Repeat Sales Index Report
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Karl L. Guntermann
Fred E. Taylor Professor of Real Estate

Adam Nowak
Research Associate
Methodology

The use of repeat sales is the most reliable way to estimate price changes in the housing market because the repeat sales approach eliminates the need to deal with the many issues associated with the heterogeneous nature of housing. Repeat sales can be used to measure the price change of the same housing unit over time. A large number of repeat sales over many years can be analyzed to develop a repeat sales index. In contrast, indices developed using regression analysis provide estimates of price changes over time while simultaneously attempting to control for differences in house characteristics, location, demographics and market conditions, etc. within the model. Regression analysis can and does produce meaningful estimates of price changes but the results are not as reliable as those produced using repeat sales data. An even less rigorous approach would be to simply average sale prices by zip code or some other geographic area where the mix of housing sizes and ages, etc. would be different each month. The percent changes based on medians or averages would reflect not only price changes but also differences in the sizes, ages and other characteristics of the houses sold each month.

The W.P. Carey School of Business – Repeat Sales Index (RSI) tracks very closely to the S&P/Case-Shiller index for Phoenix since the same methodology is employed for calculating both indices. The S&P/Case-Shiller index has been developed for 20 metropolitan areas and is being used as a basis for trading housing futures contracts in many of those markets. Any differences that exist between the two indices are partly due to the use of different house transactions databases and possibly by the way the data has been cleaned prior to the calculation process. For example, the ASU-RSI database includes For Sale by Owner (FSBO) sales, which are not included in the S&P/Case-Shiller index since it uses MLS data. The S&P/Case-Shiller index is proprietary so the cleaning procedure used in connection with that index could not be completely duplicated. However, following S&P/Case-Shiller, the cleaning process used with the ASU - RSI excludes pairs where the first sale involved new construction and pairs where sales occurred within six months of each other. Sale pairs with extremely high or low annual rates of price change are excluded since at least one of the transactions may involve a data error. The same justification is used to drop sales with extremely high or low prices or prices per square foot prior to matching the sale pairs. A more detailed explanation of the data cleaning and calculation process is contained in the ASU-RSI Methodology Report. A modified cleaning procedure has been used beginning with the November 2007 data. This typically has resulted in only slight changes to the statistics, with the exception of the Central region (Phoenix) where recent declines are more pronounced.

The house price data used in the S&P/Case-Shiller index starts in January 1989. Beginning with January 1990, the percent change from the same month in the previous year is reported. The ASU – RSI also begins with January 1989 data so the same percent change calculation also begins
in January 1990 and is reported for each month since then. There is seasonality in house price data so month to month changes may not accurately reflect changes in market conditions and would cover a very short time period. Calculating a percent change from the same month in the previous year controls for whatever seasonality may be present in the data. Annual rates of change typically are thought of applying to a calendar year but in this report the annual rates that are reported would be measuring change over the preceding twelve months.

The graphs contained in this report show the annual rate of change in house prices for the Phoenix metropolitan area on a monthly basis. The ten graphs cover two time periods. Five of the graphs present the price changes from January 1990 through November 2007 while the other five graphs cover the recent housing cycle beginning in January 2004. The S&P/Case-Shiller index is published only for the entire Phoenix metro area. One major advantage to the ASU-RSI is that in addition to the overall index, the metro area has been divided into five regions and an index has been calculated for each region. All repeat sales used in the metro index are included in one of the regional indices. An index has also been calculated for seven individual cities where there are a sufficient number of repeat sales for the index to be reliable. A list of the cities included in each region is in Table 1.

Analysis

The latest data for November 2007 reveal a continuation of the decline in house prices throughout most of the Phoenix metro area. The overall Phoenix index is 5.8 percent lower than it was in November 2006. On a moving twelve month basis, price changes first became negative in March 2007 and the rate of decline has gradually accelerated throughout the year. Between January 2004 and July 2006, house prices increased over 76 percent in the entire metro area with the peak rate of appreciation occurring from September 2004 to September 2005 at over 44.0 percent. In contrast, from the July 2006 peak through November 2007, the total decline has been 6.7 percent, a fraction of the overall increase. However, price changes have been uneven over the metro area and for those who bought houses during 2004-2006, the decline in prices has reduced, if not eliminated, their original equity, making it difficult for them to refinance their mortgages.

The disparity in price changes is apparent in the regional data. House prices in the Northeast region have held up well relative to other parts of the metro area with the change from November 2006 to 2007 only 0.8 percent. Throughout 2007, prices in the Northeast region have been essentially flat, either slightly positive or negative in any given month. For the Central region, annual price changes have been slightly negative since June 2007 but the decline from November 2006 to 2007 is considerably larger (-6.4 percent). This is similar to the Southeast region where the November 2006-2007 change is -7.4 percent. Since the annual change first became negative in
January 2007, the rate of decline has gradually accelerated each month and the November data shows a continuation of that trend.

**TABLE 1**

CITIES INCLUDED IN REGIONS

<table>
<thead>
<tr>
<th>REGION</th>
<th>CITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>NORTHEAST</td>
<td>CAREFREE, CAVE CREEK, FOUNTAIN HILLS, PARADISE, VALLEY, SCOTTSDALE</td>
</tr>
<tr>
<td>NORTHWEST</td>
<td>EL MIRAGE, GLENDALE, PEORIA, SUN CITY, SUN CITY WEST, SURPRISE, YOUNGTOWN</td>
</tr>
<tr>
<td>CENTRAL</td>
<td>PHOENIX</td>
</tr>
<tr>
<td>SOUTHEAST</td>
<td>APACHE, JUNCTION, CHANDLER, GILBERT, HIGLEY, MESA, QUEEN CREEK, SUN LAKES, TEMPE</td>
</tr>
<tr>
<td>SOUTHWEST</td>
<td>AVONDALE, BUCKEYE, GOODYEAR, LITCHFIELD, PARK</td>
</tr>
</tbody>
</table>
The November 2006-2007 decline reached double digits in the Northwest region (-10.8 percent) for the first time to go along with an 11.7 percent decline in the Northwest region, which has posted double digit declines for the past three months. The pattern observed in the Northwest and Southwest regions is similar to what is occurring in the Southeast region where the decline in house prices has accelerated throughout 2007.

Similar variations exist in the indices for individual cites where rates of change in house prices from November 2006 to 2007 ranged from 0.8 percent in Scottsdale / Paradise Valley to -13.1 percent in Sun City / Sun City West. The declines were only slightly negative in Tempe (-2.4 percent) but larger for Chandler (-6.2 percent), Glendale (-7.0 percent), Mesa (-8.1 percent) and Peoria (-9.4 percent). For Glendale and Mesa the good news is that while the twelve month rates of decline are significant, the rates are essentially stable rather than accelerating. The November decline in Chandler is slightly less than the 8+ percent rates of decline from August through October (2006 to 2007). In Peoria, the decline is slightly larger than the 7-8 percent rates of decline observed in the July through October (2006 to 2007) data. The most dramatic trend is in Sun City / Sun City West. The decline in house prices increased from 11.9 percent for October 2006 to 2007 to 13.1 percent for November 2006 to 2007. This compares to a 9.4 percent decline in September and 5.5 percent in August. The Sun City / Sun City West housing market has deteriorated significantly in the past few months compared to the same months in 2006.

One dimension to the current housing crisis is affordability. The dramatic increase in house prices from 2004 into 2006 far outpaced increases in household incomes, which tend to rise very slowly. This disparity caused housing affordability to decline drastically. Improved affordability alone will not end the crisis but recent declines in house prices are moving the market in the right direction. An affordability index of 100 means that a household earning the median income for the area can afford to buy a median priced house at prevailing interest rates. An index value of 125 means that median income is 125 percent of the income needed to buy a median priced house while an index of 75 means just the opposite. In that case a household earning the median income has only 75 percent of the income needed to buy the same median priced house. As recently as 2003 the index for Phoenix was 126 while by 2006 it had declined to 74\(^1\). The change in house prices and/or interest rates that would be needed to bring the affordability index up to 100, which is a useful benchmark, can be calculated for some of the cities in the Repeat Sales Index. The magnitude of these declines can then be related to recent changes in the RSI to gain an understanding of the sensitivity of housing affordability to future price declines and possibly to the duration of the downturn.

\(^1\) Realty Studies, Arizona State University Polytechnic Campus
Data related to affordability for 2007, Q4 at an effective interest rate of 6.2 percent are in the top portion of Table 2. The house price associated with an index value of 100 is then calculated for each of the cities. Based on these two prices, future declines that would move the index up to 100 are found to range from 5.5 percent in Peoria to 41.3 percent for Tempe. The table also includes the total price changes for October and November 2007 based on RSI data. While the declines from November 2006 to November 2007 discussed earlier are in the 6-9 percent range (except for Tempe), recent monthly price changes have been much smaller. In Peoria the relatively small decline needed (5.5 percent) might occur relatively quickly based on recent trends. However, in the other cities it appears that much more time will be required for price declines alone to bring the index back to 100.

The bottom portion of Table 2 contains the same calculations but assumes that interest rates decline by one-half percent from the 2007 Q4 average of 6.2 percent. For most of these cities a relatively small decline in interest rates substantially reduces the decline in house prices that would be needed to move the index back to 100. Lowering interest rates to benefit the housing market is one goal of recent Federal Reserve actions and this example illustrates that the impact on the housing market could be significant. It must be remembered that this is not a forecast of how much house prices will decline in these cities but rather it is an illustration of the magnitude of the price declines required to bring about a significant improvement in housing affordability in the Phoenix metro area.

Table 2
House Price and Interest Rate Declines
for the Affordability Index to = 100

<table>
<thead>
<tr>
<th>Effective Interest Rate 6.2%*</th>
<th>Chandler</th>
<th>Glendale</th>
<th>Mesa</th>
<th>Peoria</th>
<th>Phoenix</th>
<th>Tempe</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007 Q 4 Affordability Index*</td>
<td>94</td>
<td>91</td>
<td>84</td>
<td>95</td>
<td>88</td>
<td>71</td>
</tr>
<tr>
<td>Median Monthly Income*</td>
<td>$5,565</td>
<td>$4,290</td>
<td>$4,081</td>
<td>$4,975</td>
<td>$3,925</td>
<td>$4,045</td>
</tr>
<tr>
<td>Median Resale Price*</td>
<td>$272,000</td>
<td>$215,000</td>
<td>$222,000</td>
<td>$240,000</td>
<td>$204,355</td>
<td>$261,250</td>
</tr>
<tr>
<td>House Price, Affordability = 100</td>
<td>$254,413</td>
<td>$196,124</td>
<td>$186,569</td>
<td>$227,440</td>
<td>$179,438</td>
<td>$184,924</td>
</tr>
<tr>
<td>Price Decline Needed</td>
<td>6.9%</td>
<td>9.6%</td>
<td>19.0%</td>
<td>5.5%</td>
<td>13.9%</td>
<td>41.3%</td>
</tr>
<tr>
<td>October/November 2007 Change</td>
<td>-0.2%</td>
<td>1.3%</td>
<td>-1.3%</td>
<td>-3.8%</td>
<td>-2.8%</td>
<td>-2.4%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Effective Interest Rate 5.7%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median Resale Price*</td>
</tr>
<tr>
<td>House Price, Affordability = 100</td>
</tr>
<tr>
<td>Price Decline Needed</td>
</tr>
</tbody>
</table>

* Realty Studies, Arizona State University Polytechnic Campus
Metro Phoenix Repeat Sales Index (RSI)
Percent Change from Same Month Previous Year
January 1990 - November 2007

Source: ASU W.P. Carey School of Business; Center for Real Estate Theory and Practice
Data Provided by Ion Data
Regional Repeat Sales Index (RSI)
Percent Change from Same Month Previous Year
January 1990 - November 2007

Source: ASU W.P. Carey School of Business; Center for Real Estate Theory and Practice
Data Provided by Ion Data
Chandler, Mesa, & Tempe Repeat Sales Index (RSI)
Percent Change from Same Month Previous Year
January 1990 - November 2007

Source: ASU W.P. Carey School of Business; Center for Real Estate Theory and Practice
Data Provided by Ion Data
Glendale, Peoria, & Sun City/Sun City West Repeat Sales Index (RSI)
Percent Change from Same Month Previous Year
January 1990 - November 2007

Source: ASU W.P. Carey School of Business; Center for Real Estate Theory and Practice
Data Provided by Ion Data
Glendale, Peoria, & Sun City/Sun City West Repeat Sales Index (RSI)
Percent Change from Same Month Previous Year
January 2004 - November 2007

Source: ASU W.P. Carey School of Business; Center for Real Estate Theory and Practice
Data Provided by Ion Data
Scottsdale/Paradise Valley, & Phoenix Repeat Sales Index (RSI)
Percent Change from Same Month Previous Year
January 1990 - November 2007

Source: ASU W.P. Carey School of Business; Center for Real Estate Theory and Practice
Data Provided by Ion Data
Scottsdale/Paradise Valley, & Phoenix Repeat Sales Index (RSI)
Percent Change from Same Month Previous Year
January 2004 - November 2007

Source: ASU W.P. Carey School of Business; Center for Real Estate Theory and Practice
Data Provided by Ion Data