



## 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 December 2007 reveal that the decline in house prices throughout the Phoenix metro area is accelerating. The overall Phoenix index is 8.6 percent lower than it was in December 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, taking a large jump 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 December 2007, the overall decline is now over ten percent. While the decline is much less than the increase, it 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. The Northeast has been the stable region throughout 2007 but in December it showed the biggest decline from November at almost 5 percent and prices are now down over 3 percent from December 2006. Monthly declines registered in December for the other regions range from 3 to 4 percent. The declines from one year ago are in the 9 percent range for the Central and Southeast regions and approximately 14 percent for the Northwest and Southwest regions. While the annual rates of decline are higher than they were in the November

data, the most disturbing trend is the accelerating deterioration reflected in the data for November and December compared to their respective prior months.

TABLE 1  
CITIES INCLUDED IN REGIONS

<u>REGION</u>	<u>CITIES</u>
<u>NORTHEAST</u>	CAREFREE CAVE CREEK FOUNTAIN HILLS PARADISE VALLEY SCOTTSDALE
<u>NORTHWEST</u>	EL MIRAGE GLENDALE PEORIA SUN CITY SUN CITY WEST SURPRISE YOUNGTOWN
<u>CENTRAL</u>	PHOENIX
<u>SOUTHEAST</u>	APACHE JUNCTION CHANDLER GILBERT HIGLEY MESA QUEEN CREEK SUN LAKES TEMPE
<u>SOUTHWEST</u>	AVONDALE BUCKEYE GOODYEAR LITCHFIELD PARK

The overall decline in prices from the peaks reached in the second half of 2006 also vary widely by region. At the low end is the Northeast region, where house prices have declined slightly

over 5 percent from their October 2006 peak. This is followed by declines of 10 percent for the Central region (Phoenix), 13 Percent for the Southeast and 15 and 16 percent respectively for the Northwest and Southwest regions. Prices in these other regions peaked between July and November 2006.

Similar variations exist in the indices for individual cities where rates of decline in house prices from December 2006 to 2007 ranged from 3 percent in Scottsdale / Paradise Valley to 13 percent in Sun City / Sun City West, which was essentially unchanged from November. The annual declines in all cities are considerably larger than those reflected in the November data. Tempe's decline was 6 percent (compared to 2 percent in November) followed by Chandler (8 percent), Mesa (9 percent), Glendale (11 percent) and Peoria (12 percent). The overall decline in house prices from their peak levels ranged from 5 percent in Scottsdale / Paradise Valley to 17 percent in Sun City / Sun City West. In between are total declines of 10 to 12 percent for Chandler, Mesa, Tempe and Glendale, while for Peoria the overall decline is 16 percent. These results illustrate one advantage of the ASU-RSI, which is that indices are calculated separately for regions and cities to demonstrate the variability of changes in house prices throughout the metropolitan area.

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<sup>1</sup>. 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.

Data related to affordability for 2007, Q4 at an effective interest rate of 6.2 percent is 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

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<sup>1</sup> Realty Studies, Arizona State University Polytechnic Campus

monthly change from November to December 2007 based on RSI data. The more rapid decline in prices that has started to occur, while painful to those affected, will speed the necessary adjustment that is occurring in the market.

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. Since new houses compete with existing homes in parts of the market, recent cutbacks by home builders will also help to reduce excess supply and bring supply and demand 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 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 2  
House Price and Interest Rate Declines  
for the Affordability Index to = 100

	Effective Interest Rate 6.2%*					
	Chandler	Glendale	Mesa	Peoria	Phoenix	Tempe
2007 Q 4 Affordability Index*	94	91	84	95	88	71
Median Monthly Income*	\$ 5,565	\$ 4,290	\$ 4,081	\$ 4,975	\$ 3,925	\$ 4,045
Median Resale Price*	\$272,000	\$ 215,000	\$ 222,000	\$ 240,000	\$204,355	\$261,250
House Price, Affordability = 100	\$254,413	\$ 196,124	\$ 186,569	\$ 227,440	\$179,438	\$184,924
Price Decline Needed	6.9%	9.6%	19.0%	5.5%	13.9%	41.3%
November to December 2007 Change in the RSI	-2.8%	-3.6%	-2.2%	-4.5%	-3.8%	-3.0%
	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

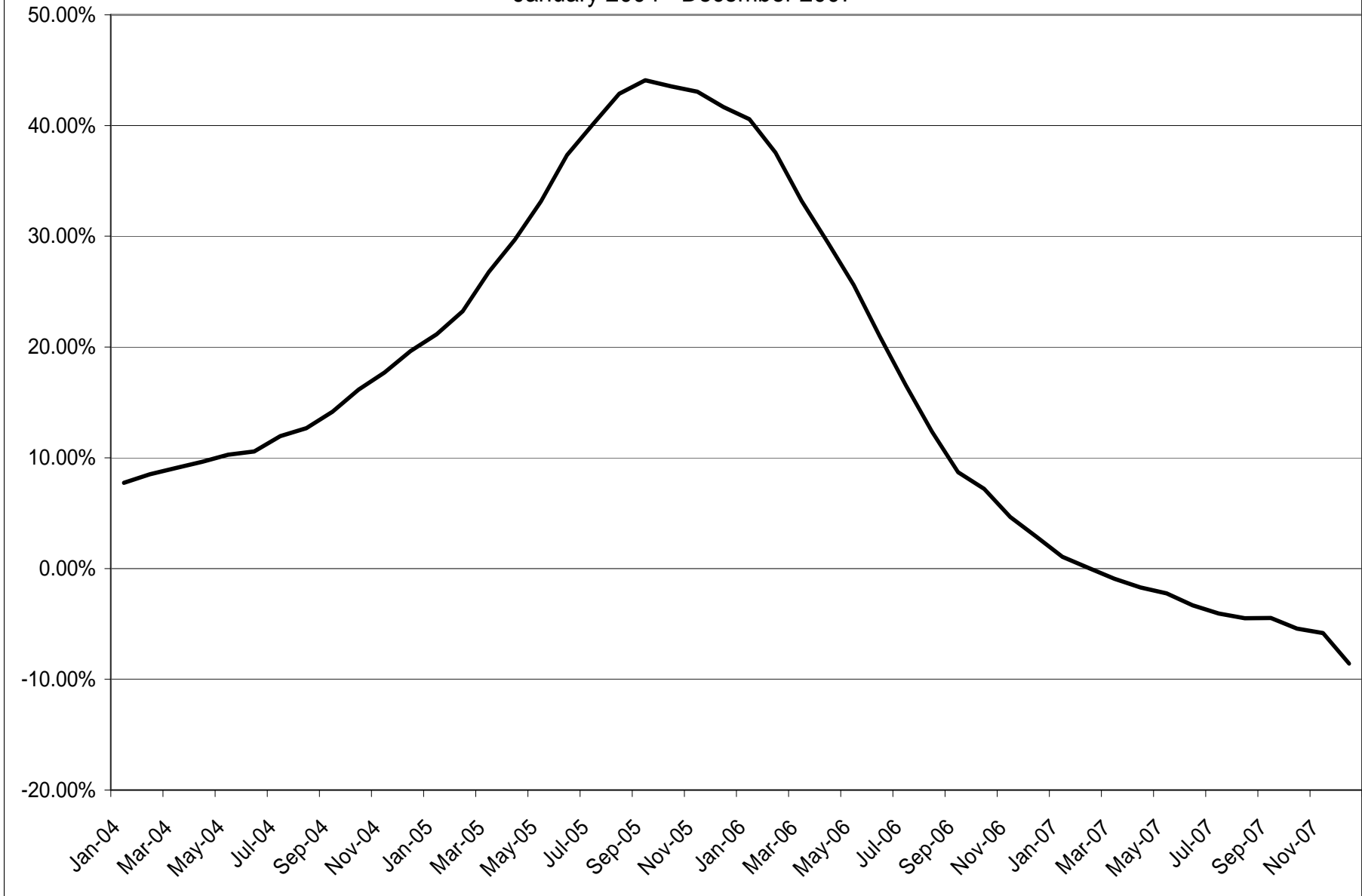
**Metro Phoenix Repeat Sales Index (RSI)**  
Percent Change from Same Month Previous Year  
January 1990 - December 2007



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

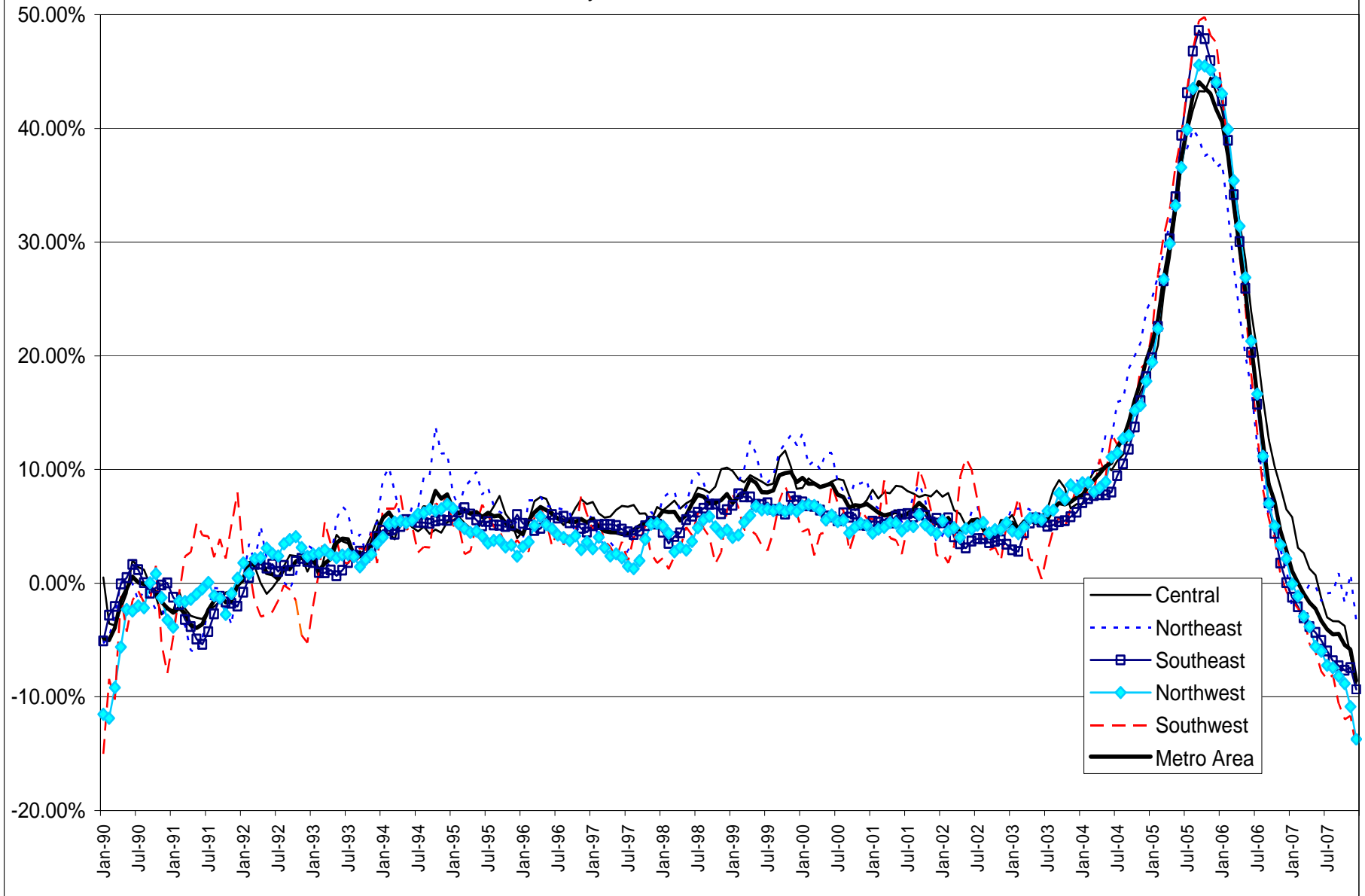
Data Provided by Ion Data

**Metro Phoenix Repeat Sales Index (RSI)**  
Percent Change from Same Month Previous Year  
January 2004 - December 2007



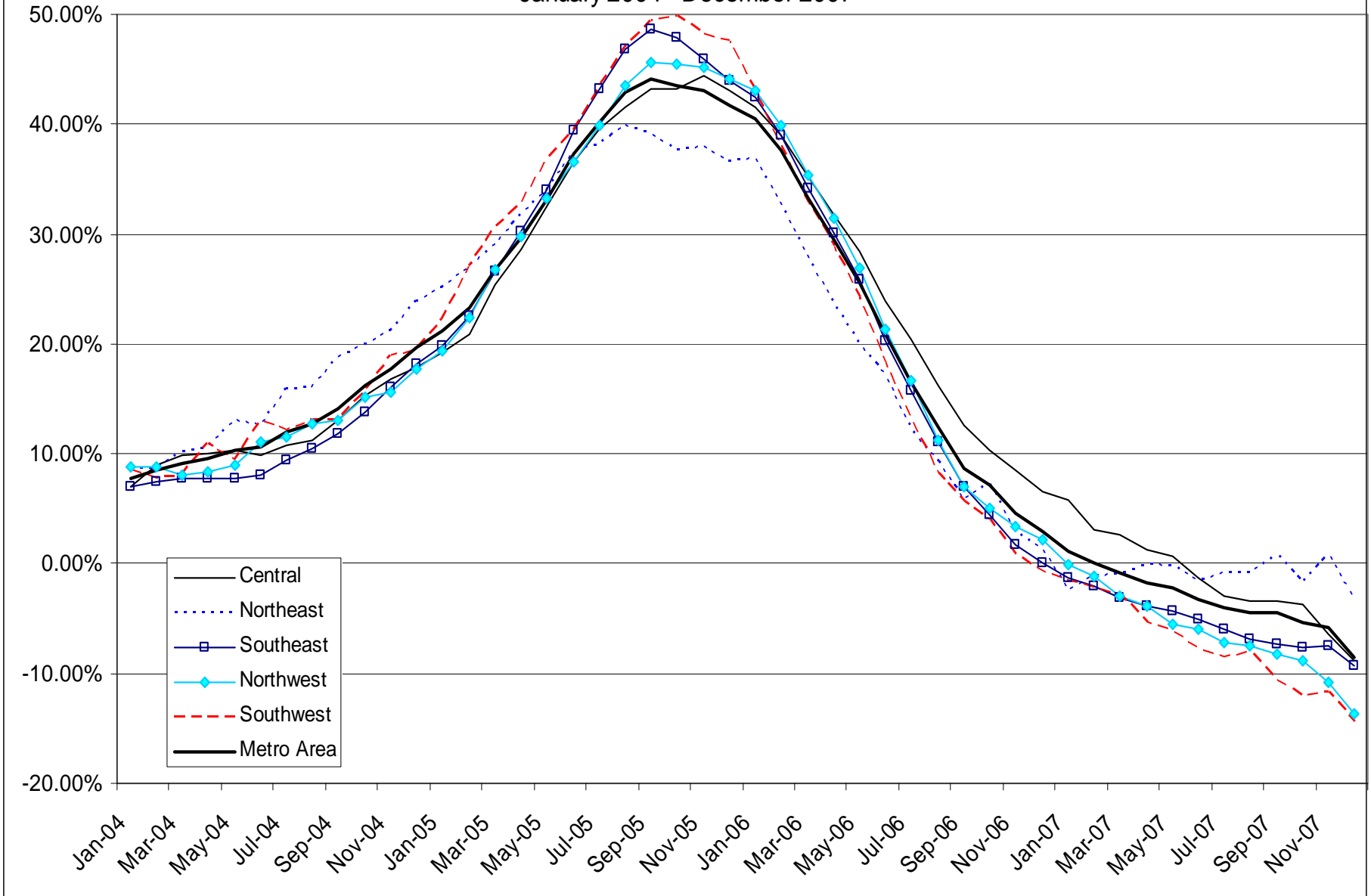
Source: ASU W.P. Carey School of Business; Center for Real Estate Theory and Practice  
Data Provided by Ion Data

**Regional Repeat Sales Index (RSI)**  
 Percent Change from Same Month Previous Year  
 January 1990 - December 2007



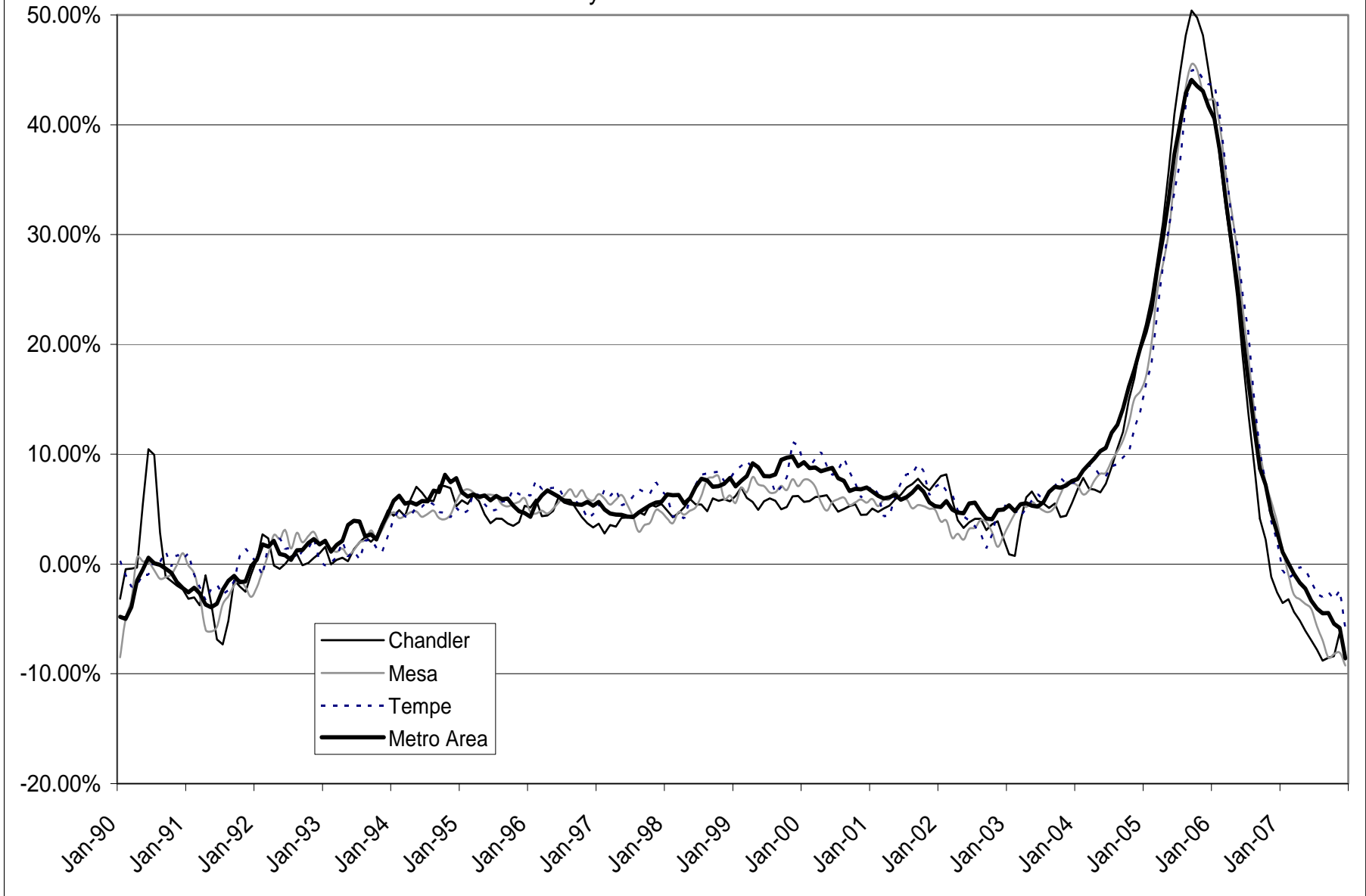
Source: ASU W.P. Carey School of Business; Center for Real Estate Theory and Practice  
 Data Provided by Ion Data

### Regional Repeat Sales Index (RSI) Percent Change from Same Month Previous Year January 2004 - December 2007



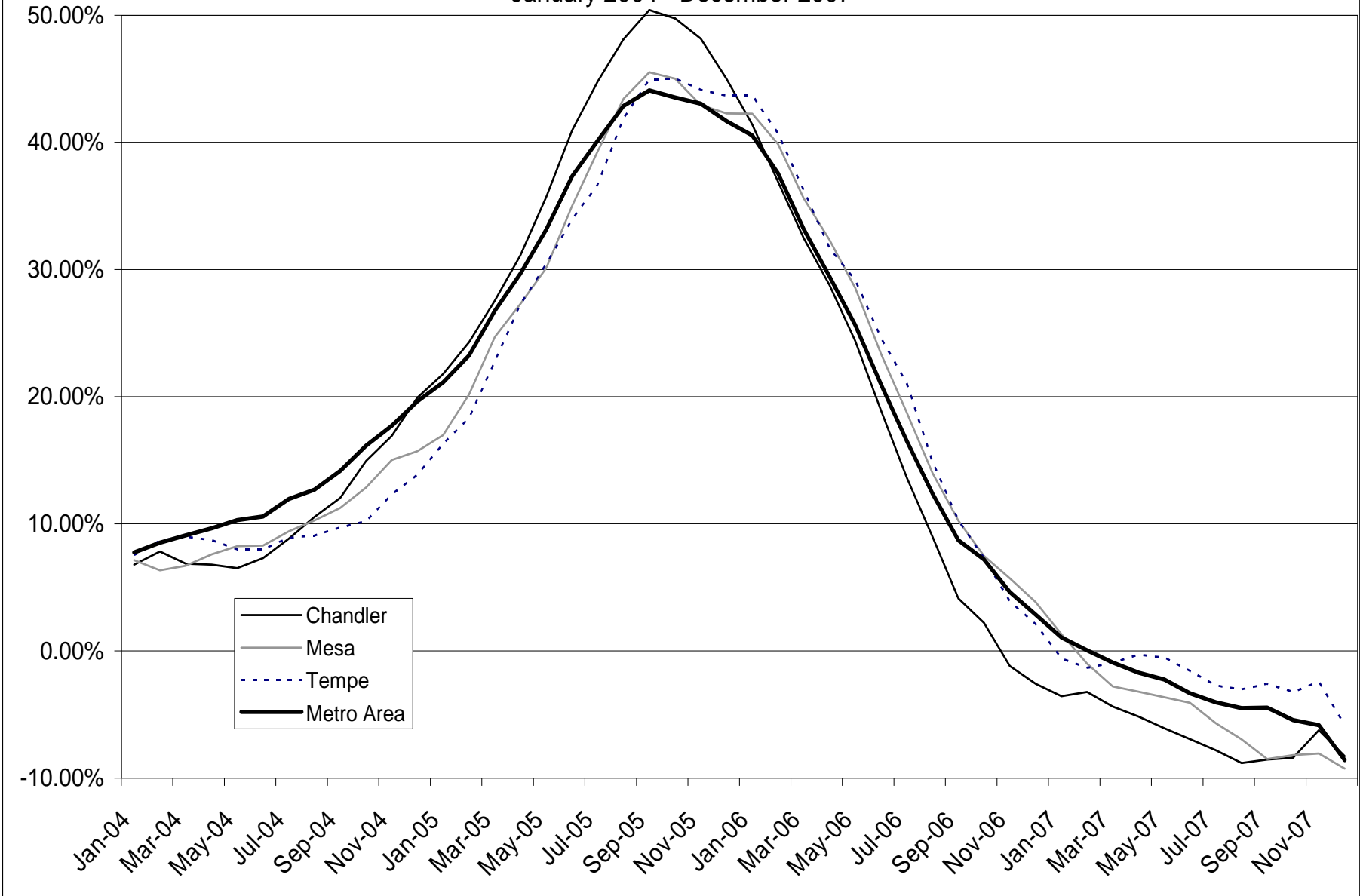
Source: ASU W.P. Carey School of Business; Center for Real Estate Theory and Practice  
Data Provided by Ion Data

**Chandler, Mesa, & Tempe Repeat Sales Index (RSI)**  
 Percent Change from Same Month Previous Year  
 January 1990 - December 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 2004 - December 2007

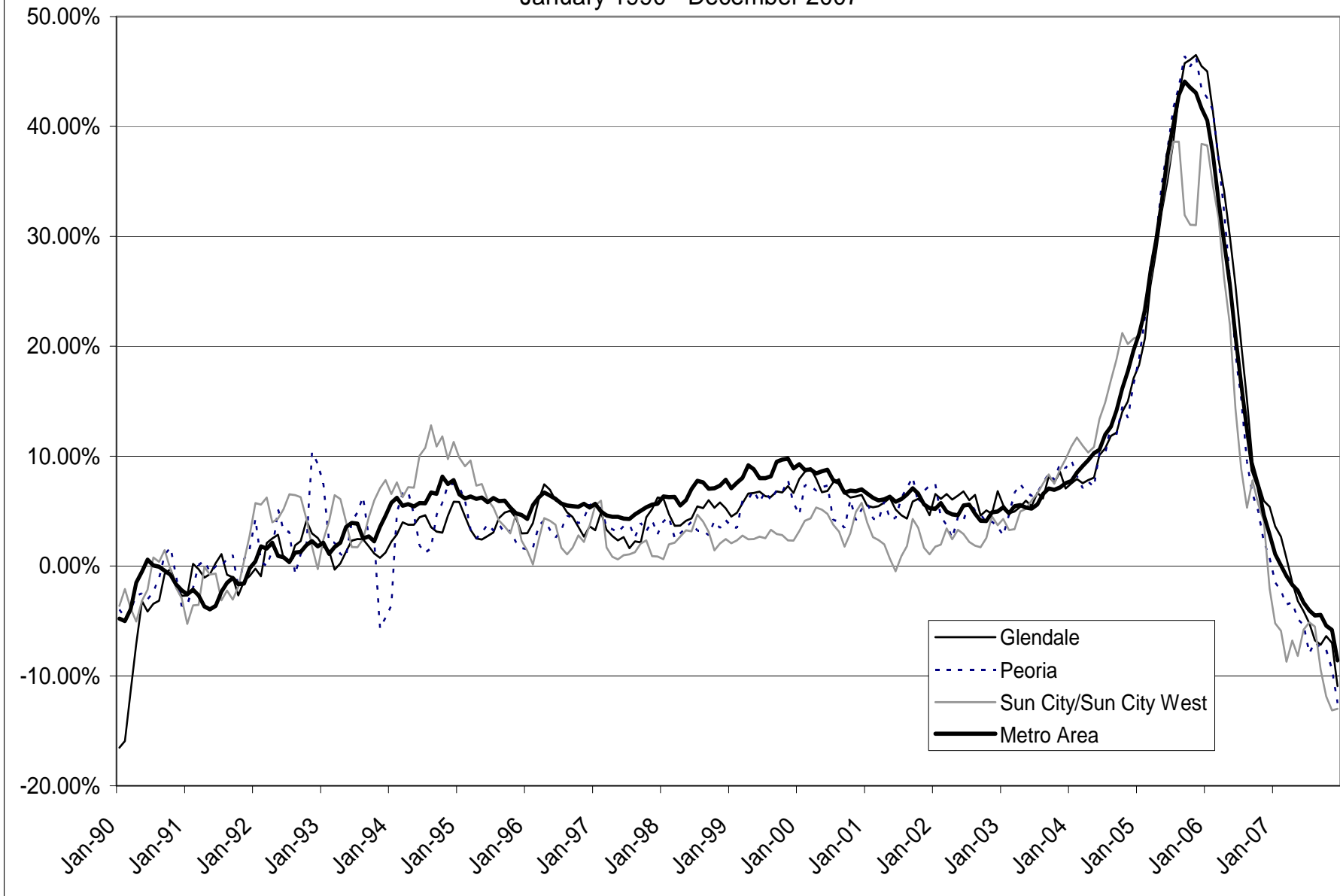


Source: ASU W.P. Carey School of Business; Center for Real Estate Theory and Practice  
 Data Provided by Ion Data

# Glendale, Peoria, & Sun City/Sun City West Repeat Sales Index (RSI)

Percent Change from Same Month Previous Year

January 1990 - December 2007



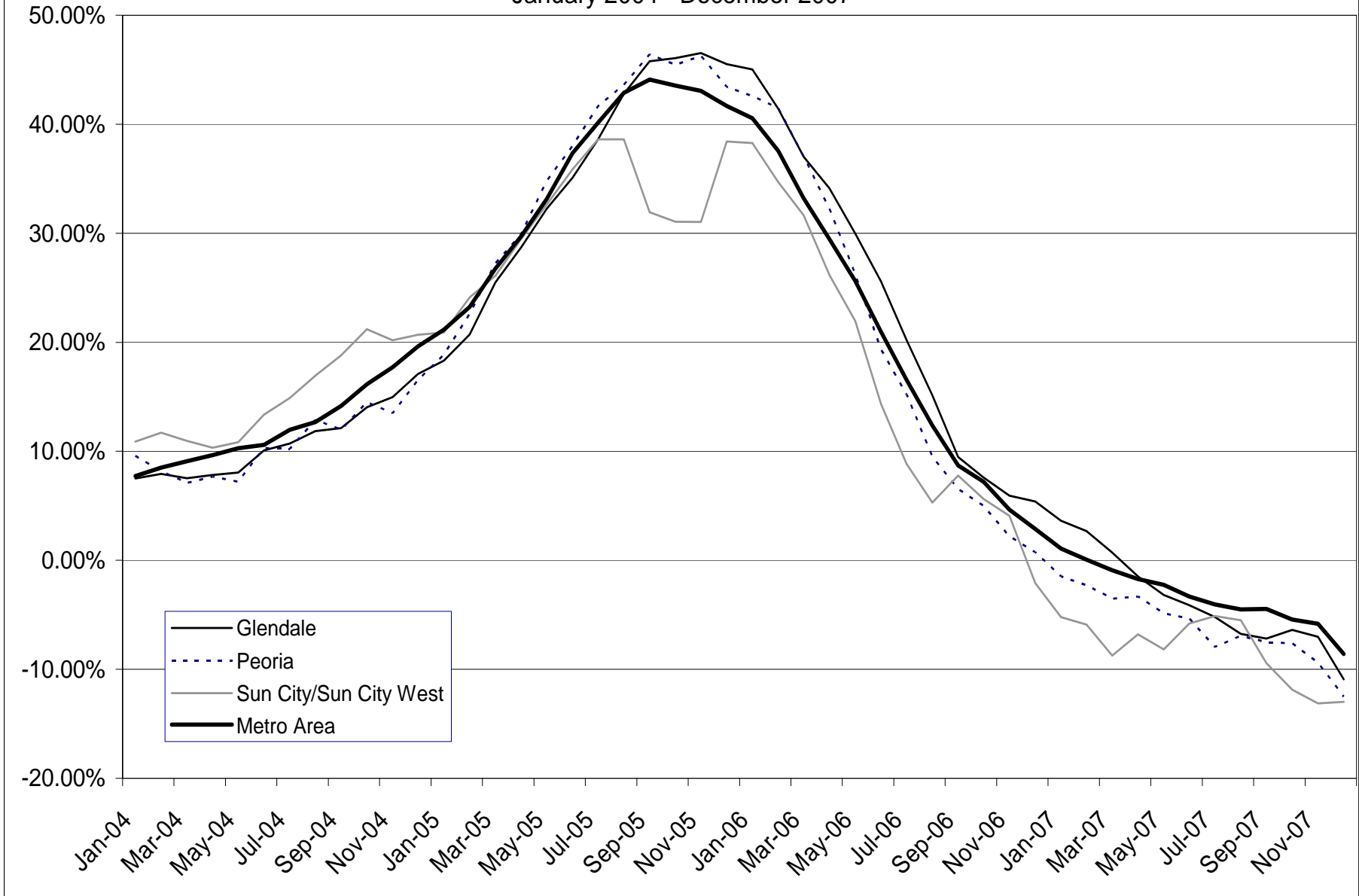
Source: ASU W.P. Carey School of Business; Center for Real Estate Theory and Practice

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 - December 2007



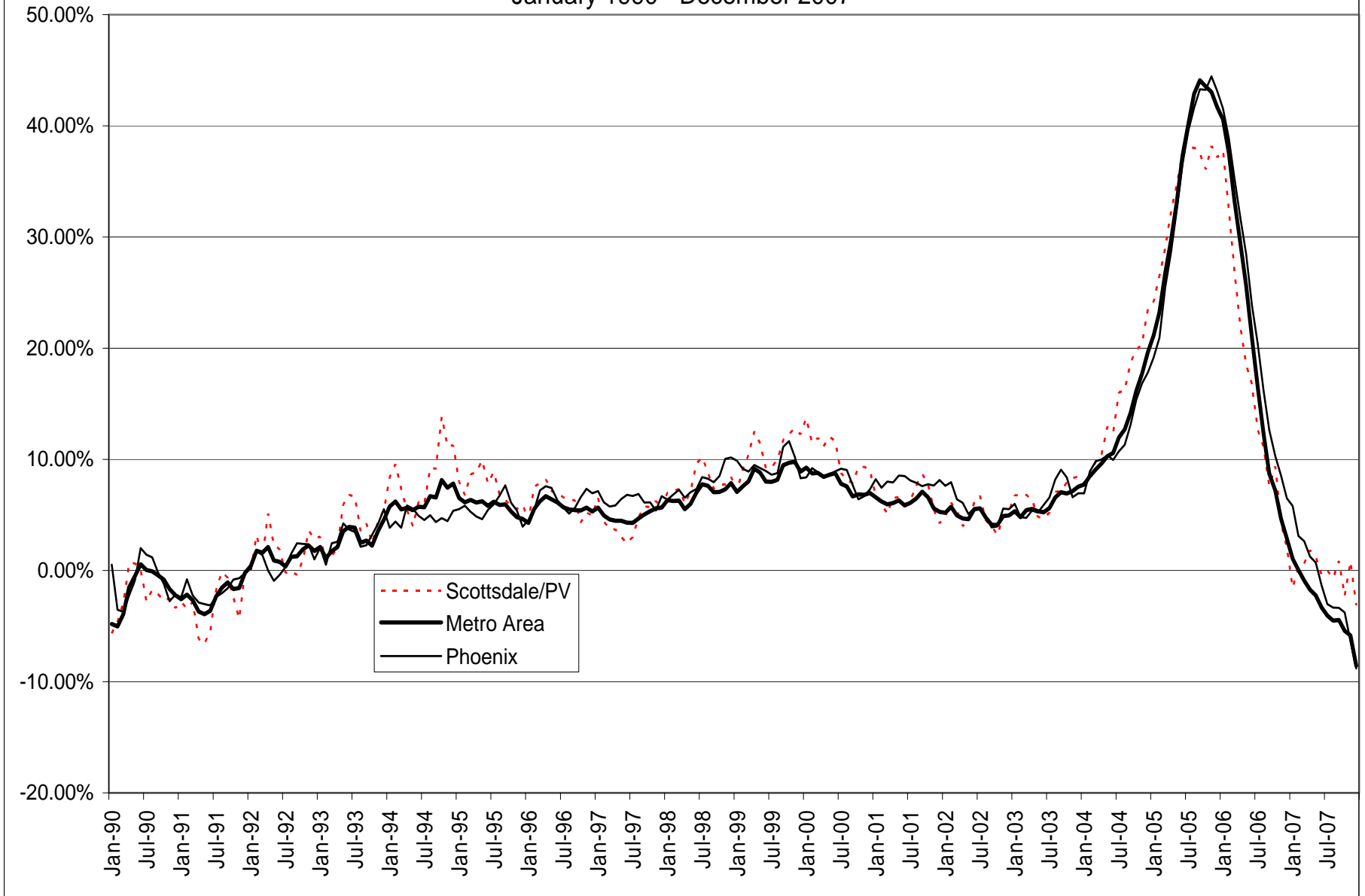
Source: ASU W.P. Carey School of Business; Center for Real Estate Theory and Practice

Data Provided by Ion Data

### Scottsdale/Paradise Valley, & Phoenix Repeat Sales Index (RSI)

Percent Change from Same Month Previous Year

January 1990 - December 2007



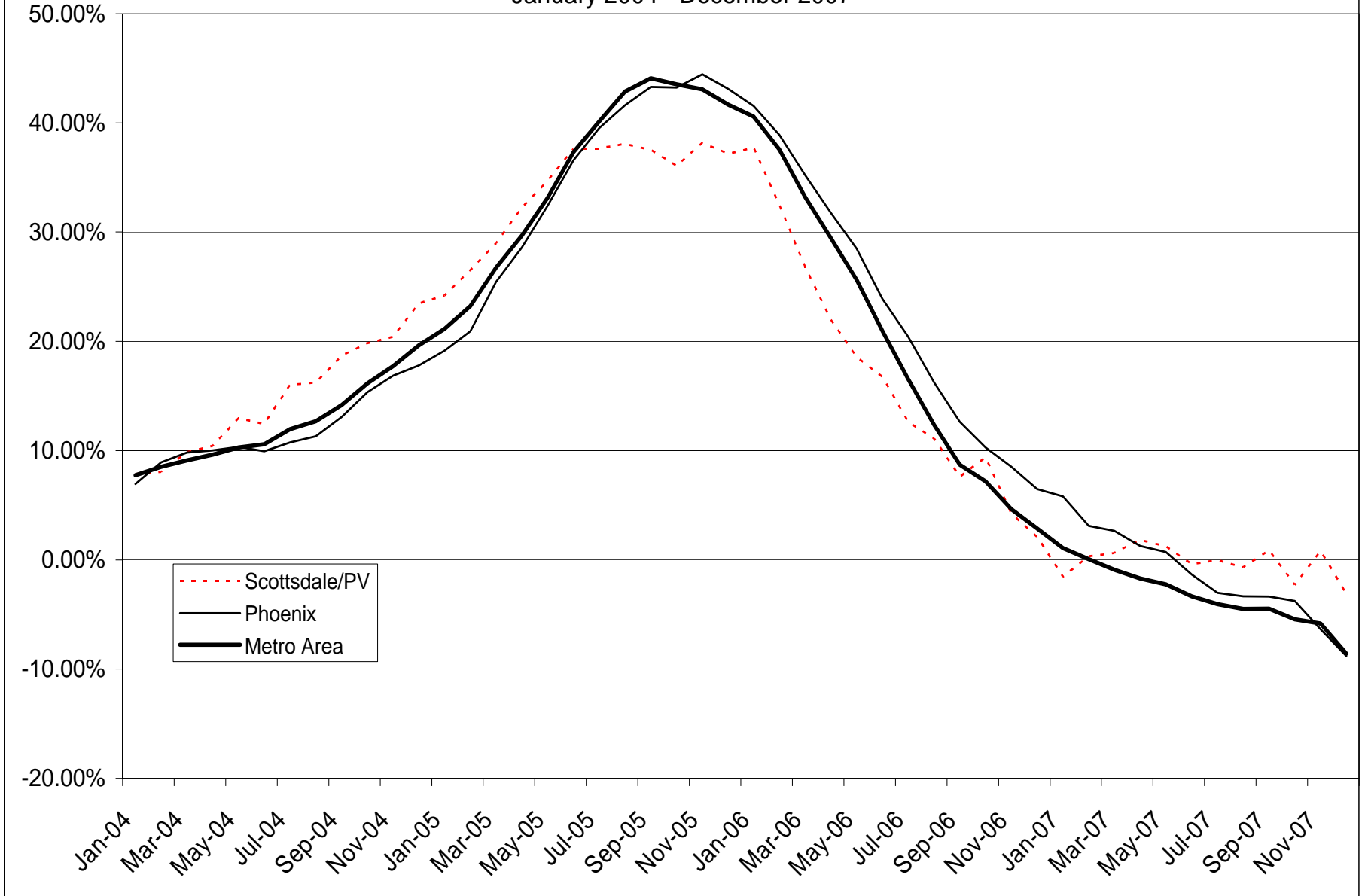
Source: ASU W.P. Carey School of Business; Center for Real Estate Theory and Practice

Data Provided by Ion Data

### Scottsdale/Paradise Valley, & Phoenix Repeat Sales Index (RSI)

Percent Change from Same Month Previous Year

January 2004 - December 2007



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

Data Provided by Ion Data