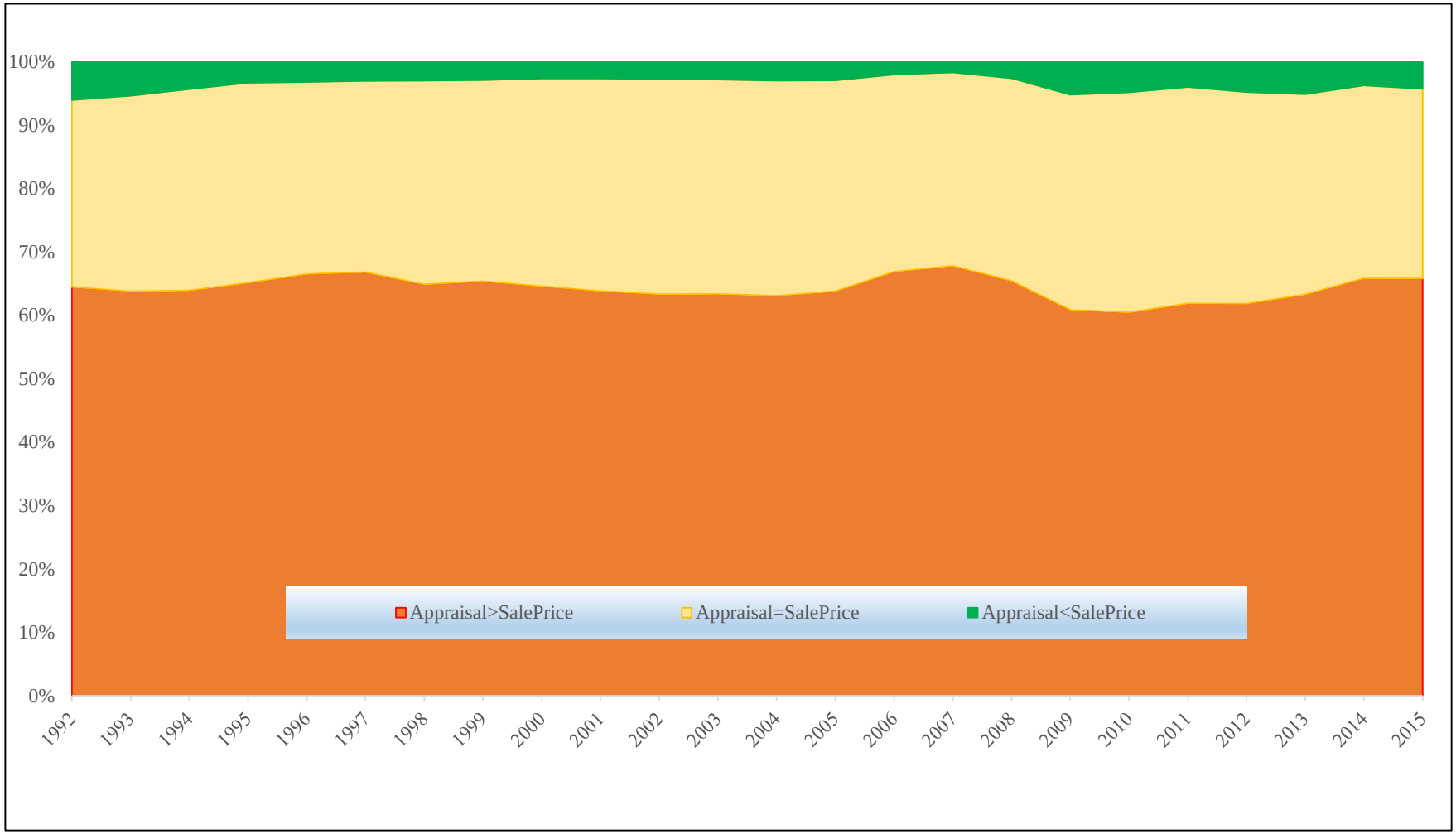
*Notes*: The first column are the average attributes of comparable properties used by appraisers without a contract price. The second column are the average attributes of comparable properties for the same subject properties after a contract price is known. The third column is the average difference between appraisal type, and the fourth column is the p-value of a t-test on whether the difference is statistically different from 0.

TABLE 5. AVERAGE DIFFERENCE IN APPRAISED VALUES, BY APPRAISAL TYPE

| | Unadjusted | Market Price Adjustment | Unadjusted w/ Subject Attributes | Market Price Adjustment w/ Subject Attributes |
|---|---|---|---|---|
| Post-Contract | 0.057*** | 0.042*** | 0.047*** | 0.031*** |
| | (0.002) | (0.002) | (0.002) | (0.002) |
| Market Price Adjustment | No | Yes | No | Yes |
| Include Subject Attributes | No | No | Yes | Yes |
| Observations | 17,066 | 17,066 | 17,066 | 17,066 |
| Within R-Square | 0.104 | 0.057 | 0.130 | 0.085 |
| Property Fixed Effects | 8,533 | 8,533 | 8,533 | 8,533 |

*Notes:* This table compares the appraised value of properties that were subject to two separate appraisals within 6 months. The dependent variable is the natural log of the final appraised value, with an adjustment for local market appreciation in the second and fourth columns as described in the text. Each specification includes a separate intercept (for fixed effect) for each individual property. The row labeled 'Post-Contract' indicates the coefficient on a dummy variable of the appraised value after a contract price was accepted between borrower and seller. The third and fourth columns control for differences in stated property and qualitative attributes of each appraiser. Those property attributes are age, number of bedrooms, number of full baths, number of half baths, natural log of living area, natural log of lot size, and dummy variables for each score of quality and condition. Standard errors clustered at the property-level are listed in parentheses below each estimates, with asterisks indicating significance at the following levels: *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

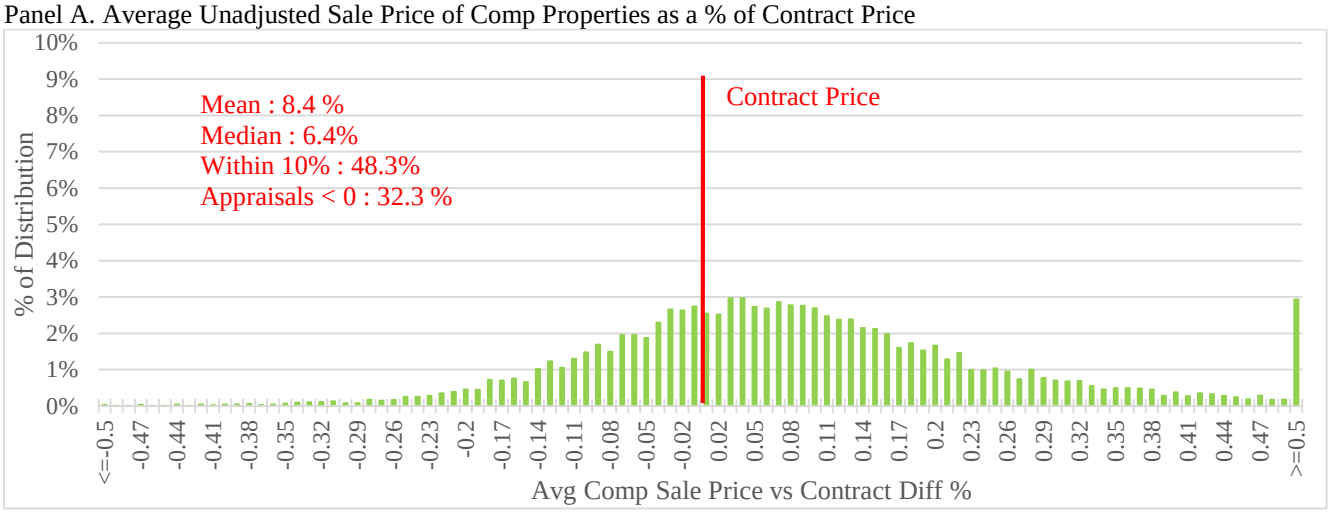
FIGURE 1. PERCENT OF APPRAISALS AT OR ABOVE SALES PRICE PER YEAR FROM 1992 UNTIL 2015



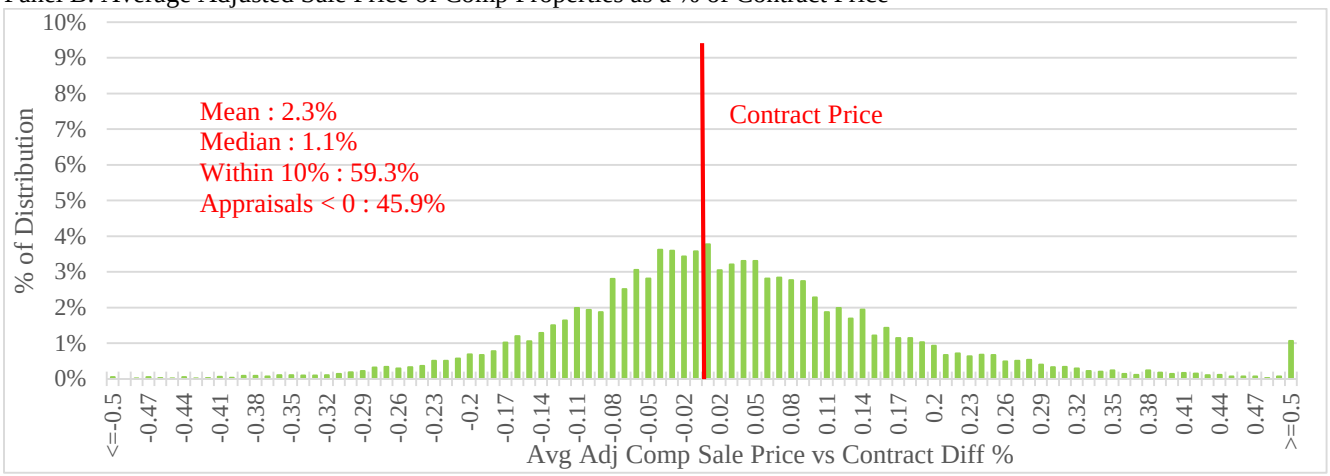

*Notes:* The source of the data are 17 million mortgage loans purchased by Fannie Mae between 1992 and 2015 where the proceeds would be used for a home purchase.

FIGURE 2. ADJUSTED AND UNADJUSTED SALE PRICE OF COMPS AND SUBJECT AS A % OF CONTRACT PRICE FOR PRE-CONTRACT APPRAISALS (N = 8,533)

Panel A. Average Unadjusted Sale Price of Comp Properties as a % of Contract Price




Panel B. Average Adjusted Sale Price of Comp Properties as a % of Contract Price




Panel C. Appraised Value of Subject Property as a % of Contract Price

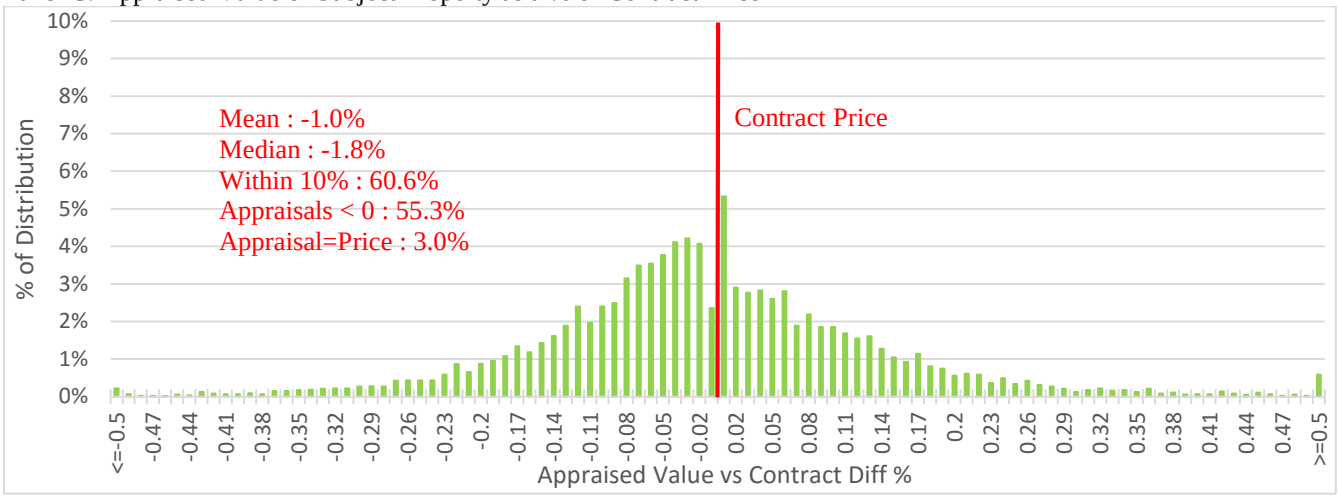
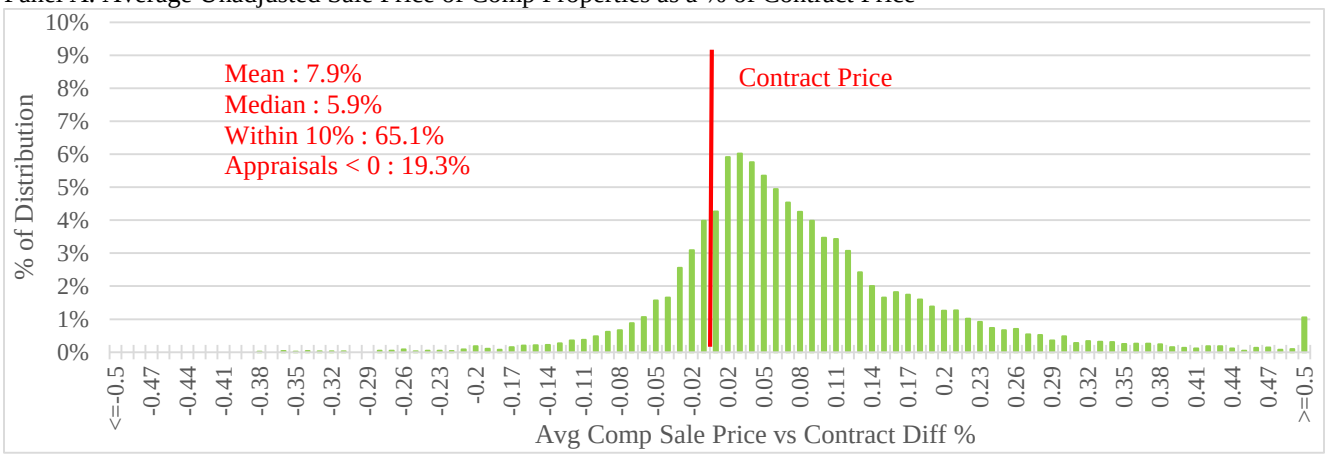
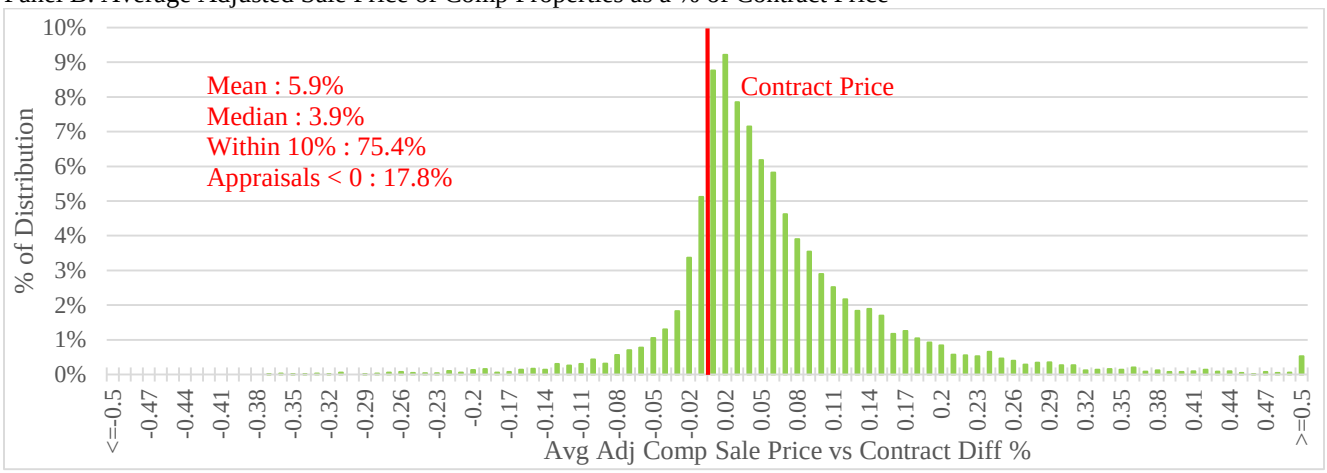



FIGURE 3. ADJUSTED AND UNADJUSTED SALE PRICE OF COMPS AND SUBJECT AS A % OF CONTRACT PRICE FOR POST-CONTRACT APPRAISALS (N = 8,533)

Panel A. Average Unadjusted Sale Price of Comp Properties as a % of Contract Price




Panel B. Average Adjusted Sale Price of Comp Properties as a % of Contract Price




Panel C. Appraised Value of Subject Property as a % of Contract Price

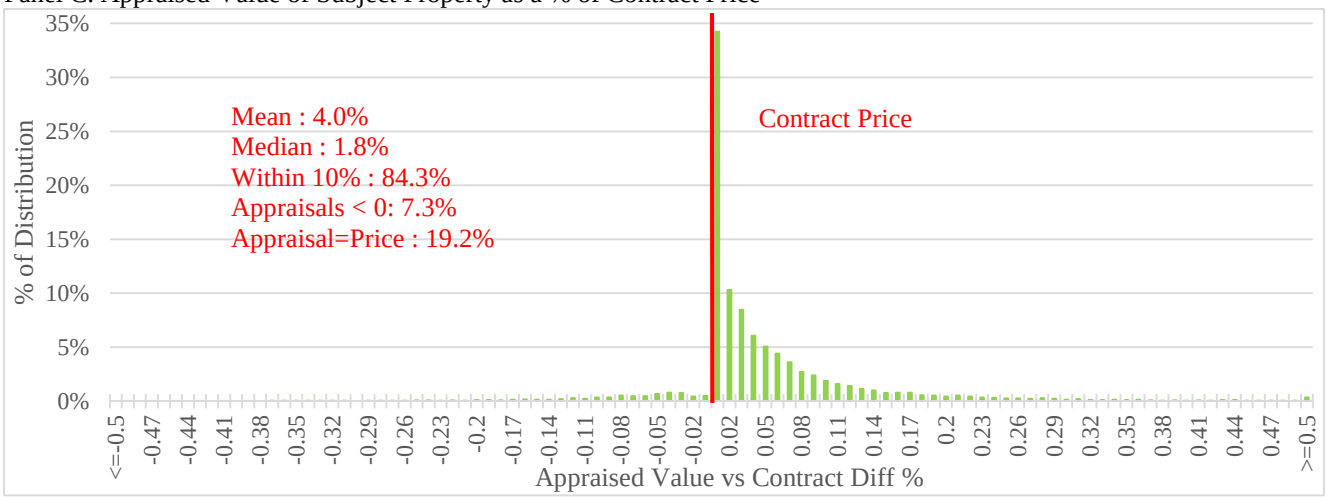
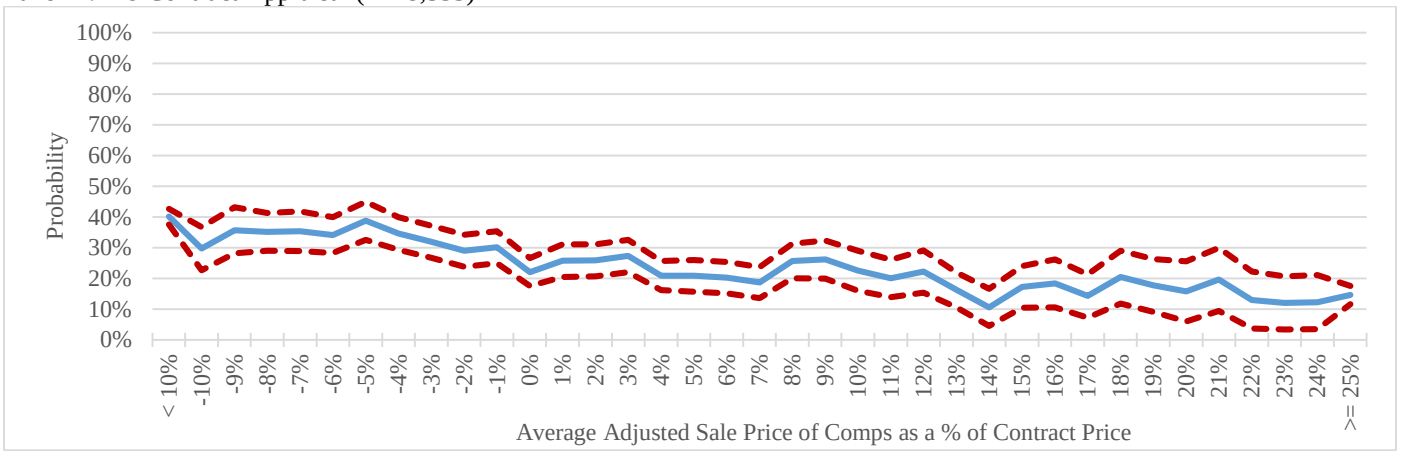
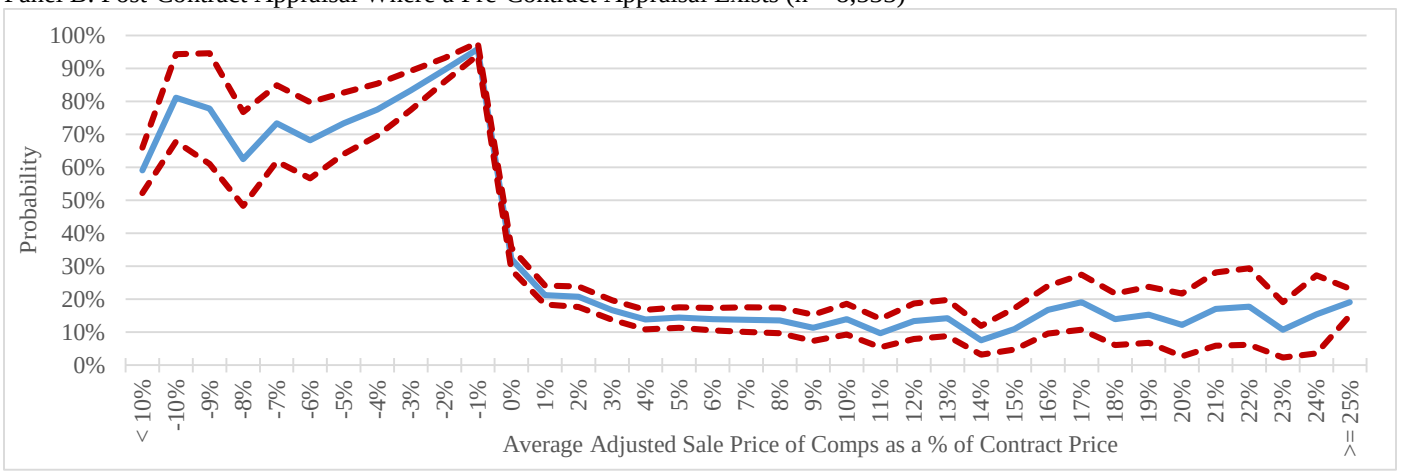


FIGURE 4. PROBABILITY THAT FINAL APPRAISED VALUE IS GREATER THAN AVERAGE OF ADJUSTED SALES PRICE OF COMPARABLE PROPERTIES

Panel A. Pre-Contract Appraisal (n = 8,533)




Panel B. Post-Contract Appraisal Where a Pre-Contract Appraisal Exists (n = 8,533)

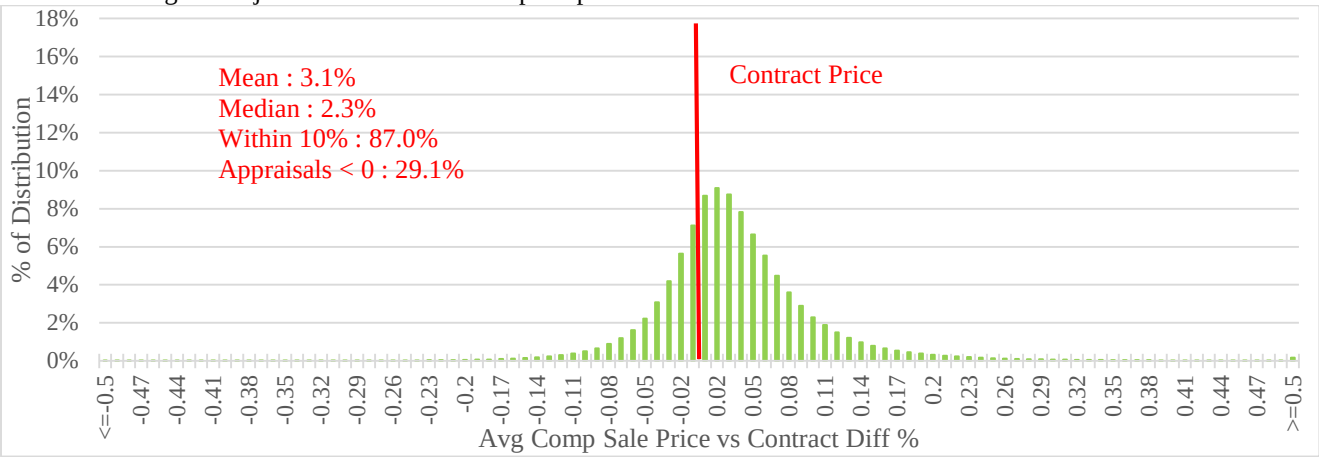



Panel C. Full Sample of Post-Contract Appraisals (n=3,751,547)

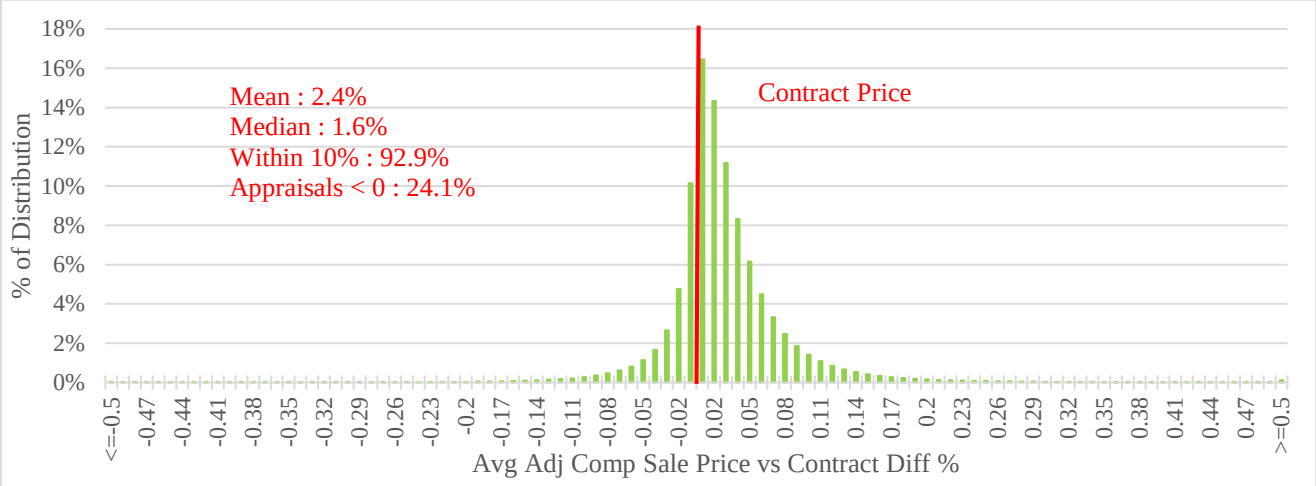

*Notes:* Dashed lines represent 95% confidence Intervals.

FIGURE 5. ADJUSTED AND UNADJUSTED SALE PRICE OF COMPS AND SUBJECT AS A % OF CONTRACT PRICE FOR FULL SAMPLE OF POST-CONTRACT APPRAISALS (N = 3,751,547)

Panel A. Average Unadjusted Sale Price of Comp Properties as a % of Contract Price




Panel B. Average Adjusted Sale Price of Comp Properties as a % of Contract Price




Panel C. Appraised Value of Subject Property as a % of Contract Price