



## EMPLOYMENT, INCOME, AND HOUSE PRICES

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### Introduction

FHFA recently released its House Price Index (HPI) for the fourth quarter of 2013. The statistics in the report indicated that housing markets were quite strong in the quarter—and in the preceding four quarters—in most of the country. The price change for the U.S. as a whole was reported to be 7.7 percent between the fourth quarter of 2012 and the fourth quarter of 2013. Although that change was slightly below appreciation observed in the previous four-quarter interval, it was still well above the baseline rate of inflation for other goods and services.

Traditionally, employment and income growth have tended to be reasonably strong indicators of local home appreciation rates. This Mortgage Market Note briefly examines whether such a relationship has held over recent quarters. For individual states, the most recent changes in home prices reflected in the newest HPI release are compared to changes in income and employment. Generally, the data suggest that the correlation between the health of local labor markets and house price appreciation has been relatively loose over the past year.

### House Price Appreciation and Labor Market Outcomes: Statistics

Table 1, attached at the end of this Note, shows for each state the change in home prices measured by the HPI between the fourth quarters of 2012 and 2013. Using employment data from the Bureau of Labor Statistics (BLS) and personal income figures from the Bureau of Economic Analysis (BEA), the table also reports the change in each state's civilian employment levels and the growth (or decline) in aggregate personal income.

The house price changes reflected in Table 1 clearly show the strength in home prices over the latest year. Six states showed double-digit house price appreciation, only three states—Delaware, Arkansas, and West Virginia—experienced house price growth lower than that of

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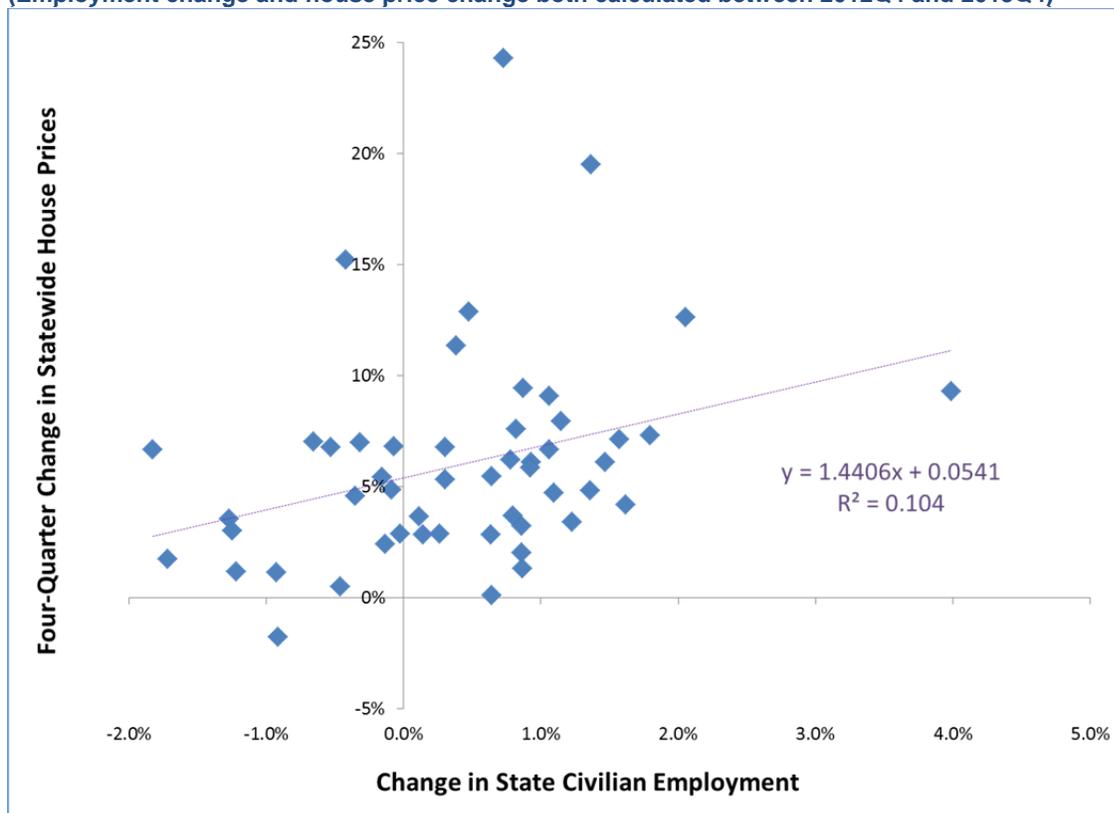
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baseline inflation (0.7 percent<sup>2</sup>), and only one state, West Virginia, saw an absolute decline in prices.

If one compares the magnitudes of house price appreciation to the labor market outcomes in the final two columns in the table, a clear relationship between the respective variables is difficult to discern. Close inspection of the employment data does reveal some correlation, however. For instance, the ten states with the greatest home price appreciation, on average, saw 1.2 percent employment growth—well above the 0.2 percent growth for other states. The home price appreciation-personal income correlation is weaker, but still apparent. The average growth in personal income for the ten states with the greatest home price appreciation was 1.8 percent—somewhat higher than the 1.4 percent average growth in other states.

The scatter plots in Exhibits 1 and 2 show the relationship between home price appreciation and the growth in employment and personal income. As with Table 1, the analysis is done at the state level. Dots in each exhibit correspond to outcomes for individual states.

**Exhibit 1. Recent Changes in House Prices and Employment by State**  
(Employment change and house price change both calculated between 2012Q4 and 2013Q4)



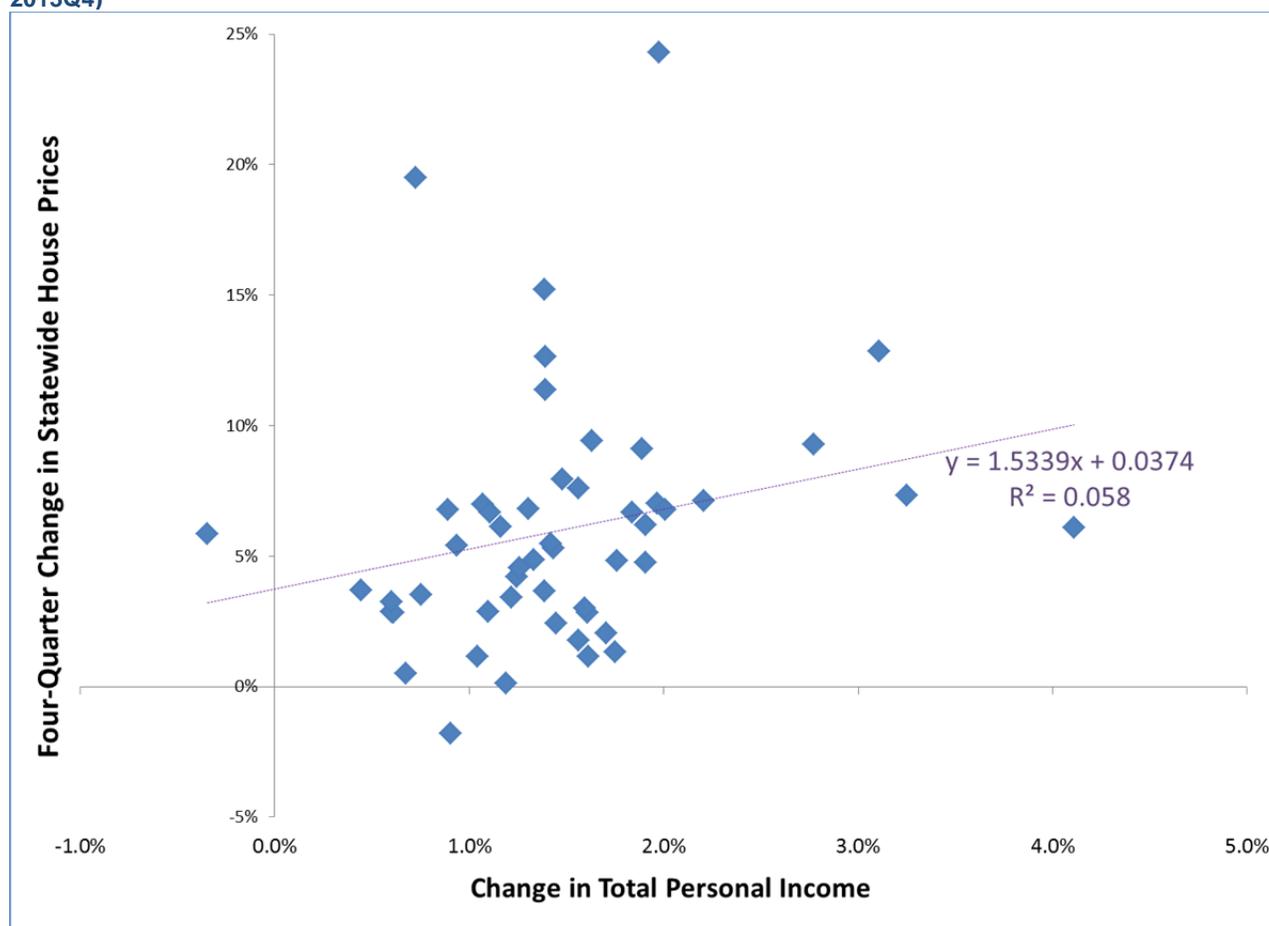
**Source:** FHFA calculations. House price changes computed from FHFA's House Price Index (Purchase-Only Index, 2013Q4 Release). The four-quarter change in state employment has been derived from the Bureau of Labor Statistics' monthly employment data release. Quarterly estimates are an unweighted average of the component monthly estimates.

<sup>2</sup> Baseline inflation for others goods and services has been measured with the Bureau of Labor Statistics' Series ID CUUR0000SAOL2.

A loose, but positive correlation between recent house price appreciation and employment growth is evident in Exhibit 1. A simple regression model roughly fits the data. The model indicates that a one percentage point increase in the employment growth rate was associated with a roughly 1.4 percent higher home price appreciation over the latest four quarters.

The data in Exhibit 2 reflect a similarly loose relationship between personal income growth and changes in house prices. Although notable exceptions exist (e.g., California had extremely strong house price appreciation, but relatively modest growth in personal income), in general, states with greater personal income growth tended to have higher rates of home price appreciation.

**Exhibit 2. Recent Changes in House Prices and Personal Income by State**  
 (House price appreciation and growth in Total Personal Income both measured between 2012Q4 and 2013Q4)



**Source:** FHFA calculations. House price changes computed from FHFA's House Price Index (Purchase-Only Index, 2013Q4 Release). Four-quarter change in Personal Income derived from Bureau of Economic Analysis data.

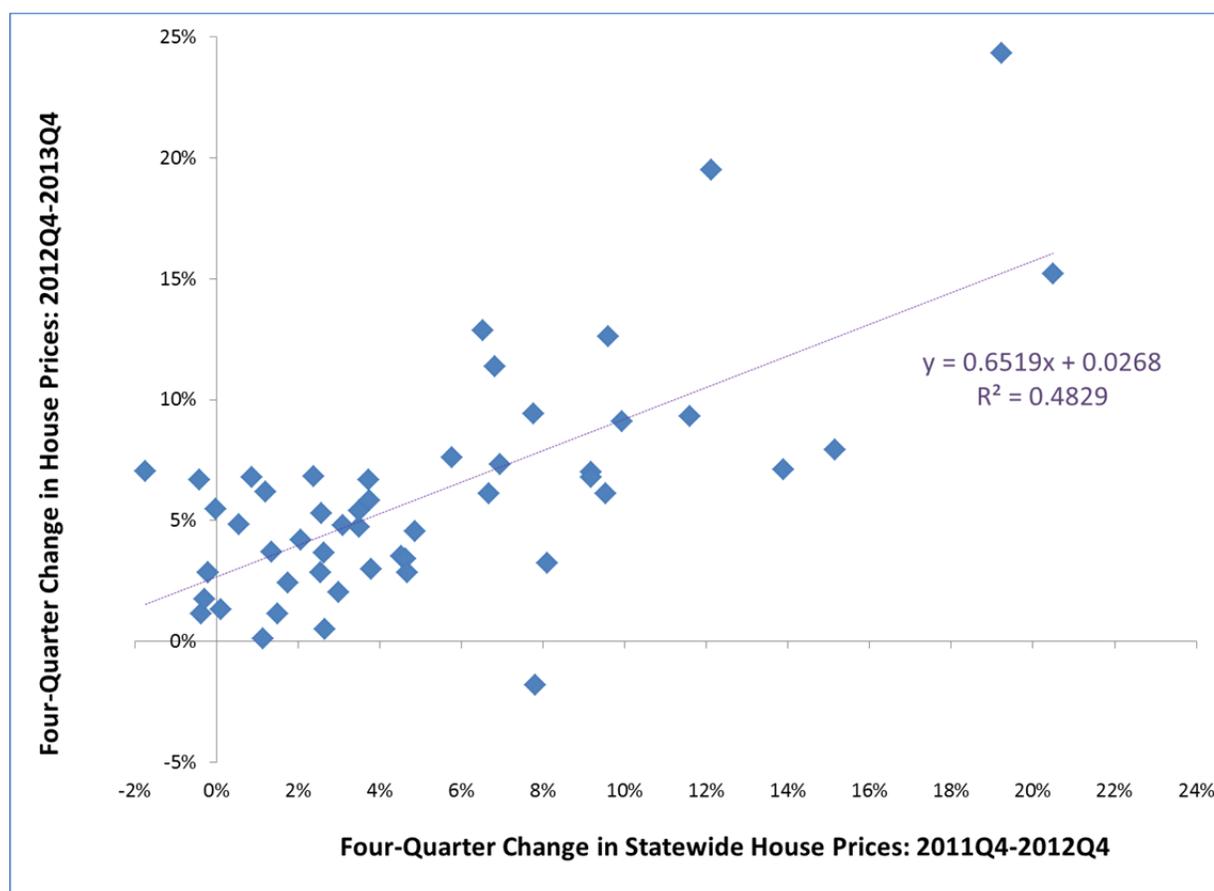
## Discussion

A number of other economic factors besides labor market conditions determine house price appreciation. The local inventory of homes available for sale, for example, is critical, as are mortgage rates and rental prices. Buyer and seller expectations concerning future price growth play a key role as well. Indeed, as has been addressed in a great deal of economic literature, these expectations and other factors lead to strong “persistence” in house price appreciation. That is—house price appreciation in one period tends to be highly correlated with house price appreciation in the next period.

Although an analysis of the other factors determining recent home price growth is well beyond the scope of this Brief, the persistence in home price appreciation is notable in the context of the labor market discussion here. In particular, recent price appreciation for individual states looks far more closely correlated with prior-period appreciation than it does with labor market outcomes.

### Exhibit 3. Recent Four-Quarter Change in House Prices versus Change over Preceding Four Quarters

(“Recent” change measured between 2012Q4 and 2013Q4. Preceding four-quarter interval is 2011Q4-2012Q4)



**Source:** FHFA. House price changes computed from FHFA's House Price Index (Purchase-Only Index, 2013Q4 Release).

Exhibit 3 illustrates the strong recent persistence in price appreciation. For each state, the figure plots price appreciation in the 2011Q4-2012Q4 interval against price appreciation between 2012Q4 and 2013Q4. A strong relationship is obvious in the graph, as only a handful of states lie a significant distance from a trend line drawn through the data. Only West Virginia (2011Q4-2012Q4 appreciation: +7.8 percent; 2012Q4-2013Q4 appreciation: -1.8 percent) is a notable outlier. The most commonly-cited metric for the closeness of a data relationship, the “R-Squared,”<sup>3</sup> takes a value of 0.48 for a trend line estimated through the data points. This value is strikingly large compared to the R-Squared value for the models correlating recent price appreciation and the employment variables (Exhibits 1 and 2). The models that explained recent price appreciation with employment changes and income changes had R-Squared values of only .104 and .058 respectively.

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<sup>3</sup> The R-Squared value ranges between 0 and 1, with higher values associated with models that more closely “fit” the data observations (i.e., fewer outliers are present).

Table 1: Changes in House Prices, Employment, and Income in Recent Quarters

(Darker shades corresponds to greater growth rates)

	Change in House Prices*	Change in Civilian Employment**	Change in Personal Income***
	2012Q4-2013Q4	2012Q4-2013Q4	2012Q4-2013Q4
Alabama	3.5%	-1.3%	0.8%
Alaska	2.4%	-0.1%	1.4%
Arizona	15.2%	-0.4%	1.4%
Arkansas	0.5%	-0.5%	0.7%
California	19.5%	1.4%	0.7%
Colorado	9.1%	1.1%	1.9%
Connecticut	1.2%	-0.9%	1.0%
Delaware	0.1%	0.6%	1.2%
District of Columbia	7.0%	-0.3%	1.1%
Florida	12.6%	2.1%	1.4%
Georgia	11.4%	0.4%	1.4%
Hawaii	7.9%	1.1%	1.5%
Idaho	7.1%	1.6%	2.2%
Illinois	6.8%	-0.5%	0.9%
Indiana	4.2%	1.6%	1.2%
Iowa	4.8%	1.4%	1.8%
Kansas	2.8%	0.1%	1.6%
Kentucky	3.0%	-1.2%	1.6%
Louisiana	4.7%	1.1%	1.9%
Maine	1.3%	0.9%	1.8%
Maryland	5.4%	-0.2%	0.9%
Massachusetts	6.8%	-0.1%	1.3%
Michigan	9.4%	0.9%	1.6%
Minnesota	7.6%	0.8%	1.6%
Mississippi	1.8%	-1.7%	1.6%
Missouri	3.4%	1.2%	1.2%
Montana	6.1%	0.9%	1.2%
Nebraska	4.6%	-0.4%	1.3%
Nevada	24.3%	0.7%	2.0%
New Hampshire	2.9%	0.0%	0.6%
New Jersey	2.9%	0.3%	1.1%
New Mexico	4.8%	-0.1%	1.3%
New York	3.7%	0.8%	0.4%
North Carolina	6.2%	0.8%	1.9%
North Dakota	6.1%	1.5%	4.1%
Ohio	5.3%	0.3%	1.4%
Oklahoma	2.0%	0.9%	1.7%

Table 1: Changes in House Prices, Employment, and Income in Recent Quarters

(Darker shades corresponds to greater growth rates)

	Change in House Prices*	Change in Civilian Employment**	Change in Personal Income***
	2012Q4-2013Q4	2012Q4-2013Q4	2012Q4-2013Q4
Oregon	12.9%	0.5%	3.1%
Pennsylvania	3.7%	0.1%	1.4%
Rhode Island	1.2%	-1.2%	1.6%
South Carolina	6.7%	1.1%	1.8%
South Dakota	5.8%	0.9%	-0.3%
Tennessee	6.7%	-1.8%	1.1%
Texas	7.3%	1.8%	3.3%
Utah	9.3%	4.0%	2.8%
Vermont	7.0%	-0.7%	2.0%
Virginia	2.8%	0.6%	0.6%
Washington	6.8%	0.3%	2.0%
West Virginia	-1.8%	-0.9%	0.9%
Wisconsin	5.5%	0.6%	1.4%
Wyoming	3.2%	0.9%	0.6%

Sources:

\* - FHFA's Purchase-Only House Price Index (2013Q4 Release)

\*\* - Bureau of Labor Statistics Monthly State Civilian Employment

\*\*\* - Bureau of Economic Analysis' "SQ1 Quarterly Personal Income" series