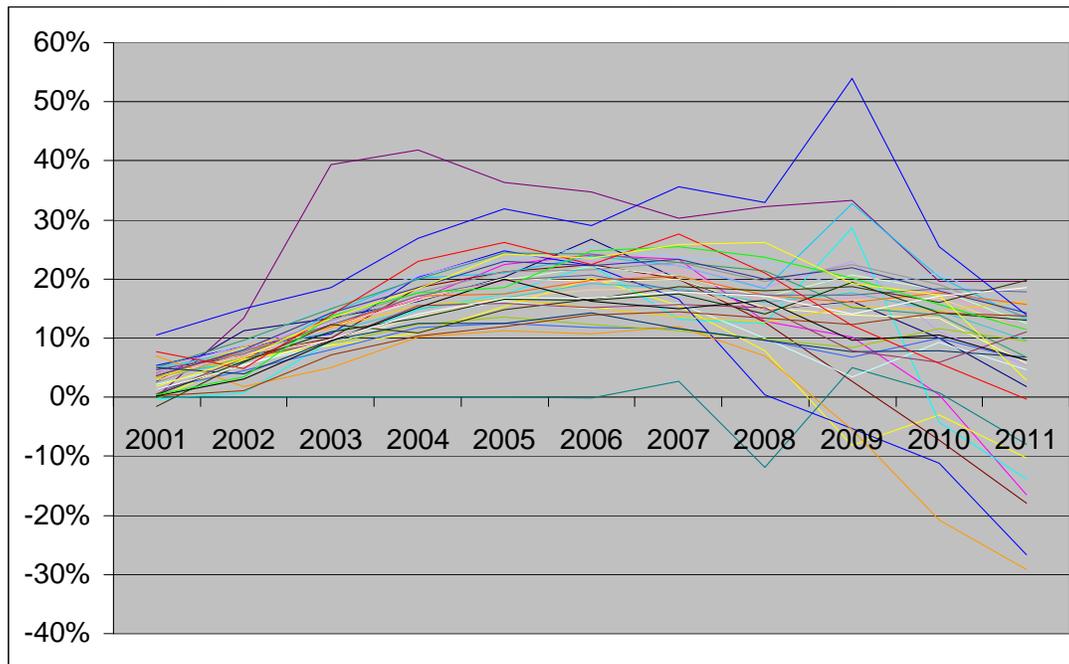


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*College of Business Administration*  
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**Single-Family Residential Housing Prices**  
**Omaha Metro Area (2000-2011)**

*Housing Price Appreciation Across 36 Different Omaha Zipcodes*



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# Single-Family Residential Housing Prices: Omaha Metro Area (2000-2011)

## Executive Summary

Single-family residential housing price appreciation across the Omaha metropolitan area<sup>1</sup> from 2000 through the end of 2011 is calculated using these three alternative estimation approaches: 1) Average (median) sale price comparisons adjusted by house size; 2) Mass appraisal modeling; 3) Repeat sale indices

Over the 2000 through 2011 period, homes appreciated by 8.7% based on median values, 7.3% based on mass appraisal calculations, and a negative 1.3% based on repeat sales.

Since the peak in Omaha housing values in 2006, prices have fallen by between 9.5% (medians), versus 12% based on mass appraisal and 17.3% based on repeat sales.

In the last year (2010 through 2011) prices declined by about 5% regardless of the calculation approach used. However, some inner-city neighborhoods have seen price declines as high as 49%, while a few suburban neighborhoods had very slight price increases of between 1% and 3% during last year (based on mass appraisal modeling within zipcodes).

These price appreciation estimates are primarily conducted in support of an ongoing UNO research project that is attempting to quantify the various factors influencing housing price appreciation in different neighborhoods across the Omaha metro area

## Background: Alternative Approaches to Estimate Housing Price Appreciation

There are three commonly approaches used by economists to measure changes in the selling prices (i.e. appreciation) of single family homes. The most simplistic approach which 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. Disadvantages are that the results 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

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<sup>1</sup> The Omaha metro area is defined as the non-rural parts of Douglas, Sarpy, and Washington Counties. Housing sales were obtained from the MLS and excluded while new housing sales, condominiums, and rural-acreage properties, home sale prices less than \$20,000 and home sale prices greater than \$535,000. And repeat sales held less than 1-year and or subject to house size increases were dropped from the analyses.

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).

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 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 which conceptually measures price changes for individual homes when they re-sell over time. The approach is used 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). Advantages of that it is the best of the three approaches for guaranteeing that similar homes are evaluated over time, and that like the mass appraisal approach, it is parametric (statistical significance is reported).

The 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 and relatively late (approximately 3 to 4 months after re-sale periods).

Another 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.

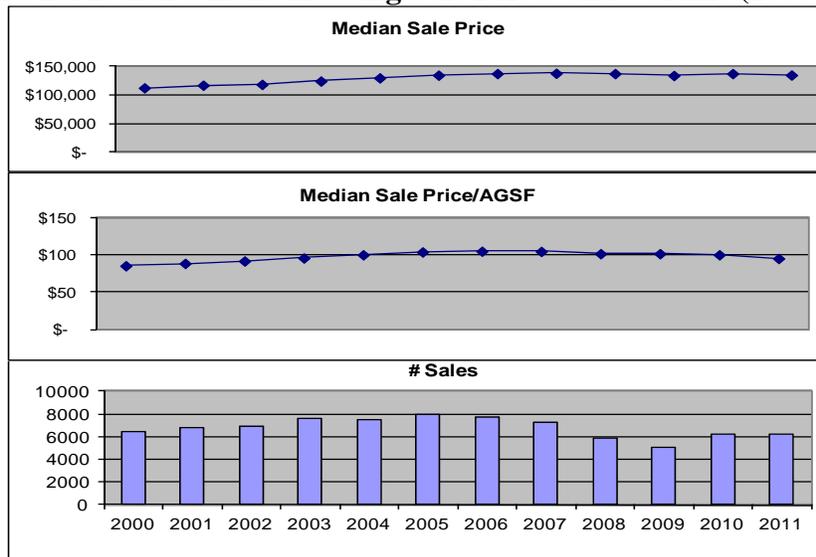
**Appreciation Based on Simple Average (Median) Price Changes**

A total of 88,653 Omaha housing sales were analyzed over the January 1, 2000 through December 31, 2011 time period. The prices and characteristics of sold homes were obtained from the multiple listing service (MLS) of the Omaha Area Board of Realtors (often referred to as the Great Plains Multiple Listing Service). The advantage of this data is that it represents ‘arms-length’ transactions and includes detailed house and transaction data that is often not available from county sale records. The disadvantage of this data source is that some legitimate market transactions (i.e. ‘for sale by owners’) are excluded, and that housing and transaction details are not always accurately recorded.

This study focused on existing single family homes sales in the Omaha metro market area defined as the non-rural areas of Douglas, Sarpy and Washington Counties. New housing construction, condominium sales, homes priced less than \$20,000 and more than \$535,000, and rural acreage sales (greater than 1 acre in size) were all excluded. Sale prices were calculated as recorded sale price minus noted seller costs. Statistical outlier sales measured by extreme house sizes or prices adjusted for size were also excluded.

Housing sale statistics (median prices, median prices adjusted for size, and sale frequencies) from 2000 through 2011 are summarized in Figure 1. Over this 12 year period, median house price appreciation when adjusted for house size (i.e. price divided by above grade square footage), was 8.7%. From the 2006 to the end of 2011 prices fell by 9.5%, while in the last year (2000 through 2011) they declined by 4.9%

**Figure 1. Median Omaha Housing Sale Prices and Volume (2000-2011)**



### **Appreciation Based on Mass Appraisal Modeling**

A multiple regression based mass appraisal model was estimated using the same Omaha housing sales data used for the median price comparisons (described previously). The model specified the log of sale prices to be function of detailed housing and lot characteristics as well as time-trend (dummy) variables indicating the year of each sale and which are used to represent cumulative price appreciation. The resulting model based on 63,388 sales (smaller than the mean comparison sample size due to missing variables from selected observations) had an  $R^2$  statistic of 0.77 meaning that the model explained 77% of the variation in Omaha housing sale prices from 2000 through 2011. As well, all of the estimated explanatory variables in the model were statistically significant at the 99% confidence level.

From 2000 through 2011 homes appreciated by 7.3% which slightly lower than reported median based appreciation (Figure 2). This mass appraisal based appreciation is considered superior to the median approach because it accounts for additional house and lot characteristic changes (other than house size) over time. From the peak of the housing market in 2006 through to 2011, housing prices decreased by 12% and in the last year (2010 to the end of 2011), they have fallen by 5%.

### **Appreciation Based on Repeat Sales Analyses**

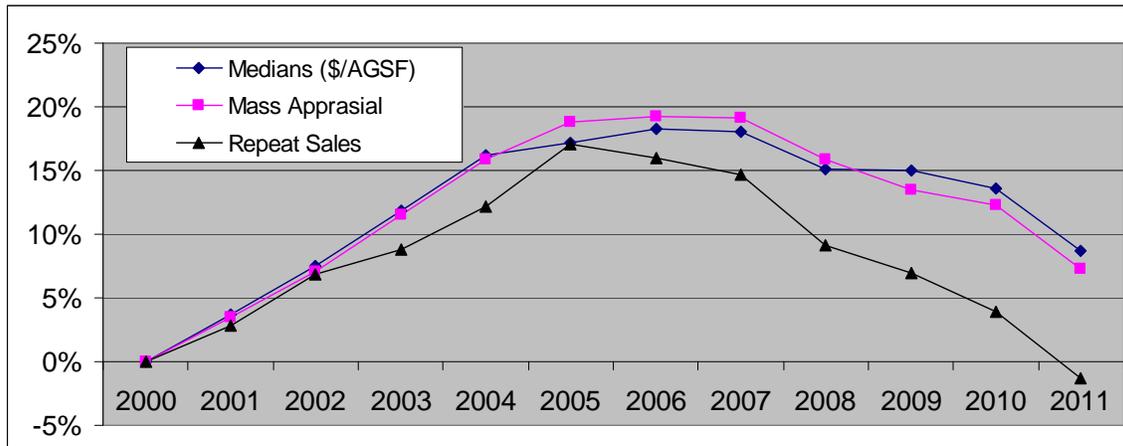
The previously described Omaha housing sales database from 2000 to 2011 (with outliers and erroneous sales removed) was used to identify 7,916 repeat sales (homes that sold more than once). However, 993 of these repeat sales were excluded because they were either resold within less than a 1 year period, and/or because they received substantial improvements defined as above grade square foot increases of more than 10%. This resulted in 6,923 repeat sales available for analysis.

The resulting repeat sale regression model generated statistically significant appreciation estimates across all years at the 90% confidence level of higher. Appreciation over the 2000 through 2011 period was negative 1.3% (Figure 2). From 2006 through 2011, prices declined by 17.3% and in the last year (2010 through 2011) they declined by 5.2%.

### **Comparing Omaha Price Appreciation Based on Alternative Approaches**

Cumulative Omaha housing price appreciation based on all three approaches (medians, mass appraisal, and repeat sales) over the 2000 to 2012 time period are shown in Figure 2 and summarized in Table 1. Housing price appreciation estimated based on the median and mass appraisal approaches are quite similar over time with the median-based estimates being slightly higher than mass appraisal estimates, particularly over the 2004 to 2008 time period. Appreciation estimates based on repeat sales have been consistently lower than the median and mass appraisal based approaches particularly since the peak of the housing market in 2005-2006.

**Figure 2. Cumulative Omaha Housing Price Appreciation Based on Three Alternative Calculation Approaches (2000-2011)**



**Table 1. Cumulative Omaha Housing Appreciation Statistics Over Different Time Periods and Based on Alternative Calculation Approaches**

	Medians (\$/AGSF)	Mass Appraisal	Repeat Sales
2000-2012	8.7%	7.3%	-1.3%
2006-2012	-9.5%	-12.0%	-17.3%
2010-2012	-4.9%	-5.0%	-5.2%

Recent comparisons of national housing price trends (generally reported in the national press via repeat sale indices) with average (median) housing price declines in the Omaha market have generated a false sense of security over the state of the Omaha housing market. The reality of the situation is that all of the housing value equity growth in Omaha from 2000 to 2005 has been lost to the post 2006 housing market crash. This is the exact same situation that has occurred nationally with the only difference being the relative magnitude of the declines which for the most part only impact people who purchased homes at the peak of the housing market.

**The Range of Housing Appreciation Across Omaha**

The importance of evaluating price appreciation within specific neighborhoods rather than relying on a single (city-wide) appreciation estimate is demonstrated by the fact that across 36 Omaha neighborhoods (zipcodes), the range of housing price appreciation (based on mass appraisal modeling) was from -29% to +20% from 2000 to 2012 (see the figure on the cover page of this report). From 2006 to 2012 this range was -49% to +3%. Price depreciation was most severe in several inner-city and low income zipcodes while price positive price appreciation occurred in only three suburban based zipcodes: ‘68118’ (1%), ‘68133’ (1.7%) and ‘68028’ (3.3%).

A forthcoming UNO research report further evaluates the range of neighborhood specific housing price appreciation and factors influencing appreciation rates.