Repeat Sales Index Report
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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 10 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.

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>
</tbody>
</table>

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The latest data for January 2008 reveal that the decline in house prices throughout the Phoenix metro area has leveled off after a steep decline in the December 2007 data. The overall Phoenix index is 8.9 percent lower than it was in January 2007. On a moving twelve month basis, price changes first became negative in March 2007 and the rate of decline gradually accelerated throughout the year, making a large drop in December. 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 January 2008, prices have declined over eleven percent. While the decline is small compared to earlier increases, any decline is not good news for those trying to sell or refinance their homes, especially considering the problems in the mortgage market and weakness in the national and Arizona economies.

The disparity in price changes is apparent in the regional data whether comparing the declines from last month or last year. Since the end of 2006, prices have been relatively stable in the Northeast region except for a decline of 3.3 percent from December 2006 to December 2007. There is only a slight decline in the January data suggesting that December may have been an aberration. The January data show twelve month declines for Phoenix (Central) of 10.0 percent and 10.6 percent for the Southeast. The largest annual declines are on the West side with 16.1 percent for the Northwest and 14.6 percent for the Southwest regions. While all five regions showed similar dramatic increases in house prices from January 2004 to their 2006 peaks (73.5 – 80.6 percent), prices have fallen the most on the West side as can be seen in Table 2. Total declines are 17.7 and 17.5 percent for the West regions compared to 3.9 percent for the Northeast, 11.0 percent for the
Central and 14.6 percent for the Southeast. The early 1990s saw a recession and fallout from the excesses of the 1980s in the real estate market. On a twelve month basis, house prices declined from August 1990 to December 1991, a record 17 straight months. The current weakness in the housing market is approaching the duration experienced in the early 1990s and the magnitude of the declines exceeds those from the earlier period in three of the regions (Central, Southeast and Northwest) and is approaching the largest decline (-21.2 %) in the Southwest region. Unfortunately, since there is nothing in the data yet to indicate that house prices are reaching a bottom, the decline is likely to continue until fundamentals in the housing market improve and/or the turmoil in the mortgage market subsides.

TABLE 2
TOTAL DECLINE IN HOUSE PRICES BY REGION
EARLY 1990s VS THE PRESENT

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Central</td>
<td>-3.2 %</td>
<td>-11.0</td>
</tr>
<tr>
<td>Northeast</td>
<td>-9.7 %</td>
<td>-3.9</td>
</tr>
<tr>
<td>Southeast</td>
<td>-7.0 %</td>
<td>-14.6</td>
</tr>
<tr>
<td>Northwest</td>
<td>-15.3 %</td>
<td>-17.7</td>
</tr>
<tr>
<td>Southwest</td>
<td>-21.2 %</td>
<td>-17.5</td>
</tr>
</tbody>
</table>

Variations similar to those observed in the regional data are also apparent in the city data. Rates of change in house prices from January 2007 to 2008 ranged from 0.7 percent in Scottsdale / Paradise Valley to -17.1 percent in Glendale. Other cities on the West side also registered large declines with Peoria down 14.9 percent and Sun City / Sun City West down 12.1 percent. In contrast declines were smaller in the Southeast Valley for Chandler (8.7 percent), Mesa (9.7 percent) and Tempe (7.0 percent). To put things in historical perspective, a comparison between current housing market conditions and those in the early 1990s for cities included in the ASU-RSI is contained in Table 3. Overall declines for five of the seven cities are already greater than in the early 1990s, in some cases by a large margin, while the decline in Glendale is close to the earlier record. Only housing in Scottsdale / Paradise Valley appears to be weathering the downturn better than it did earlier with a total decline of just 3.4 percent. These results illustrate one advantage of the ASU-RSI, which is that indices calculated separately for regions and cities demonstrate the variability of changes in house prices throughout the metropolitan area. It is important to remember that housing cannot be analyzed as a single market. Rather, conditions are likely to vary not only by cities but also by zip codes and even neighborhoods.
TABLE 3
TOTAL DECLINE IN HOUSE PRICES BY CITY
EARLY 1990s VS THE PRESENT

<table>
<thead>
<tr>
<th>City</th>
<th>CHANDLER</th>
<th>GLENDALE</th>
<th>MESA</th>
<th>PEORIA</th>
<th>SCOTTSDALE/ PARADISE</th>
<th>SUN CITY/ SUN CITY WEST</th>
<th>TEMPE VALLEY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1989 – 1991</td>
<td>-7.6%</td>
<td>-19.6%</td>
<td>-10.9%</td>
<td>-7.3%</td>
<td>-9.7%</td>
<td>-10.5%</td>
<td>-1.9%</td>
</tr>
<tr>
<td>2006 – 2008</td>
<td>-13.9</td>
<td>-17.4</td>
<td>-13.2</td>
<td>-18.7</td>
<td>-3.4</td>
<td>-17.5</td>
<td>-11.4</td>
</tr>
</tbody>
</table>

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 ASU-RSI. The magnitude of these declines can then be related to recent changes in the ASU-RSI to gain an understanding of the sensitivity of housing affordability to future price declines and possibly to the duration of the downturn.

Data related to affordability for 2007, Q4 at an effective interest rate of 6.2 percent is in the top portion of Table 4. 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 monthly change from December 2007 to January 2008 based on the ASU-RSI data. The more rapid decline in prices observed in Glendale (7.3 percent) suggests that its housing market is closer to turning the corner on affordability than most other markets. While painful to those affected, the price declines will speed the necessary adjustment that is occurring in the housing market.

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\(^1\) Realty Studies, Arizona State University Polytechnic Campus
The bottom portion of Table 4 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 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. Since new housing compete with existing homes in parts of the market, recent cutbacks by home builders will also help to reduce excess supply and bring the market into better balance. It must be remembered that this affordability calculation 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 needed to bring about a significant improvement in housing affordability in the Phoenix metro area.

Table 4
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>December 2007 to January 2008</td>
<td>-1.7%</td>
<td>-7.3%</td>
<td>-1.8%</td>
<td>-3.2%</td>
<td>-1.2%</td>
<td>-1.9%</td>
</tr>
<tr>
<td>Change in the ASU-RSI</td>
<td>-1.7%</td>
<td>-7.3%</td>
<td>-1.8%</td>
<td>-3.2%</td>
<td>-1.2%</td>
<td>-1.9%</td>
</tr>
</tbody>
</table>

Effective Interest Rate 5.7%

| Median Resale Price*          | $272,000 | $215,000 | $222,000 | $240,000 | $204,355 | $261,250|
| House Price, Affordability = 100 | $268,470 | $206,961 | $196,878 | $240,007 | $189,352 | $195,141|
| Price Decline Needed          | 1.3%     | 3.9%     | 12.8% | 0.0%    | 7.9%     | 33.9% |

* Realty Studies, Arizona State University Polytechnic Campus
Metro Phoenix Repeat Sales Index (RSI)
Percent Change from Same Month Previous Year
January 1990 - January 2008

Source: ASU W.P. Carey School of Business; Center for Real Estate Theory and Practice
Metro Phoenix Repeat Sales Index (RSI)
Percent Change from Same Month Previous Year
January 2004 - January 2008

Source: ASU W.P. Carey School of Business; Center for Real Estate Theory and Practice
Regional Repeat Sales Index (RSI)
Percent Change from Same Month Previous Year
January 1990 - January 2008

Source: ASU W.P. Carey School of Business; Center for Real Estate Theory and Practice
Chandler, Mesa & Tempe Repeat Sales Index (RSI)
Percent Change from Same Month Previous Year
January 2004 - January 2008

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 - January 2008

Source: ASU W.P. Carey School of Business; Center for Real Estate Theory and Practice
Glendale, Peoria, & Sun City/Sun City West Repeat Sales Index (RSI)
Percent Change from Same Month Previous Year
January 2004 - January 2008

Source: ASU W.P. Carey School of Business; Center for Real Estate Theory and Practice
Scottsdale/Paradise Valley, & Phoenix Repeat Sales Index (RSI)
Percent Change from Same Month Previous Year
January 1990 - January 2008

Source: ASU W.P. Carey School of Business; Center for Real Estate Theory and Practice
Scottsdale/Paradise Valley, & Phoenix Repeat Sales Index (RSI)

Percent Change from Same Month Previous Year

January 2004 - January 2008

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