

HIGHLIGHTS – Part 2

New “Purchase-Only” House Price Indexes: Comments and Statistics

With this release, OFHEO has expanded the availability of house price indexes that rely exclusively on purchase prices in the index construction. The standard all-transactions HPI augments purchase price valuations with appraisals from refinance mortgages. Downloadable “purchase-only” indexes are now available for each of the nine Census Divisions and every state (plus the District of Columbia). Previously, the only purchase-only series published by OFHEO was a national index. Seasonally-adjusted versions of the new Census Division indexes have also been made available to supplement the seasonally-adjusted, purchase-only index for the United States.

Advantages and Disadvantages of Purchase-Only Indexes

The new purchase-only indexes offer some advantages over OFHEO’s all-transactions HPI. Empirical analyses performed by academic and industry researchers have suggested that home appraisals, which are used in the construction of OFHEO’s all-transactions index, may be systematically biased measures of true home values. While this bias does not appear to have significant implications for measuring long-term appreciation rates, short-term price patterns may be obscured by the inclusion of appraisal data.

The exclusion of appraisals entails disadvantages as well. The chief pitfall is that refinance appraisals comprise a significant proportion of OFHEO’s valuation data and thus, their removal reduces the estimation sample considerably. The smaller sample size for the purchase-only series means that that index is estimated with less statistical precision, particularly in less-populated states where the number of purchase transactions in any given period may be small. Standard errors, which quantify the amount of imprecision in statistical measures, are much larger for purchase-only indexes than they are for the all-transactions HPI, which includes purchase prices and appraisal valuations. For example, the Washington, D.C. purchase-only index value for the latest quarter has a standard error that is more than two and a half times larger than for the all-transactions HPI. The most recent purchase-only index estimate for the South Atlantic Census Division has a standard error that is 1.8 times larger than the standard error for the all-transactions HPI.

Dropping refinance appraisals could have another material, but difficult-to-evaluate effect. The theoretical issue is: Does the inclusion of refinance appraisals make the data sample look more or less like the housing stock as a whole? In estimating house price appreciation, a key modeling assumption is that the price changes observed in the data sample mimic price changes in the relevant house stock. To the extent that the inclusion of refinance appraisals makes the data sample more representative of the relevant housing stock, then the exclusion of such observations would have an adverse “sample selection” effect.

The refinance appraisals may make the data sample more representative, for example, because refinanced homes are more expensive, on average, than purchased homes. In expensive parts of the country, OFHEO’s sample may lack full representation at the upper end of the price spectrum because home prices are only available for conforming mortgages; in expensive areas, buyers frequently rely on jumbo-sized mortgages for home financing. Although the refinanced homes in the OFHEO sample have conforming mortgages, the home

values have tended to be 12-14 percent higher than for other properties.¹ Their inclusion in the sample thus partially mitigates any bias that results from the skewness of the OFHEO sample toward less expensive homes.

While refinanced homes may help ameliorate selection problems related to the conforming loan limit, they may introduce sample selection problems. Specifically, homes that have refinances may have systematically higher appreciation rates than other homes. House price appreciation improves homeowners' ability and incentive to refinance, particularly if they want to extract home equity. Accordingly, refinancing may signal homes with greater-than-average appreciation. The inclusion of such homes in the indexing sample may thus produce higher appreciation measures than would be obtained were the index to be constructed with a random sampling of the housing stock.

The overall attractiveness of removing refinance appraisals from the HPI calculation is a topic beyond the scope of this Highlights piece, but has been and continues to be the subject of research within OFHEO. The statistical data provided in this article focus on comparing appreciation patterns and revision magnitudes for the all-transactions HPI and the new purchase-only series.

Variability in Refinance Shares

The share of home values derived from refinance mortgages changes significantly over time. Similarly, the proportion of the refinance mortgages that entail the extraction of equity, so-called "cash-out" refinances, also changes. Ultimately, this variability in the mix of loans plays a considerable role in determining the magnitude of the divergence between the purchase-only and all-transactions indexes in any given period. A previous HPI Release detailed the positive correlation between the proportion of cash-out loans and measured appreciation rates.

Table 1 reports the share of mortgage loans with various loan purposes over the last five years.² Loans are classified into three groups: purchase mortgages, refinances aimed at changing the interest rate or loan duration ("Rate-Term Refinances"), and cash-out refinances. The table also shows the percentage of refinances that involved cash-out refinances.

The data reflect the significant variability in loan types. Over the last year, for example, the quarterly share of purchase mortgages ranged from 30.3 percent to 46.3 percent. Of the refinance mortgages, the proportion that involved cash-out refinances ranged from 69.5 percent to 75.0 percent during the year. This range grows considerably if a longer time period is considered. In the first half of 2003, for example, refinances comprised about 90 percent of all mortgages, but most refinancings were aimed to take advantage of the very low mortgage rates that were available as only 36 percent were cash-out refinances.

¹ To compare prices for refinanced and unrefinanced homes, a sample of sales prices is collected for homes that had a refinance at some point in the data sample. Then, average and median sales prices for these homes are compared with average and median prices for homes for which no refinance appraisals are available. In recent years, average and median sales prices for refinanced homes have exceeded prices for other homes by about 12-14 percent.

² These data, as well as data for earlier years, can be downloaded at www.ofheo.gov/media/pdf/loantype.xls.

Appreciation Rates

Tables 2 and 3 compare percentage price changes for the purchase-only and all-transactions HPI over three five-to-six year intervals since the first quarter of 1991, the first quarter for which OFHEO's purchase-only series are provided. Housing market conditions were very different in the three periods and, to the extent that the purchase-only and all-transactions indexes have a tendency to diverge during certain economic cycles, the observed cyclical differences may be systematic.

Statistics are shown for the aggregate U.S. index and all nine Census Divisions in Table 2 and the ten most populated U.S. states in Table 3. With a few exceptions, the tables reveal that estimates for long-term appreciation patterns are very similar for the two indexes. In the latest interval--the first quarter of 2001 through the first quarter of 2007--the divergence between the two indexes was greatest for the South Atlantic Census Division, where the estimated total appreciation over the latest six years differed by only about 10 percentage points. The all-transactions HPI calculated total appreciation of 77.0 percent, while the purchase-only index found price growth of 66.2 percent. The smallest divergence was for the Mountain Census Division, where both indexes estimated total appreciation of 65.7 percent.

As shown in Table 3, the divergences for the ten most populated states are also generally small across the various time intervals. The most notable exception is for Michigan in the latest period. The purchase-only series estimates about 10 percent total appreciation over the last six years, about half of the estimate for the all-transactions HPI. This discrepancy contrasts with previous time intervals, when there was little difference between the two series for Michigan. Results for Ohio, which saw similarly sluggish appreciation over the latest six years, also exhibited no such divergence.

Index Revisions

Tables 4 and 5 compare recent index revisions for the all-transactions and purchase-only indexes. Index revisions, in this case, are defined as the difference between the first and second estimates of a quarter's appreciation rate. For example, the estimates provided in this HPI Release indicate that U.S. prices grew approximately 1.3 percent between the third and fourth quarter of 2006. This represents OFHEO's first revision of price appreciation over that interval, which increased the estimate by 0.2 percent. Because negative revisions (the initial estimates are lower than subsequent estimates) can occur, it makes sense to look at the absolute value of revisions.

For each Census Division and the United States, Table 4 reports the average of the absolute revisions over the last four periods. For the all-transactions U.S. index, the last four revisions were: 0.2 percent (the first revision for 2006Q3 – 2006Q4), 0.2 percent (2006Q2 - 2006Q3), 0.1 percent (2006Q1 – 2006Q2), and 0.1 percent (2005Q4 – 2006Q1). The mean absolute revision over the last four quarters for the all-transactions HPI series was between 0.1 and 0.3 percent for the U.S. and the nine Census Divisions. Revisions tended to be slightly higher for the purchase-only series, but lay within a relatively tight band of 0.1 to 0.4 percent. The results reported in Table 5, indicate that, for most states, the relative increase in the size of the revision is comparable; revisions for the purchase-only series tend to exceed those for the all-transactions HPI by about 0.1 to 0.2 percent.

As mentioned earlier, for some smaller states, the elimination of refinancings from the data sample results in particularly small sample sizes for the purchase-only series. Some states, those that are italicized at the bottom of Table 5, have fewer than 15,000 transactions over the last ten years. OFHEO puts metropolitan areas with such small sample sizes on its list of “unranked” metropolitan areas and cautions index users that estimation imprecision may be significant for such areas. The same warning is necessary here. Indeed, as evidenced by the fact that the purchase-only revisions are particularly high for many of these states, care must be exercised in reviewing short-term price movements for these areas.

In addition to revisions data, Tables 4 and 5 also report the relative sample size for the purchase-only series. The number of observations in the purchase-only samples tends to be between one-tenth to one-quarter of the number of observations in the all-transactions dataset. While the table suggests that the purchase-only samples tends to be more limited in high cost areas (such as California and Massachusetts), the association is not particularly strong. The purchase-only samples are also relatively small in several low-cost states, notably Wisconsin, Utah, and Maine.

Seasonal Effects

Table 6 provides a detailed look at the impact of seasonally-adjusting the new purchase-only U.S. and Census Division indexes. The table compares seasonally-adjusted and unadjusted quarterly appreciation rates over the latest four quarters.³ The empirical estimates suggest that the adjustment can be material and has certainly been significant in recent periods. For the aggregate U.S. purchase-only index, for example, the unadjusted index suggests that prices did not increase between the third and fourth quarter and rose just 0.3 percent in the latest quarter. By contrast, the adjusted index estimated price growth of 0.5 and 0.6 percent in those periods. The adjustment is larger for specific Census Divisions, notably the East North Central and West North Central Census Divisions. For these two areas, the seasonal adjustment increases estimated appreciation between the third and fourth quarters by about one full percentage point. Given that the increase amounts to a four percentage point change in annualized appreciation, it seems that the seasonally-adjusted number may sometimes depict a much different picture of regional housing market conditions than the unadjusted number portrays.

³ OFHEO uses the Census Bureau’s X12-ARIMA seasonal-adjustment procedure, a commonly-used algorithm for removing seasonal effects from time series data.

Table 1: Loan Types by Quarter
(Share of Valuation Data used in HPI Sample)

Period	Purchase Mortgages	Cash-Out Refinances	Rate-Term Refinances	Cash-Out Share of Refinances
	[A]			[B]/([B]+[C])
2007 Q1	30.3%	48.5%	21.3%	69.5%
2006 Q4	33.1%	47.5%	19.3%	71.1%
2006 Q3	46.3%	39.9%	13.8%	74.3%
2006 Q2	46.2%	40.4%	13.5%	75.0%
2006 Q1	32.9%	49.9%	17.2%	74.4%
2005 Q4	32.1%	49.8%	18.2%	73.3%
2005 Q3	32.0%	46.4%	21.6%	68.3%
2005 Q2	37.1%	41.4%	21.5%	65.8%
2005 Q1	26.1%	43.2%	30.7%	58.4%
2004 Q4	29.2%	40.1%	30.7%	56.6%
2004 Q3	43.5%	33.9%	22.7%	59.9%
2004 Q2	27.4%	32.3%	40.3%	44.5%
2004 Q1	19.0%	33.5%	47.5%	41.3%
2003 Q4	25.6%	35.1%	39.2%	47.2%
2003 Q3	13.3%	31.1%	55.6%	35.9%
2003 Q2	11.2%	31.0%	57.8%	34.9%
2003 Q1	9.9%	33.1%	57.0%	36.7%
2002 Q4	11.4%	33.3%	55.3%	37.6%
2002 Q3	20.7%	31.4%	47.9%	39.6%
2002 Q2	37.8%	32.0%	30.1%	51.5%
2002 Q1	21.1%	37.6%	41.3%	47.6%

**Table 2: House Price Appreciation in Different Time Intervals Since 1991
OFHEO HPI vs. Purchase-Only Index**

(U.S. and Census Divisions)

	1991Q1-1996Q1		1996Q1-2001Q1		2001Q1-2007Q1	
	OFHEO HPI	PO Index	OFHEO HPI	PO Index	OFHEO HPI	PO Index
USA	12.9%	12.3%	29.0%	29.3%	63.5%	58.1%
Pacific	-2.7%	-2.2%	37.7%	37.0%	103.9%	97.0%
Mountain	39.1%	38.4%	28.0%	26.4%	65.7%	65.7%
West North Central	22.9%	23.4%	31.5%	31.7%	40.6%	35.7%
West South Central	18.4%	17.3%	24.1%	24.8%	34.3%	33.4%
East North Central	25.4%	25.1%	28.3%	26.0%	30.7%	24.6%
East South Central	23.8%	23.0%	22.7%	19.6%	34.1%	34.9%
New England	-0.5%	-2.2%	41.5%	48.6%	67.2%	61.1%
Mid-Atlantic	5.7%	2.3%	23.4%	27.0%	78.3%	75.2%
South Atlantic	12.4%	12.4%	26.1%	26.7%	77.0%	66.2%

**Table 3: House Price Appreciation in Different Time Intervals Since 1991:
OFHEO HPI vs. Purchase-Only Index**

(Ten Most Populated States)

	1991Q1-1996Q1		1996Q1-2001Q1		2001Q1-2007Q1	
	OFHEO HPI	PO Index	OFHEO HPI	PO Index	OFHEO HPI	PO Index
California	-11.0%	-15.0%	45.1%	48.5%	117.8%	114.7%
Texas	14.8%	13.4%	25.4%	27.4%	29.8%	30.0%
New York	3.2%	-1.0%	29.1%	33.2%	79.9%	71.3%
Florida	12.4%	11.3%	26.4%	28.7%	121.0%	115.7%
Illinois	21.3%	20.1%	22.5%	23.0%	50.3%	45.9%
Pennsylvania	9.7%	5.7%	15.2%	17.0%	63.3%	65.2%
Ohio	25.5%	24.4%	23.5%	20.3%	20.1%	17.5%
Michigan	26.9%	27.8%	41.0%	38.1%	19.7%	10.0%
Georgia	16.6%	16.2%	34.3%	34.2%	34.0%	30.4%
North Carolina	20.4%	20.7%	24.8%	22.0%	36.6%	35.6%

Table 4: Mean Absolute Revisions in Estimated Quarterly Appreciation

2006Q1 - 2007Q1

	<u>Mean Absolute Revision</u>		Purchase-Only Sample Size (% of Sample Size for the OFHEO HPI)
	OFHEO HPI	Purchase-Only Index	
USA	0.1%	0.2%	14.6%
Pacific Division	0.2%	0.4%	10.4%
Mountain Division	0.2%	0.2%	16.0%
West North Central Division	0.1%	0.2%	15.3%
West South Central Division	0.2%	0.2%	26.3%
East North Central Division	0.1%	0.1%	14.2%
East South Central Division	0.3%	0.4%	19.3%
New England Division	0.1%	0.2%	10.6%
Middle Atlantic Division	0.2%	0.3%	15.1%
South Atlantic Division	0.1%	0.1%	18.0%

Table 5: Mean Absolute Revisions in Estimated Quarterly Appreciation

2006Q1 - 2007Q1

	Mean Absolute Revision		Purchase-Only Sample Size (% of Sample Size for the OFHEO HPI)
	OFHEO HPI	Purchase- Only Index	
California, (CA)	0.2%	0.4%	9.0%
Texas, (TX)	0.2%	0.3%	28.0%
Michigan, (MI)	0.1%	0.2%	13.0%
Ohio, (OH)	0.1%	0.2%	16.6%
Illinois, (IL)	0.1%	0.0%	13.5%
Florida, (FL)	0.2%	0.3%	19.0%
Pennsylvania, (PA)	0.2%	0.2%	17.8%
Washington, (WA)	0.1%	0.2%	14.3%
New Jersey, (NJ)	0.2%	0.4%	15.8%
Minnesota, (MN)	0.1%	0.2%	13.4%
New York, (NY)	0.3%	0.3%	14.9%
Georgia, (GA)	0.1%	0.2%	17.6%
North Carolina, (NC)	0.1%	0.1%	18.6%
Wisconsin, (WI)	0.2%	0.2%	12.5%
Indiana, (IN)	0.1%	0.2%	16.4%
Virginia, (VA)	0.2%	0.3%	15.7%
Colorado, (CO)	0.2%	0.3%	14.2%
Oregon, (OR)	0.2%	0.4%	17.6%
Massachusetts, (MA)	0.1%	0.2%	9.5%
Missouri, (MO)	0.1%	0.3%	13.9%
Arizona, (AZ)	0.2%	0.2%	17.0%
Tennessee, (TN)	0.3%	0.3%	20.2%
Alabama, (AL)	0.3%	0.5%	21.2%
Louisiana, (LA)	0.2%	0.2%	22.7%
Kentucky, (KY)	0.2%	0.2%	16.8%
Iowa, (IA)	0.0%	0.3%	18.9%
Maryland, (MD)	0.2%	0.5%	10.5%
South Carolina, (SC)	0.2%	0.3%	20.1%
Connecticut, (CT)	0.1%	0.4%	13.1%
Utah, (UT)	0.2%	0.3%	12.7%
Kansas, (KS)	0.2%	0.3%	20.2%
Oklahoma, (OK)	0.1%	0.2%	24.8%
Nevada, (NV)	0.2%	0.5%	17.2%
New Mexico, (NM)	0.3%	0.3%	21.1%
Arkansas, (AR)	0.1%	0.5%	22.4%
Nebraska, (NE)	0.1%	0.5%	16.7%
Mississippi, (MS)	0.2%	0.5%	19.7%
New Hampshire, (NH)	0.3%	0.4%	10.7%
Idaho, (ID)	0.3%	0.4%	18.1%
Montana, (MT)	0.2%	0.3%	17.3%
Rhode Island, (RI)	0.1%	0.2%	10.2%
Delaware, (DE)	0.4%	0.8%	17.1%
Maine, (ME)	0.1%	0.3%	11.9%
* <i>Wyoming, (WY)</i>	0.4%	0.5%	23.0%
* <i>South Dakota, (SD)</i>	0.4%	0.8%	16.4%
* <i>West Virginia, (WV)</i>	0.6%	0.8%	18.1%
* <i>Vermont, (VT)</i>	0.3%	0.9%	12.2%
* <i>North Dakota, (ND)</i>	0.4%	0.5%	16.6%
* <i>Alaska, (AK)</i>	0.3%	0.5%	14.2%
* <i>Hawaii, (HI)</i>	0.5%	1.3%	8.2%
* <i>District of Columbia, (DC)</i>	0.4%	3.5%	11.0%

* Italicized states have fewer than 15,000 transactions over prior ten years.

**Table 6: Quarterly House Price Appreciation Since 2006Q1
Purchase-Only Indexes (Not Seasonally-Adjusted and Seasonally Adjusted)**

	2006Q1-2006Q2		2006Q2-2006Q3		2006Q3-2006Q4		2006Q4-2007Q1	
	PO Index (NSA)	PO Index (SA)	PO Index (NSA)	PO Index (SA)	PO Index (NSA)	PO Index (SA)	PO Index (NSA)	PO Index (SA)
USA	2.1%	1.3%	0.6%	0.5%	0.0%	0.6%	0.3%	0.5%
Pacific	2.6%	2.1%	1.2%	1.2%	-0.3%	0.3%	0.9%	0.9%
Mountain	2.5%	2.0%	1.6%	1.7%	1.7%	2.0%	0.7%	0.7%
West North Central	2.2%	0.7%	0.6%	0.5%	-0.8%	0.4%	0.1%	0.6%
West South Central	2.3%	1.7%	1.6%	1.8%	1.1%	1.4%	0.8%	1.0%
East North Central	2.4%	0.7%	0.1%	-0.1%	-1.7%	-0.7%	-1.1%	-0.4%
East South Central	2.5%	1.9%	1.4%	1.3%	0.7%	1.2%	0.5%	0.8%
New England	1.1%	-0.1%	-0.8%	-0.8%	-1.0%	0.0%	-0.6%	-0.3%
Mid-Atlantic	2.2%	1.5%	0.0%	-0.3%	0.2%	0.6%	0.3%	0.9%
South Atlantic	1.3%	0.9%	0.2%	0.3%	1.1%	1.2%	0.6%	0.7%

NSA - Not Seasonally Adjusted

SA - Seasonally Adjusted