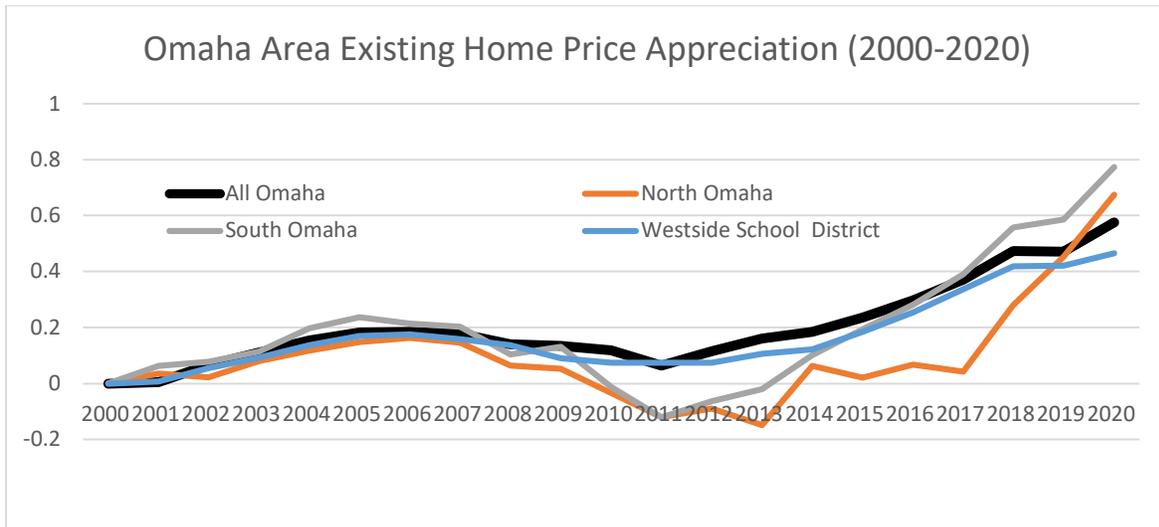


*Research Report*  
*Center for Real Estate and Asset Management*  
*College of Business Administration*  
*University of Nebraska at Omaha.*  
*Updated/Corrected Version, March 18, 2021\**

**Omaha Single Family Housing Prices (2000 to 2020):  
Focus: The Impact of COVID**



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*\* An earlier (March 2, 2021) version of the report had some year 2020 housing sales missing from the analyses. This is the corrected/updated version of the study report.*

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## Executive Summary

This study quantified existing single-family housing price appreciation across the Omaha, NE, Metropolitan Area from 2000 through the end of 2020 with particular emphasis on price changes during the last two years to update the prior (2000-2018) UNO Housing Price Report and to quantify the impact of the COVID-19 crisis on year 2020 home prices.

Price appreciation was estimated using sales transaction data recorded by the multiple listing service of the Omaha Area Board of Realtors and two approaches: 1) mass appraisal modeling using multiple regression to quantify annual price appreciation while accounting for the unique characteristics of sold homes, and 2) median sale price changes over time.

Appreciation is estimated for the entire Omaha metropolitan area and 14 sub-markets.

From 2000 through 2020, existing single-family home prices in the Omaha metro area have increased by 58% (on average 2.9% per year). From 2018 to 2019, prices fell slightly (by 0.3%) which is the first year of non-positive housing price growth since 2011. However, in 2020 during the COVID crisis, the number of homes listed for sale was down by only 34% (versus around 50% nationally), home sales increased by 7.5% and home prices rose 10.3%, which is one of the largest single-year housing price increases in the last 20 years. This price spike was due to a combination of reduced supply combined with increased demand which was likely influenced by historically low mortgage interest rates.

Year 2019 to 2020 Omaha price appreciation based on median price changes (10.6%), is below U.S. median price appreciation reported by the National Association of Realtors (16.7%) and slightly higher than the 9.7% appreciation for Midwestern cities.

Housing price appreciation continues to vary substantially across different areas of Omaha: From 2018 to 2020, price appreciation ranged from a low of 8% to a high of 28% across 14 different sub-markets. Appreciation continues to be highest in North Omaha, the suburbs of Sarpy County, and South Omaha.

## Methods and Data Sources

This study relies on housing transaction data (178,793 ‘arms-length’ single family home sales) as recorded by the Great Plains Regional Listing Service over the 2000 through 2020 period. Utilized sales needed to be detached single-family residences, existing (not new construction), within the Omaha metro area (Douglas, Sarpy and parts of Washington counties), on lots smaller than 1 acre, and within the \$20,000 to \$600,000 price range, which resulted in 148,607 sales available for mass appraisal modeling.

A ‘mass appraisal’ multiple regression model was used to estimate annual appreciation by specifying the log of sold price to be a function of structural housing and neighborhood-level characteristics (home and lot sizes, home style, age, and features present). Estimated coefficients for dichotomous (dummy) variables indicating sold year represent annual price appreciation. This model has been peer reviewed by mass appraisal experts and published in national real estate journals and compares favorably against both more simplistic (average price change) and more complex (repeat sale index) appreciation estimation approaches.

Corresponding median-based estimates of annual appreciation are calculated as the percentage difference in median sale price across two time periods. A limitation with median appreciation estimates is that they do not always represent homogeneous (similar) housing stock (type, age, size, and price) sold over time, particularly within relatively small sub-market areas that may have small numbers of sales within particular time periods. As well, these results are considered non-parametric and their statistical significance or validity is not calculated in a multi-variate framework. Nevertheless, these median estimates are useful for evaluating the accuracy of mass appraisal estimates and are used in this study to provide appreciation estimates in cases when mass appraisal estimates are not reported (due to statistical insignificance). To improve the accuracy of median price estimates used in this study medians are obtained for sale prices divided by home size (above grade living area) to lessen the impact of varying home sizes sold over time from biasing the appreciation estimates. For readers interested in alternative approaches to measuring housing price appreciation, refer to Appendix A at the end of this report.

## **Time Frames and Geographical Focus of the Price Appreciation Estimates.**

Appreciation is estimated in this report for five distinct time periods: 1) The 2000 to 2007 time period often described as the housing boom; 2) The housing ‘crash’ of 2007 to 2011; 3) The recovery period of 2011 to 2018; 4) from 2018 to 2019 which represents flat prices in pre-COVID year, and 5) from 2019 to 2020 in order to quantify the impact of COVID-19 on 2020 housing prices.

Based on prior housing market studies in Omaha, it is known that housing characteristics and housing price appreciation are not homogeneous. Therefore, in this present study, housing price appreciation is reported by 12 geographical sub-markets based on aggregating adjacent and/or nearby zip code boundaries. The goal, where possible, is to maintain county and city boundaries, while attempting to capture as much homogeneity of housing stock as possible while allowing the sub-markets to be recognizable to readers of the report. The resulting 14 sub-market classifications along with their corresponding zip codes are summarized in Table 1. These sub-markets are not all mutually exclusive. For example, appreciation is estimated separately for Douglas and Sarpy County and then for sub-markets within each county. One sub-market (‘Omaha Far South Central and Sarpy North Central’) contains zip codes both north and south of Harrison (the Douglas/Sarpy divide street) in the approximate center of the entire study area. Another area (‘Westside School District’) contains many housing sale locations that are also reported in other sub-markets (‘Omaha Central’ and ‘Omaha Central South’). The definition of sub-markets for making appreciation estimates is subjective and ever-changing. Other alternatives which have been explored in past years (prior UNO study reports) include multiple listing service regions (as defined by the Omaha Area Board of Realtors), zip codes, and even all the school districts in the Omaha Metro area.

**Table 1. Omaha Metro Sub-Markets for Reporting Housing Price Appreciation**

<b>Sub-Market</b>	<b>Zip Codes</b>
Douglas County	Various
Sarpy County	Various
Bellevue	68005, 68123, 68147, 68157
North Omaha	68110, 68111, 68131
Omaha Central	68114, 68132
Omaha Central-South	68106, 68124
Omaha Far South-Central & Sarpy North-Central	68117, 68127, 68128
Omaha North Central	68104, 68134
South Omaha	68105, 68107, 68108
Suburbs Douglas County East	68137, 68144, 68154, 68164
Suburbs Douglas County West	68022, 68116, 68118, 68130, 68135
Suburbs North of Omaha	68007, 68112, 68122, 68142, 68152
Suburbs Sarpy	68028, 68046, 68059, 68133, 68136, 68138
Westside School District	Parts of 68114, 68124, 68132, 68144

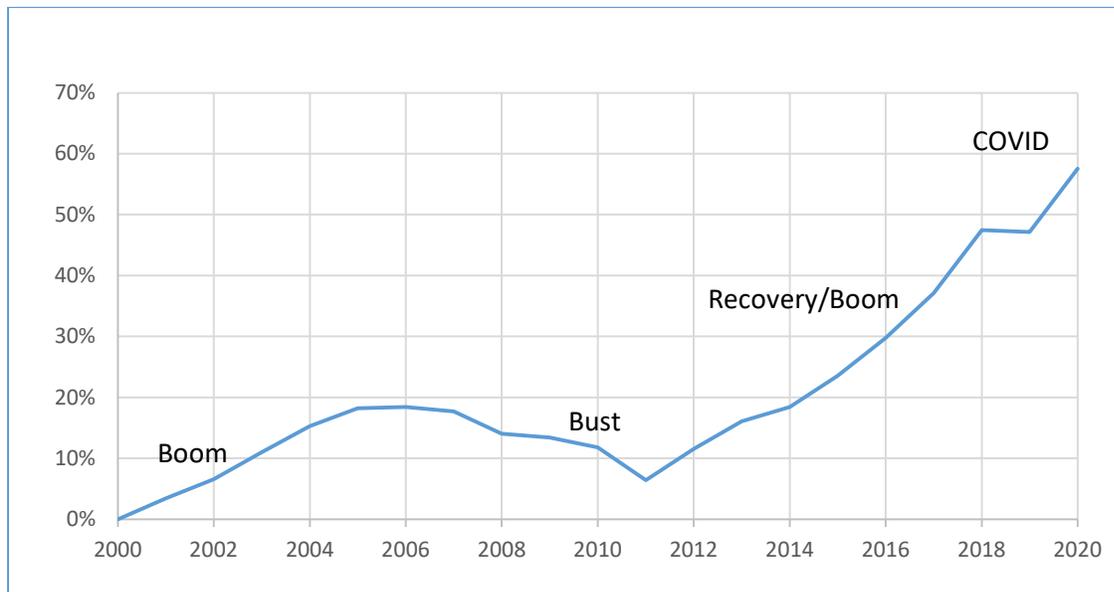
## Results

### 1) Omaha-Wide Price Appreciation and Sales Frequency (2000-2020)

From 2000 through the end of 2020, existing single family home prices in Omaha appreciated by an average of 58% or 2.9% per year (Figure 1). Since the bottom, (low price point) of the 2007-2011 housing market crash, Omaha housing prices having rebounded by 51%. During the 2018 through 2019 period (right before the COVID crisis) a clear reversal of price appreciation appears to have occurred with 0.3% decline in prices representing the first year of non-positive price growth in Omaha since 2011. But over the 2019 through 2020 time period representing the COVID crisis, prices increased 10.3% which is tied for the largest annual price appreciation increase in the last 20 years (an identical record high price increase was observed from 2017 to 2018)

Over the full time period that is new to this present report 2018-2020, mass appraisal appreciation for all of Omaha is 9.9% (driven by the -0.3% decline in prices noted for 2018 to 2019 and then the 10.3% price increase from 2019 to 2020).

**Figure 1. Omaha Housing Price Appreciation 2000-2020**



## **2) Mass Appraisal Versus Median Price Change-based Appreciation (2018-2020).**

More simplistic price appreciation estimates for the 2018-2020 period based on median sale prices as well as median prices divided by square footage, are higher than the mass appraisal results: 24% based on median prices and 18% based on medians divided by home finished square footage. When mass appraisal and median price adjustments differ, it is usually a result of different types of homes being sold across years being evaluated. Based on past research reports both by the UNO Real Estate Center and nationally it has been clearly demonstrated mass appraisal-based results are more accurate and superior to median price change-based appreciation estimates, and, that median price changes while accounting for home size are considered superior to simple median price changes over time. For more information on this topic refer to Appendix A.

Differences between mass appraisal and median price change-based estimates of appreciation in Omaha are much smaller during the most recent (2019 to 2020 period) where mass appraisal appreciation is 10.3% versus 10.6% for median prices and 7.4% for median prices adjusted for home size. One advantage of median price change appreciation estimates is that they can be directly compared to appreciation estimates in other areas of the country where median-based estimates are readily available. This is the focus of the next section of this report.

## **3) Omaha Median Price Housing Appreciation versus U.S. and Midwestern Averages**

Over the 2018-2020 period, simple median based Omaha appreciation at 24% was markedly higher than the national average and 15% higher than the corresponding Midwest Cities appreciation of 9.3% both based on median prices reported by the National Association of Realtors (Table 2). In contrast, during the 2019-2020 (COVID) time frame, median-based Omaha price appreciation was 10.6% (or alternatively 9%, as reported by Info Sparks data compilation service of the Great Plains Regional Multiple Listing Service using slightly different sample selection criteria), which is less than observed nationally (16.7%) and slightly lower than appreciation in other Midwestern Cities (9.7%). This Omaha-national difference can

likely be explained by the fact housing supply (homes listed for sale) in only declined in Omaha only declined by 34% versus around 50% nationally as reported recently by the New York Times ('Where Have All The Houses Gone', February 26, 2021).

**Table 2. Omaha Versus National Housing Appreciation (2018-2020 & 2019-2020)**

	<b>2018-20</b>	<b>2019-20 (COVID)</b>
Omaha Metro (Mass Appraisal)	9.9%	10.3%
Omaha Metro Median (Median Prices divided by Finished Sq. Feet)	18%	12.3%
Omaha Metro (Median Prices)	24%	10.6%
USA (Median Prices)*	14.8%	16.7%
Midwestern Cities (Median Prices)*	9.3%	9.7%

*\* As reported by the National Association of Realtors*

**4) Price Appreciation and the Characteristics of Recent (2018-2020) Omaha Home Sales**

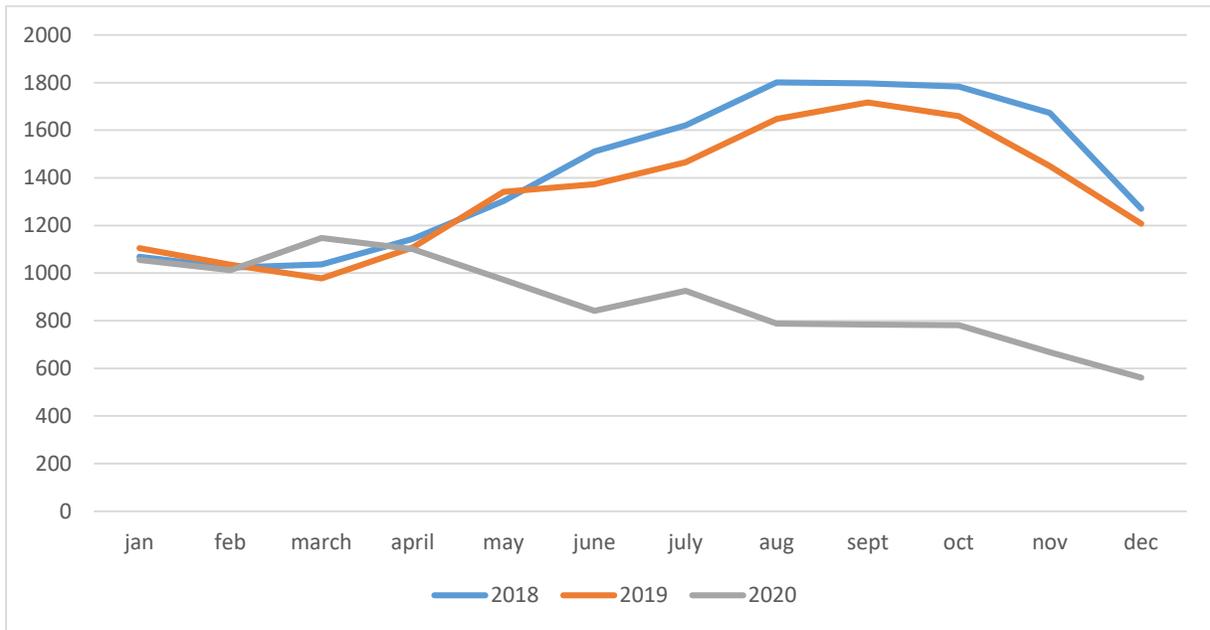
The characteristics of existing home sales for all of Omaha over three time periods (2018, 2019, and 2020) are summarized in Table 3 and Figure 2 to demonstrate listing inventory (supply or inventory), sales volume and price trends both before and during the COVID crisis of 2020.

From 2018 to 2019 the inventory (supply) of homes for sale decreased slightly (by 1.3%) and followed a very similar monthly pattern. In 2020, supply/inventory began higher than 2019 levels in the months of January through March, but from April through December dropped substantially and in fact the overall decline in inventory from 2019 to 2020 was 34% which is by far the highest annual decline in sold homes observed in Omaha in the last 20 years. The fact that supply from 2019 to 2020 declined by only 34% while the number of sales actually increased by 7.4% by 49% indicates that that Omaha sellers and buyers reacted very differently by the COVID crisis. In other words, declining inventory (supply) alone does not explain the

large increase in home sale prices from 2019 to 2020.

From 2018 to 2019, sales volume and median prices began a modest decline but in 2020 during COVID, the number of sales dropped increased by 7.5%. Homes in 2020 also sold more quickly (fewer days on market and closer to the listing price. No noticeable differences in home size, age, or location (city core versus suburbs) are apparent across these three years of data.

**Figure 2. Omaha Area Home For Sale (Listing) Inventory: 2018-2019**



**Table 3. Characteristics of Existing Homes Sold in Omaha: 2018-2020\***

	2018	2019	2020
# Listings**	17,032	16,805 (-1.3%)	10, 636 (-34%)
# Sales**	12,391	12,228 (-1%)	13,145 (+7%)
Price Appreciation from the prior year (based on mass appraisal modeling)	10.3%	-0.3%	10.3%
Price Appreciation from the prior year (median price adjusted by home size)	8.2%	7.4%	8.1%
Median Sale Price	\$198,000	\$213,000	\$230,000
Median Sale Price/Finished Sq. Ft	\$104	\$110	\$117
Median Size Finished Square Feet	1,920	1,948	1,975
Median Age (years)	32	30	31
Median/Mean Days on Market	6/24	5/22	3/19
Mean Sale Price as a % of List Price	99%	99%	100%
% Purchased with a Mortgage	89%	88%	88%
% in the Suburbs (Outside the I-80/Harrison Boundaries)	68%	67%	68%

\*Excludes new home sales defined as less than 1 year old at the time of sale.

\*\* Inventory and sale of existing single-family homes for sale across the entire year (existing homes, inventory of homes for sale as reported monthly by Info Sparks of the Great Plains Regional Multiple Listing Service for the Omaha Area.

### **5) Price Appreciation Across Different Omaha Sub-Markets (2019-2020)**

Analyses of sales volume and median sale prices across more detailed 14 sub-markets in Omaha over the 2019 to 2020 period are summarized in Table 4. Similar to results of prior Omaha price

appreciation studies by the UNO Real Estate Center, the Omaha housing market is not homogeneous. There are markedly varied appreciation rates occurring in different market segments. While the overall Omaha price appreciation rate from 2019 to 2020 was between 7.4% (based on median prices) and 10.3% (based on mass appraisal modeling), the range of price appreciation across the 14 sub-market segments is 4.4% to 22%. Appreciation during the year of COVID was lowest in the Westside School District (4.4%) Omaha Central (4.6%) and highest in South Omaha (19%) and North Omaha (22%).

Mass appraisal versus median price while adjusting for home size appreciation estimates are reasonably close over the 2019 to 2020 period in most of the sub-markets.

Since the supply of homes as measured by homes sold are relatively constant across all the market segments the most obvious explanation for this price appreciation differential was the demand for lower cost homes (North and South Omaha overall have the lowest priced homes in the Omaha Metro area while Omaha Central and Westside have some of the most expensive homes), and the fact that price appreciation in the last few years has been trending highest in North and South Omaha as these areas were relatively slow to recover from the initial housing market recovery that began in 2012. As reported in the most recent (2018) UNO Omaha Housing Price Report, these two areas have since seen considerable investor purchasing activity as represented by a much higher percentage of cash sales than observed in other parts of Omaha. In fact, this investor/cash sale activity has continued into 2020 when on average 14% of all Omaha sales were cash only versus 39% in North Omaha and 24% in South Omaha.

This situation of housing price appreciation during the COVID crisis is somewhat at odds with anecdotal evidence from the crisis which portrayed lower income people on hourly wages in the service sector suffering disproportionately more than higher paid salaried persons. But again, it is possible that this trend of higher price appreciation in North and South Omaha is being driven more by speculative investor activity rather than local residents buying homes. More research into this topic is warranted.

**Table 4. Existing Home Sales and Prices and Across Omaha Sub-Markets (2019-2020)**

<b>Market</b>	<b>Median Prices (2020) and Median Appreciation (2019-20) while Adjusting for Home Size</b>	<b>Mass Appraisal Appreciation</b>
All Omaha Metro	\$230, 000 (7.4%)	<b>10.3%</b>
Douglas County	\$220,000 (8%)	<b>10.7%</b>
Sarpy County	\$265,000 (7.4%)	<b>9.2%</b>
Bellevue	\$217,000 (6.5%)	<b>8.8%</b>
North Omaha	\$94,500 (24.6%)	<b>19%</b>
Omaha Central	\$265,000 (5.1%)	<b>4.4%</b>
Omaha Central-South	\$185,00 (11.6%)	<b>11%</b>
Omaha Far South Central & Sarpy North Central	\$195,000 (6.6%)	<b>7.8%</b>
Omaha North Central	\$165,000 (6.8%)	<b>10.3%</b>
South Omaha	\$150,000 (14%)	<b>12.1%</b>
Suburbs Douglas County (East)	\$220,000 (8%)	<b>9%</b>
Suburbs Douglas County (West)	\$312,500 (7.6%)	<b>8.7%</b>
Suburbs North of Omaha	\$221,400 (5.8%)	<b>10.9%</b>
Suburbs Sarpy County	\$282,000 (6.7%)	<b>8.1%</b>
Westside School District	\$250,000 (11%)	<b>9%</b>

*\*Excludes new home sales defined as homes less than 1 year old at the time of sale.*

## **6) Longer Term Mass Appraisal-based Price Appreciation Across Omaha Sub-Markets**

Price appreciation for the entire Omaha Metro from the baseline year of 2000 through the end of 2020 is 58% with a relatively tight range of 46% to 78% across the 14 sub-markets (Table 5).

The highest appreciation has occurred in North and South Omaha despite the fact that these two lower income areas of the Metro Area were hit very hard by the housing market crisis associated the great recession of 2007 to 2011 that has been documented in past UNO housing studies as being partially caused by a high amount of sub-prime lending that occurred in these areas.

From 2001 to present (2020), price appreciation has been particularly high in South Omaha (78% compared to an Omaha-wide appreciation rate of 57%). In the last two years (2018-2019) appreciation was highest in North Omaha (28%), Bellevue, the Suburbs of Sarpy County (20%), Bellevue (18%), and South Omaha (22%).

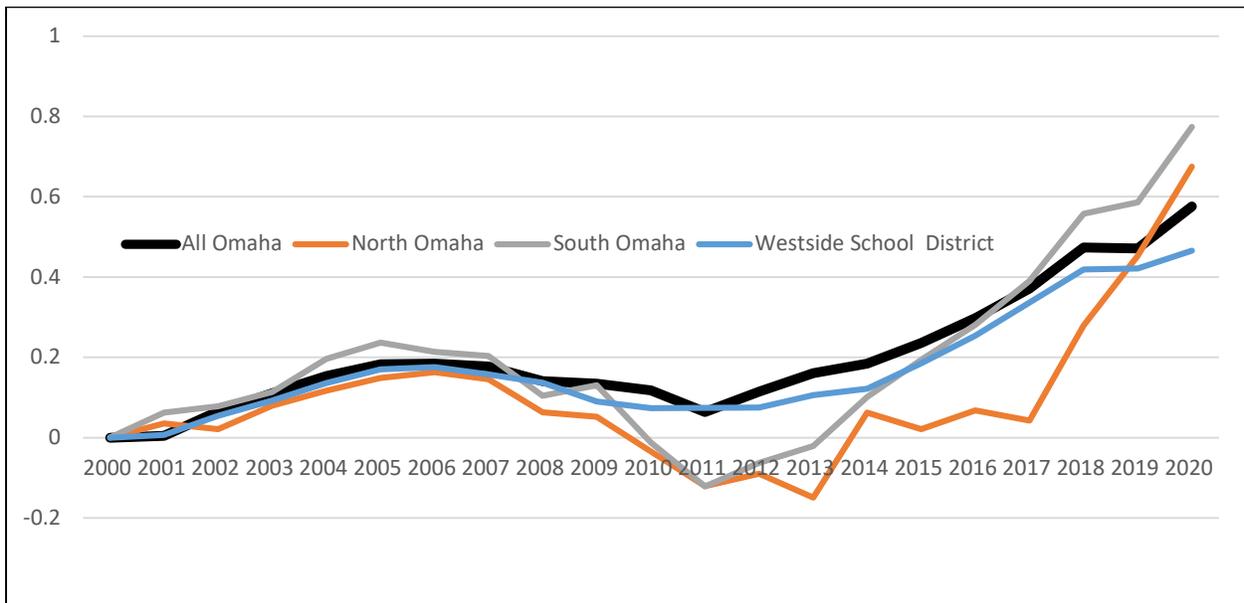
Long term mass appraisal-based appreciation estimates for the entire Omaha market and three sub-markets (North Omaha, South Omaha, and the Westside School District) are show in Figure 3. The relatively low income and older areas of North and South Omaha had very high levels of price depreciation during the housing crisis years and were not really part of the initial housing price recovery but they have clearly been leading price appreciation recovery since 2017. In contrast the Westside School District which has some very expensive homes, has had very constant and moderate price changes over the entire 20-year period.

**Table 5. Mass Appraisal Based Existing\* Home Price Appreciation Across Omaha Market Segments and Time Periods**

	2000-2020	2000-2007 (Boom # 1)	2007-2011 (Bust)	2011-2017 (Boom # 2)	2018-2020
All Omaha Metro	57%	18%	-11%	41%	10%
Douglas County	57%	17%	-12%	41%	11%
Sarpy County	59%	20%	-7%	38%	10%
Bellevue	61%	22%	-11%	41%	18 %
North Omaha	67%	15%	-27%	57%	28%
Omaha Central	49%	21%	-14%	38%	11%
Omaha Central-South	60%	26%	-22%	49%	13%
Omaha Far South Central & Sarpy North Central	61%	19%	-14%	47%	12%
Omaha North Central	62%	19%	-27%	57%	14%
South Omaha	78%	20%	-32%	71%	15%
Suburbs Douglas County (East)	61%	18%	-8%	41%	12%
Suburbs Douglas County (West)	51%	12%	-3%	33%	8%
Suburbs North of Omaha	59%	18%	-17%	48%	14%
Suburbs Sarpy County	55%	17%	-4%	34%	20%
Westside School District	46%	16%	-8%	35%	12%

*\*Excludes new home sales defined as homes less than 1 year old at the time of sale.*

**Figure 3. Historical Price Appreciation (2000-2020) Across Omaha and Select Sub-Markets**



The convergence of price appreciation rates over time across Omaha appears to be an example of the financial theory of ‘mean reversion’ where asset prices and returns eventually return back to the long run average of the entire portfolio of stocks. That is, when particular market segments have bargain priced properties as compared to home prices in other areas that have appreciated more strongly, buyers eventually take notice and purchase these lower cost homes that over time lead to increased price appreciation in these previously underperforming areas. This ‘bargain hunting’ phenomena may have been accelerated in the last two years due to the shortage of affordable homes to many first-time homebuyers in the suburban reaches of Omaha due to limited supply and rapidly increasing home construction costs.

Researchers in the UNO Real Estate Program plan to continue to monitor and evaluate changing housing price trends in Omaha. It is expected that providing local stakeholders in both the public and private sectors with timely, accurate and objective information about changing housing market conditions will encourage efficient housing development trends. Related and ongoing real estate research projects being undertaken by the UNO Real Estate Research Center are summarized on the next (and final) pages of this report.

## Other/Ongoing UNO Real Estate Research Projects

Faculty and staff at the UNO Center for Real Estate and Asset Management undertake research to provide public and private stakeholders in the Omaha community with objective and unbiased information to help assist with equitable and efficient real estate development. Funding for such research efforts has been obtained from federal, state and local governments and agencies as well as from private benefactors. Current (ongoing and pending) research efforts include:

- Modeling the frequency and success of tax protests.
- Evaluating the accuracy of tax assessment and appraisal adjustment factors in Omaha
- Quantifying the impact of lending and community development programs on Omaha price appreciation
- Understanding the extent and role of house flipping in the Omaha market
- Measuring the impact of TIFF projects on adjacent/nearby housing prices
- The impact of alternative approaches to determining the assessment value of Low Income Housing Tax Credit Properties
- Refining the use of the cost approach to value flood damage risk.
- Relationships between apartment rents and housing price appreciation
- Predicting cost approach values for apartment buildings based on observed rents.

**If readers are interested in obtaining copies of these research reports when they become available, they should request to be placed on the email distribution list of the UNO Center for Real Estate and Asset Management by emailing: [realestate@unomaha.edu](mailto:realestate@unomaha.edu).**

**Other UNO Real Estate Center Research Reports** can be downloaded from:

<https://www.unomaha.edu/college-of-business-administration/center-for-real-estate-and-asset-management/research/index.php>

## Appendix A.

### Background: Alternative Approaches to Estimate Housing Price Appreciation

There are three commonly used approaches to calculate housing price appreciation, defined as the change in sold prices over time. The most simplistic approach that is regularly used in press releases by the National Association of Realtors is to report price appreciation as a percentage based on average price trends (either means or medians) over time using a formula such as:

$$Appreciation = \frac{P_t - P_{t^*}}{P_{t^*}}$$

where  $t^*$  is the first period in a sequence and  $t$  is the year immediately following  $t^*$ .

The advantage of this approach is that it is easy to calculate and intuitive. The disadvantages are that the results are susceptible to statistical outliers and that it is difficult to ensure that same types of housing are compared over time. Therefore, most analysts relying on this approach use median statistics rather than means, remove statistical outlier sales, exclude new housing, and often evaluate prices adjusted for house size. Another limitation of the approach is that it is not possible to ascertain whether or not noted appreciation rates are statistically significant (i.e., it is a non-parametric approach). This approach can be improved by dividing median sale prices by sold home size (usually above grade living area) to account for differently sized homes selling over two or more time periods.

A second and usually more accurate approach for estimating housing price appreciation involves a mass appraisal model (also commonly known as hedonic price model or an automated valuation model). This requires the estimation of a multivariate statistical model where housing sale prices are specified to be a function of the physical and location-related characteristics of sold homes and the time period in which they are sold. A generic form of such a model is:

$$\ln P = \beta_0 + \sum_{i=1}^n \beta_j X_{ij} + \delta_t D_{it} + \varepsilon$$

where  $X$  is a vector of housing characteristics, and  $D$  is a matrix of binary variables equal to 1 if the home sold in time  $t$  and 0 if otherwise. Each estimated (reported) time-dummy variable coefficient measures the cumulative change in price up to the year of the sale. The advantage of this technique is that it controls for changing housing characteristics over time and that the statistical significance is reported for appreciation and the other explanatory variables. A disadvantage of the approach is that it requires large numbers of detailed housing sales and that model specifications often need to be complex.

The third and most widely accepted and reported approach to measure housing price appreciation is the repeat sales approach that conceptually measures price changes for individual homes when they re-sell over time. The approach is used by the Federal Housing Finance Authority (FHFA) to track the performance of federally-backed (Fannie Mae and Freddie Mac) mortgages and the trademarked and highly publicized Case-Shiller Repeat Sale Index. A repeat sale index involves calculating sale and re-sale prices of individual homes. When applied to many homes re-sold over different time periods the generic specification of the repeat-sale model is:

$$(\ln P_t - \ln P_{t^*}) = \sum_{i=1}^n \delta_i D_{it} + \varepsilon$$

which involves regressing the difference in logged prices of the second and first sales against a matrix of time variables equal to -1 if the home sold for the first time in that year, equal to 1 if the home sold for the second time in that year, and 0 otherwise. These dummy year coefficients are interpreted as the logged price index.

To ensure that similar and typical homes are evaluated, the approach usually excludes housing sales in which a re-sale occurs within a single year and/or when substantial (atypical) improvements are made to homes between sales (usually identified by changing home sizes). This is the superior approach as it guarantees that similar homes are evaluated over time, and that like the mass appraisal approach, it is parametric (statistical significance is reported). A disadvantage of the approach is that it requires complex data manipulation to identify and classify repeat sales which is why the Case-Shiller indices are estimated only for 20 major U.S. cities, approximately 3 to 4 months after specific sale periods. A weakness of the approach is that there are often insufficient sample sizes of repeat sales to accurately estimate appreciation in specific sub-markets (neighborhoods) within a city over short time periods. Finally, the repeat-sale approach usually under predicts appreciation (in comparison to other approaches) since it inherently uses geometric means rather than arithmetic means to estimate appreciation.

Researchers at the UNO Center for Real Estate and Asset Management have previously evaluated the use of all three of these approaches for measuring single-family housing price appreciation in Omaha over the 2000 to 2011 time period. They concluded that during periods of steady and moderate price appreciation over intermediate time periods (around five continuous years) that all three approaches generate very similar appreciation estimates particularly at the Omaha-wide level of analysis with mass appraisal results in most cases generating slightly higher appreciation rates than median-based estimates during years of price growth versus slightly lower depreciation rates during years of price decline. However, appreciation results over shorter time periods (between 1- and 3-year time spans) and/or longer periods (e.g., 2000-2016) vary across the two approaches especially across different neighborhoods. It was found that appreciation estimates based on repeat sales during short and long time periods were consistently lower than the median calculations particularly after 2006. It was also concluded that median based appreciation estimates were less stable (i.e., accurate) when appreciation was estimated within specific neighborhoods (i.e., based on smaller samples sizes of sales), which can result in sale prices of non-similar homes being compared.

A known problem with both mass appraisal and median appreciation calculations are that they give too much weight to appreciation in areas of new housing construction (i.e., the suburbs) relative to already developed (i.e., inner city) areas. Therefore, the use of repeat sales indices is warranted but they involve substantial data management/calculation effort which is one reason why UNO Real Estate researchers have not estimated repeat sale indices in Omaha since 2011.