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 provided by Ion Data 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.

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. To smooth the index, data is included in calculations for the current month and the next two months before it is reported. This means that the rate of return calculated from each sale pair is included in calculations for a total of three months before it is published, which accounts for the difference between the date on the report and the ending date on the graphs.

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 February 2008 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>
<thead>
<tr>
<th>TABLE 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>CITIES INCLUDED IN REGIONS</td>
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</table>

<table>
<thead>
<tr>
<th>REGION</th>
<th>CITIES</th>
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<tbody>
<tr>
<td>NORTHEAST</td>
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<td></td>
<td>CAVE CREEK</td>
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<tr>
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<td>FOUNTAIN HILLS</td>
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<td></td>
<td>PARADISE</td>
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<td></td>
<td>VALLEY</td>
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<tr>
<td></td>
<td>SCOTTSDALE</td>
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<tr>
<td>NORTHWEST</td>
<td>GLendale</td>
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<tr>
<td></td>
<td>PEORIA</td>
</tr>
<tr>
<td></td>
<td>SUN CITY</td>
</tr>
<tr>
<td></td>
<td>SUN CITY WEST</td>
</tr>
<tr>
<td></td>
<td>SURPRISE</td>
</tr>
<tr>
<td></td>
<td>YOUNGTTOWN</td>
</tr>
</tbody>
</table>

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Summary

The latest data for July 2008 shows a larger decline from one year ago than was reported last month. The overall metro decline from May 2007 to May 2008 was -21 percent while from June 2007 to June 2008 it was -23 percent. For July the annual decline was -24 percent. It appears that the rapid, double-digit rates of decline that began in March are leveling off. That good news must be tempered with the realization that the leveling off may be close to -30 percent from the prior year. It probably will take months for the decline in the index to reach zero, which would mean that house prices themselves have stopped declining. A similar slowing in the rate of decline also is showing up in the Northeast region and some of the cities. The rate of appreciation peaked in September 2005 at a 44 percent annual rate and house prices increased 76 percent from January 2004 to July 2006. Since then the ASU-RSI has declined almost 28 percent in total. Because of the way the ASU-RSI is calculated, preliminary estimates of the index can be made for August and September. The August estimate is for a decline of 26 percent from August 2007 while for September the decline is estimated to be -27 percent. These estimates, while preliminary and subject to change, also suggest that the rate of house price declines is leveling off.

Regions

Annual rates of decline vary widely across the five regions as does the change in the rate of decline from June to July. From July 2007 to 2008 prices declined by 14 percent in the Northeast but by almost 36 percent in the Southwest (Table 2). House prices in the Central, Northwest and Southeast regions were in between with declines ranging from 24 to 28 percent.
TABLE 2
ANNUAL AND TOTAL DECLINES IN HOUSE PRICES BY REGION
EARLY 1990s VS THE PRESENT

<table>
<thead>
<tr>
<th></th>
<th>CENTRAL</th>
<th>NORTHEAST</th>
<th>SOUTHEAST</th>
<th>NORTHWEST</th>
<th>SOUTHWEST</th>
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</thead>
<tbody>
<tr>
<td>July 2007 – July 2008</td>
<td>-25.6%</td>
<td>-14.0%</td>
<td>-23.7%</td>
<td>-28.4%</td>
<td>-35.8%</td>
</tr>
<tr>
<td>June 2007 – June 2008</td>
<td>-23.3%</td>
<td>-14.0%</td>
<td>-22.4%</td>
<td>-27.0%</td>
<td>-34.3%</td>
</tr>
<tr>
<td>2006 – 2008</td>
<td>-27.9</td>
<td>-16.0</td>
<td>-28.3</td>
<td>-33.6</td>
<td>-42.2</td>
</tr>
</tbody>
</table>

While all five regions showed similar dramatic increases in house prices from January 2004 to their 2006 peaks (74 – 81 percent), price declines vary widely. The Southwest is suffering the most (-36%) followed by the Northwest, Southeast, Central and Northeast regions. The June and July indices show the same leveling off observed in the overall index. However, the leveling off is occurring at very different annual rates of decline. 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. To put things in historical perspective, a comparison between current housing market conditions and those in the early 1990s for regions and cities included in the ASU-RSI is presented in the bottom half of Tables 2 and 3. The current weakness in the housing market has now matched the duration experienced in the early 1990s and the magnitude of the declines far exceeds those from the earlier period in all regions and cities.

Cities

Variations similar to those observed in the regional data are also apparent in the city data. Rates of decline in house prices from July 2007 to 2008 ranged from -14 percent in Scottsdale / Paradise Valley to -29 percent in Glendale (Table 3). Similar to other geographic areas, the annual rate of decline slowed compared to June with four of the seven cities actually showing slightly slower rates of decline than in the June index. Prices have now declined more in percentage terms relative to the early 1990s across the board, making this the worst housing market on record, measured by
price change. In Glendale and Peoria the total decline from the 2006 peak is now over 30 percent while in three other cities it exceeds 20 percent. One advantage of the ASU-RSI is that estimating the index for regions and cities reveals very significant variations within the metro market resulting in a more accurate picture of housing market conditions in Phoenix.

TABLE 3

ANNUAL AND TOTAL DECLINES IN HOUSE PRICES BY CITY
EARLY 1990s VS THE PRESENT

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Chandler</td>
<td>-20.5%</td>
<td>-20.1%</td>
<td>-7.6</td>
<td>-26.7</td>
</tr>
<tr>
<td>Glendale</td>
<td>-29.3%</td>
<td>-27.4%</td>
<td>-19.6</td>
<td>-33.4</td>
</tr>
<tr>
<td>Mesa</td>
<td>-24.9%</td>
<td>-23.3%</td>
<td>-10.9</td>
<td>-29.5</td>
</tr>
<tr>
<td>Peoria</td>
<td>-27.7%</td>
<td>-28.1%</td>
<td>-7.3</td>
<td>-34.1</td>
</tr>
<tr>
<td>Scottsdale/Paradise Valley</td>
<td>-13.7%</td>
<td>-14.0%</td>
<td>-9.7</td>
<td>-15.9</td>
</tr>
<tr>
<td>Scottsdale/Sun City West</td>
<td>-15.2%</td>
<td>-15.4%</td>
<td>-10.5</td>
<td>-23.6</td>
</tr>
<tr>
<td>Tempe</td>
<td>-13.1%</td>
<td>-13.2%</td>
<td>-1.9</td>
<td>-15.5</td>
</tr>
</tbody>
</table>

Preliminary Estimates

The extraordinary nature of the housing cycle beginning in January 2004 compared to the prior history of the market back to 1989 is apparent in Figure 1. That graph is based on the trend in the annual rate of change in Phoenix house prices calculated from the ASU-RSI beginning in January 1990 through the end of 2003. This trend shows a gradual increase in the rate of price change reaching approximately 7 percent by 2002-2003. The trend is then projected out to the end of 2009 and compared to the actual change in the RSI through July 2008. The peak appreciation rate of 44 percent in September 2005 clearly was not sustainable and from looking at Figure 1, it is not surprising that prices are now declining at double digit annual rates.

Perhaps the most important question that homeowners have relates to how much further house prices are likely to fall. While it is impossible to predict where prices will level off, Figure 2 contains a comparison of the trend in median house prices in Phoenix with actual median prices through July 2008. The trend is estimated using the RSI database from January 1989 through the end of 2003 and it is then projected through December 2009. As difficult as the market correction
has been and still is, the data show that in July, median house prices returned to their long-term trend at approximately $190,000. When compared to the peak median price, $263,000, the magnitude of the decline in house prices over the past two years is apparent. Since the ASU-RSI is down 24% from July 2007, prices clearly will continue declining for the foreseeable future. Once the index levels off, it will then have to move up to a zero percent change from the prior year before it can be stated that house prices themselves have leveled off. How quickly price changes return to the long-term trend will depend not only on supply and demand factors in the housing market but also on the state of the economy and the mortgage market.

It was stated earlier that the data for each month is also included in calculations for the next two months to smooth the index. A comparison of the change in the index for the two months that are not reported with their final reported values has revealed that the preliminary values are fairly close to the eventual, final values. This means that it may be possible to get an early, fairly reliable estimate of the direction and magnitude of changes in house prices, eliminating the two month delay inherent in the index. For example, the July decline in the overall index is -24 percent from July 2007 and the preliminary values for August and September are -26 and -27 percent respectively. The preliminary estimate for July reported in the last report was -24.5 percent, very close to the actual decline in the index. It must be remembered that the estimates for August and September are preliminary and that the decline for August reported next month may be somewhat different.

Affordability

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 most cities in the ASU-RSI.

The affordability index and median resale house prices for 2008, Q2 at an effective interest rate of 6.25 percent are in the top portion of Table 4. The house price associated with an index value of 100 is then calculated for each city based on estimated gross monthly household income

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\(^1\) Realty Studies, Arizona State University Polytechnic Campus
and the effective 6.25 percent interest rate. A comparison of the two house prices is an indication of the condition of the housing market in each city and it can be related to house price changes calculated from the ASU-RSI data. For example, the affordability index for Mesa in the second quarter was 79 and the median resale house price was $235,000. The median price would have to decline an additional 20.7% to $186,373 for the affordability index for Mesa to equal 100 at a mortgage rate of 6.25 percent. Affordability is just one aspect of the current housing problem and it must be remembered that this affordability calculation is not a forecast of how much house prices will decline in any of 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.

Table 4
House Price and Interest Rates for the Affordability Index to = 100

<table>
<thead>
<tr>
<th>Effective Interest Rate 6.25%*</th>
<th>Chandler</th>
<th>Glendale</th>
<th>Mesa</th>
<th>Peoria</th>
<th>Phoenix</th>
<th>Tempe</th>
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</thead>
<tbody>
<tr>
<td>2008 Q2 Affordability Index*</td>
<td>105</td>
<td>80</td>
<td>79</td>
<td>88</td>
<td>80</td>
<td>65</td>
</tr>
<tr>
<td>Median Gross Monthly Household Income*</td>
<td>$ 5,625</td>
<td>$ 4,335</td>
<td>$ 4,120</td>
<td>$ 5,025</td>
<td>$ 3,965</td>
<td>$ 4,085</td>
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<tr>
<td>Median Resale Price*</td>
<td>$242,000</td>
<td>$243,995</td>
<td>$235,000</td>
<td>$257,000</td>
<td>$225,000</td>
<td>$285,000</td>
</tr>
<tr>
<td>House Price for Affordability Index to = 100</td>
<td>$254,454</td>
<td>$196,099</td>
<td>$186,373</td>
<td>$227,312</td>
<td>$179,362</td>
<td>$184,790</td>
</tr>
<tr>
<td>Additional Price Decline Needed</td>
<td>-5.1%</td>
<td>19.6%</td>
<td>20.7%</td>
<td>11.6%</td>
<td>20.3%</td>
<td>35.2%</td>
</tr>
</tbody>
</table>

* Realty Studies, Arizona State University Polytechnic Campus
Figure 1
Trend and Actual Annual Change in Phoenix House Prices

Source: ASU W.P. Carey School of Business; Center for Real Estate Theory and Practice
Data Provided by Ion Data
Figure 2
Median Trend and Actual Phoenix House Prices 1989-2009

Source: ASU W.P. Carey School of Business; Center for Real Estate Theory and Practice
Data Provided by Ion Data
Figure 3
Metro Phoenix Repeat Sales Index (RSI)
Percent Change from Same Month Previous Year
January 1990 - July 2008

Source: ASU W.P. Carey School of Business; Center for Real Estate Theory and Practice
Data Provided by Ion Data
Figure 4
Metro Phoenix Repeat Sales Index (RSI)
Percent Change from Same Month Previous Year
January 2004 - July 2008

Source: ASU W.P. Carey School of Business; Center for Real Estate Theory and Practice
Data Provided by Ion Data
Figure 5
Regional Repeat Sales Index (RSI)
Percent Change from Same Month Previous Year
January 1990 - July 2008

Source: ASU W.P. Carey School of Business; Center for Real Estate Theory and Practice
Data Provided by Ion Data
Figure 6
Regional Repeat Sales Index (RSI)
Percent Change from Same Month Previous Year
January 2004 - July 2008

Source: ASU W.P. Carey School of Business; Center for Real Estate Theory and Practice
Data Provided by Ion Data
Figure 7
Chandler, Mesa, & Tempe Repeat Sales Index (RSI)
Percent Change from Same Month Previous Year
January 1990 - July 2008

Source: ASU W.P. Carey School of Business; Center for Real Estate Theory and Practice
Data Provided by Ion Data
Figure 8
Chandler, Mesa & Tempe Repeat Sales Index (RSI)
Percent Change from Same Month Previous Year
January 2004 - July 2008

Source: ASU W.P. Carey School of Business; Center for Real Estate Theory and Practice
Data Provided by Ion Data
Figure 9
Glendale, Peoria, & Sun City/Sun City West Repeat Sales Index (RSI)
Percent Change from Same Month Previous Year
January 1990 - July 2008

Source: ASU W.P. Carey School of Business; Center for Real Estate Theory and Practice
Data Provided by Ion Data
Figure 10
Glendale, Peoria, & Sun City/Sun City West Repeat Sales Index (RSI)
Percent Change from Same Month Previous Year
January 2004 - July 2008

Source: ASU W.P. Carey School of Business; Center for Real Estate Theory and Practice
Data Provided by Ion Data
Figure 11
Scottsdale/Paradise Valley, & Phoenix Repeat Sales Index (RSI)
Percent Change from Same Month Previous Year
January 1990 - July 2008

Source: ASU W.P. Carey School of Business; Center for Real Estate Theory and Practice
Data Provided by Ion Data
Figure 12
Scottsdale/Paradise Valley, & Phoenix Repeat Sales Index (RSI)
Percent Change from Same Month Previous Year
January 2004 - July 2008

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