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 November 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>REGION</th>
<th>CITIES</th>
</tr>
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<tbody>
<tr>
<td>NORTHEAST</td>
<td>CAREFREE</td>
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<tr>
<td></td>
<td>CAVE CREEK</td>
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<tr>
<td></td>
<td>FOUNTAIN HILLS</td>
</tr>
<tr>
<td></td>
<td>PARADISE</td>
</tr>
<tr>
<td></td>
<td>VALLEY</td>
</tr>
<tr>
<td></td>
<td>SCOTTSDALE</td>
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<td>NORTHWEST</td>
<td>EL MIRAGE</td>
</tr>
<tr>
<td></td>
<td>GLENDALE</td>
</tr>
<tr>
<td></td>
<td>PEORIA</td>
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<td></td>
<td>SUN CITY</td>
</tr>
<tr>
<td></td>
<td>SUN CITY WEST</td>
</tr>
<tr>
<td></td>
<td>SURPRISE</td>
</tr>
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<td>YOUNGTOWN</td>
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Summary

The latest data for November 2008 reveals that house prices declined by 32 percent in the Phoenix metro area. This is an increase from the October decline of 30 percent and the September 2007 to September 2008 decline of 28 percent. It appears that the rapid, double-digit rates of decline that began in March 2008 are slowing but the uncertainty in the financial markets last fall and the accelerating decline in the U.S economy are just beginning to be reflected in the RSI. It probably will be months before the decline in the index levels off, which would be the first step is ending the decline in house prices that has now reached a record 21 months. In comparison, the 1989 – 1991 down turn lasted 17 straight months. The median price of houses used in the index was approximately $160,000 in October while for November the median dropped to $150,000. That puts prices back to the level of October 2003, prior to the start of the current cycle. The preliminary estimates for December, $139,000 and January 2009, $130,000 would put prices back to the levels of March 2002 and January 2001, respectively.

The rate of appreciation for the overall metro area peaked in September 2005 at a 44 percent annual rate with house prices increasing by 76 percent from January 2004 to July 2006. Since then the ASU-RSI has declined over 36 percent in total. Since the ASU-RSI is calculated as a three month moving average, preliminary estimates of the index can be made for December and January 2009. The preliminary figures are for declines of 33 percent for December and 34 percent for January 2009. While preliminary and subject to change, these figures suggest that at least the rate of decline is leveling off.
Regions
Annual rates of decline vary widely across the five regions as does the change in the rate of decline from October to November. Price declines in the Northeast region exceeded 20 percent and were almost 42 percent in the Southwest. House prices in the Central, Northwest and Southeast regions were in between with declines ranging from 28 to 34 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>
</tr>
</thead>
<tbody>
<tr>
<td>Nov. 2007 – Nov. 2008</td>
<td>-34.0%</td>
<td>-23.2%</td>
<td>-27.5%</td>
<td>-34.0%</td>
<td>-41.8%</td>
</tr>
<tr>
<td>October 2007 – October 2008</td>
<td>-33.0%</td>
<td>-21.5%</td>
<td>-26.5%</td>
<td>-33.3%</td>
<td>-40.0%</td>
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<tr>
<td>2006 – 2008</td>
<td>-38.2</td>
<td>-23.7</td>
<td>-34.9</td>
<td>-41.8</td>
<td>-49.3</td>
</tr>
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</table>

While all five regions showed similar dramatic increases in house prices from January 2004 to their 2006 peaks (74 – 81 percent), total price declines vary widely. The Southwest is down the most (over 49%) followed by the Northwest, Central, Southeast and Northeast regions. The early 1990s saw a recession and fallout from the excesses of the 1980s in the real estate market. The current weakness in the housing market has not only exceeded the duration experienced in the early 1990s but the magnitude of the declines far exceeds those from the 1989 - 1992 period in all regions.

Cities
Variations similar to those observed in the regional data are also apparent in the city data. Rates of decline in house prices from November 2007 to 2008 ranged from 14 percent in Sun City / Sun City West to 37 percent in Glendale (Table 3). In Sun City/Sun City West the annual decline in the index has been in the range of -13 to -15 percent for the past twelve months. While prices are still declining, at least the rate is not accelerating in that area. The decline in the other cities ranged
from 19 percent in Tempe to 37 percent in Glendale. In two cities the total decline from the 2006 peak is now over 40 percent while in two others it exceeds 30 percent. The annual rates of decline from the 2006 peak vary from 12 percent in Scottsdale/Paradise Valley and Tempe to almost 28 percent in Glendale.

### TABLE 3
ANNUAL AND TOTAL DECLINES IN HOUSE PRICES BY CITY
EARLY 1990s VS THE PRESENT

<table>
<thead>
<tr>
<th></th>
<th>Chandler</th>
<th>Glendale</th>
<th>Mesa</th>
<th>Peoria</th>
<th>Scottsdale/Paradise Valley</th>
<th>Sun City/ Sun Valley</th>
<th>Tempe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nov. 2007-</td>
<td>-25.6 %</td>
<td>-36.6 %</td>
<td>-29.9%</td>
<td>-32.8%</td>
<td>-22.1%</td>
<td>-13.7 %</td>
<td>-19.0 %</td>
</tr>
<tr>
<td>Nov. 2008</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>October 2007-</td>
<td>-23.9 %</td>
<td>-34.5 %</td>
<td>-29.2%</td>
<td>-32.4%</td>
<td>-20.0%</td>
<td>-14.8 %</td>
<td>-17.9 %</td>
</tr>
<tr>
<td>October 2008</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1989 – 1992</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>-33.0</td>
<td>-41.4</td>
<td>-36.7</td>
<td>-40.9</td>
<td>-22.8</td>
<td>-28.8</td>
<td>-24.6</td>
</tr>
</tbody>
</table>

Preliminary Estimates

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, especially for the upcoming month. 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 November decline in the overall index is 32 percent from 2007 while the preliminary values for December and January 2009 are -33 and -34 percent respectively.

The extraordinary nature of the housing cycle that began in January 2004 compared to the prior history of the market back to 1989 is apparent in Figure 1. The 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 annual 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 and estimated changes in the RSI through January 2009. 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 used in the ASU-RSI with actual and estimated median prices through January 2009. 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, the data show that in July 2008, median house prices returned to their long-term trend at approximately $191,000. The October median price of approximately $160,000 was down to $150,000 by November. When compared to the peak, $262,500, the magnitude of the decline in house prices over the past two years is apparent. Since the ASU-RSI for November is down 32% from November 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 bottomed out.

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. As recently as 2003 the index for the Phoenix metro area was 126 while by 2006 it had declined to 74\(^1\). 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.

The affordability index for 2008, Q4 at an effective interest rate of 6.30 percent is in the top row of Table 4. The other side of the dramatic decline in house prices over the past 18 months is that the affordability index for all cities but Tempe is now well over 100 with the index for Phoenix up to 152. The index is then recalculated for a range of interest rates from 4.5 to 6.5 percent. It is clear that housing affordability is very sensitive to changes in interest rates and that a significant reduction in rates along with falling house prices should have a strong positive impact on the housing market. Actions that lead to a slowing in the number of foreclosed houses added to the market would further improve the housing outlook for 2009.

\(^{1}\) Realty Studies, Arizona State University Polytechnic Campus
<table>
<thead>
<tr>
<th>Interest Rate</th>
<th>Chandler</th>
<th>Glendale</th>
<th>Mesa</th>
<th>Peoria</th>
<th>Phoenix</th>
<th>Tempe</th>
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<tr>
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<td>4.75%</td>
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<td>161</td>
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<tr>
<td>4.50%</td>
<td>143</td>
<td>166</td>
<td>148</td>
<td>149</td>
<td>185</td>
<td>106</td>
</tr>
</tbody>
</table>

* Realty Studies, Arizona State University Polytechnic Campus
Figure 1
Trend and Actual Annual Percent Change in Phoenix House Price
January 1990 - January 2009

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
January 1989 - January 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 - November 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 - November 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 - November 2008

Central
Northeast
Southeast
Northwest
Southwest
Metro Area

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 - November 2008

Central
Northeast
Southeast
Northwest
Southwest
Metro Area

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 - November 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 - November 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 - November 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 - November 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 - November 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 - November 2008

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