FHFA HPI FAQs

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https://www.fhfa.gov/Media/PublicAffairs/Pages/
House-Price-Index-Frequently-Asked-Questions.aspx

OVERVIEW

1. **What is the FHFA HPI?**

   The FHFA House Price Index® (FHFA HPI®) is a broad economic measure of the movement of single-family house prices in the United States. Although FHFA constructs several indexes for different market geographies and periods, the entire suite of indexes is often referenced, in a general sense, as the "FHFA HPI". All the indexes are created in the same technical manner. The flagship FHFA HPI is the purchase-only index which uses seasonally adjusted, purchase-only data; that represents the data most commonly referenced in press releases, news stories, and social media. Additional indexes have been created to address questions about house price changes in other market segments like with refinances, FHA mortgages, or the entire single-family property market.

   The USPTO has approved two federally registered trademarks: "FHFA House Price Index®" and "FHFA HPI®". The marks cover the entire suite of FHFA indexes and are intended to protect FHFA branding, usage, and intellectual property. All indexes can be downloaded from the FHFA HPI main webpage which can be reached at:

   https://www.fhfa.gov/HPI

2. **What does the FHFA HPI measure?**

   The FHFA HPI measures average price changes in sales or refinancings on the same properties. This information is obtained by reviewing mortgage transactions on single-family properties whose mortgages have been purchased or securitized by Fannie Mae or Freddie Mac. The FHFA HPI is updated as additional mortgages are purchased or securitized by Fannie Mae and Freddie Mac. The new mortgage acquisitions are used to identify repeat transactions for the most recent period and for each subsequent period since 1975.

3. **What is the value of the FHFA HPI?**

   The FHFA HPI suite is built on tens of millions of home sales and offers insights about house price fluctuations at the national, census division, state, metro area, county, ZIP code, and census tract levels. The FHFA HPI uses a fully transparent methodology based upon a weighted, repeat-sales statistical technique to analyze transaction data

from Fannie Mae and Freddie Mac. The repeat-sales technique helps to control for differences in the quality of the houses comprising the sample and is the reason the FHFA HPI is referred to as a "constant quality" index. This distinction is important when comparing summary statistics like mean or median values (such as those provided by the American Community Survey, the Decennial Census, or Zillow) which inherently reflect changes to both the price and quantity of housing. By isolating price changes, the FHFA HPI is more reflective of the average appreciation in an area.

The FHFA HPI also provides an analytical tool that is useful for a range of housing finance topics such as updating the current value of residential property assets, estimating potential mortgage default and any losses given default, predicting prepayment speeds for financial securities, and gauging differences in housing affordability in specific geographic areas. Researchers have used the FHFA HPI data for hundreds of studies about business cycles, demographic challenges, environmental or disaster risks, labor markets, local government budgets, migration, political elections, property taxation, urban revival, and wealth creation.

4. **When is the FHFA HPI released?**

FHFA HPI reports are released on a monthly and quarterly basis. Calendar dates are always posted at the bottom of the FHFA HPI main webpage or can be found by typing: https://www.fhfa.gov/HPI#ReleaseDates

Release dates are announced at the end of every summer for the following calendar year. The reports and data are posted at 9AM on announced dates. Each month, consolidated reports highlight trends for certain regions (census divisions) as well as the entire country. Every three months, a more comprehensive report appends additional quarterly information about those areas while including new coverage for states and cities.

5. **What kind of data are published with the public releases?**

Most statistics in the reports reference price changes computed by FHFA's standard "purchase-only" HPI. In some cases, however, the statistics reference alternative price measures. These additional house price indexes use the same general methodology as the flagship index but have slight differences as follows:

- "All-Transactions" house price index. Appraisal values from refinance mortgages are added to the purchase-only data sample.
- "Expanded-Data" house price index. The purchase-only data sample is appended with FHA-backed mortgage transactions as well as sales price information sourced from county recorder offices (with sales prices below the annual loan limit ceiling). This index is used annually to adjust the maximum conforming loan limits, which dictate the dollar amount of loans that can be acquired by Fannie Mae and Freddie Mac.

- "Distress-Free" house price index. Sales of bank-owned properties and short sales are removed from the purchase-only dataset prior to estimation of the index.
- "Annual" house price index. Uses the all-transactions data but indexes are constructed on a yearly basis to provide data for very small geographic areas like counties, ZIP codes, and census tracts.

Data constraints preclude the production of all types of indexes for every geographic area, but multiple index types are generally available. For individual states, for instance, several types of indexes are available. The various indexes tend to correlate closely over the long-term, but short-term differences can be significant.

METHODOLOGY

6. **How is the FHFA HPI calculated?**

   The methodology used to construct the indexes is a modified version of the Case-Shiller® index using a geometric weighted repeat-sales procedure. A detailed description of the HPI methodology is available at: http://go.usa.gov/8BBT.

   The repeat-sales procedure estimates price changes using repeat transactions on the same property units over time. This approach helps to control for differences in the quality of the houses comprising the sample and is the reason the FHFA HPI is referred to as a "constant quality" index.

   The monthly indexes are calculated in the same way as the quarterly and annual indexes except the time period is controlled for more directly. In the monthly indexing model, all the transactions for the same month are aggregated and separate index values are estimated for each month. To construct the quarterly index, every transaction from the same quarter is aggregated and index values are estimated using the assigned quarters. The same approach is used with the annual indexes. For advanced data users, this means that dummy or constant variables are not included as additional time-varying controls.

7. **How is the FHFA HPI updated?**

   Each month, Fannie Mae and Freddie Mac provide FHFA with information on their most recent mortgage transactions. These data are combined with the deliveries from previous periods to establish price differentials on properties where more than one mortgage transaction has occurred. The current and prior data are merged, creating an updated historical database that is used to estimate the FHFA HPI.

8. **What transactions are covered in the FHFA HPI?**

   The FHFA HPI is based on transactions for single-family properties involving conforming, conventional mortgages purchased or securitized by Fannie Mae or Freddie Mac.

Conforming refers to a mortgage that both meets the underwriting guidelines of Fannie Mae or Freddie Mac and that does not exceed the conforming loan limit. For current and previously announced loan limits, references such as a table of county-specific limits and a map can be found at https://www.fhfa.gov/CLLs.

Conventional mortgages are those loans that are neither insured nor guaranteed by the FHA, VA, or other federal government entities.

The flagship FHFA HPI eliminates non-conforming and non-conventional mortgages during index production. The sample also restricts data on condominiums, cooperatives, multi-unit properties, and planned unit developments. Additional filters are applied to remove property observations with potential recording errors like extremely low sales values, implausible appreciation changes, repeat sales within the same period, and incomplete date or physical property address information.

9. **Why is the FHFA HPI based on Fannie Mae or Freddie Mac mortgages?**

Both the broad scope and long span of the Enterprises' operations allow the FHFA HPI to provide information for a wide range of geographies extending back to 1975. The FHFA HPI reliably estimates house price movements by leveraging tens of millions of transactions over the last several decades.

FHFA has access to this information by virtue of its role as the federal regulator responsible for these government-sponsored enterprises. Chartered by Congress for the purpose of creating a reliable supply of mortgage funds for homebuyers, Fannie Mae and Freddie Mac are the largest mortgage finance institutions in the U.S. representing a significant share of total outstanding mortgages.

10. **What transaction date is used in estimating the index?**

For model estimation, the loan origination date is used as the relevant transaction date. It is important to note that this is different than the loan acquisition date, which reflects the date when the loan was purchased or securitized by Fannie Mae or Freddie Mac.

11. **Are foreclosed or distressed sales included in the FHFA HPI?**

Yes. FHFA released a "distress-free" HPI in 2012Q2 along with a Highlights article at http://go.usa.gov/8kNJ. The index is a version of the purchase-only index that removes short sales and sales of bank-owned properties from the transactions data used to compute the traditional index. An analysis of how distressed sales affect the FHFA HPI is provided in an FHFA Working Paper released August 2013 at http://go.usa.gov/8kRB.

12. **Why is there a time delay with the data coverage and release?**

Due to a 30- to 45-day lag from loan origination to Enterprise funding, FHFA receives data on new fundings for one additional month following the last month of the quarter. These fundings contain many loans originating in that most recent quarter, and

especially the last month of the quarter. This will reduce with subsequent revisions; however, data on loans purchased with a longer lag, including seasoned loans, will continue to generate revisions, especially for the most recent quarters.

13. **How and why is the FHFA HPI revised each quarter?**

Historical estimates of the FHFA HPI revise for three primary reasons:

(a) The FHFA HPI is based on repeat transactions. That is, the estimates of appreciation are based on repeated valuations of the same property over time. Therefore, each time a property "repeats" in the form of a sale or refinance, average appreciation since the prior sale/refinance period is influenced.

(b) Fannie Mae and Freddie Mac (the Enterprises) purchase seasoned loans, providing new information about prior quarters.

(c) Due to a 30- to 45-day lag from loan origination to Enterprise funding, FHFA receives data on new fundings for one additional month following the last month of the quarter. These fundings contain many loans originating in that most recent quarter, and especially the last month of the quarter. This will reduce with subsequent revisions, however data on loans purchased with a longer lag, including seasoned loans, will continue to generate revisions, especially for the most recent quarters.

In connection with the release of the 2012Q2 FHFA HPI results, a special revision was made to two historical HPI values. In prior releases, the all-transactions index values for Vermont-1976Q1 and West Virginia-1982Q1 were both reported to be 100.01. Those values were not correct; index values for those respective periods should have been set to missing because no modeling data were available in the underlying sample. The FHFA HPI releases for 2012Q2 and later periods reflect the change. With the release of the 2019Q1 FHFA HPI results, modeling data became available for Vermont-1976Q1 and with the release of the 2020Q3 FHFA HPI results, modeling data became available for West Virginia-1982Q1. The FHFA HPI releases for 2020Q3 and later periods reflect these changes.

14. **Is the FHFA HPI adjusted for inflation?**

No. The FHFA HPI is not adjusted for inflation so it reflects nominal cumulative gains. For inflation adjustments, one can use the Consumer Price Index "All Items Less Shelter" series. The Bureau of Labor Statistics' price index series ID# CUUR0000SA0L2, for example, has tracked non-shelter consumer prices since the 1930s. That series and others can be downloaded at: http://data.bls.gov/cgi-bin/srgate.

15. **How does the FHFA HPI differ from the Case-Shiller® Index?**

Although both indexes employ the same fundamental repeat-valuations approach, there are several data and methodology differences. Among the dissimilarities:

- The Case-Shiller Indexes® only use purchase prices in index calibration, while the all-transactions FHFA HPI also includes refinance appraisals. FHFA's purchase-only series is restricted to purchase prices.

- The Case-Shiller Indexes use information obtained mostly from county assessor and recorder offices. FHFA's valuation data are derived mainly from conforming mortgages provided by Fannie Mae and Freddie Mac.

- The Case-Shiller Indexes are value-weighted, meaning that price trends for more expensive homes have greater influence on estimated price changes than other homes. FHFA's index weights price trends equally for all properties.

- The geographic coverage of the indexes may differ. For example, the Case-Shiller National Home Price Index previously did not have valuation data from 13 states. The national FHFA HPI is calculated using data from all states.

A working paper that analyzes in detail the methodological and data differences between the two metrics can be accessed at http://go.usa.gov/8BBJ. For details on these and other differences, consult the FHFA HPI Technical Description at http://go.usa.gov/8BBT and the Case-Shiller methodology.

16. **Why are the FHFA HPIs adjusted for seasonality and how is it done?**

Many of the FHFA HPIs are provided in both seasonally adjusted and non-seasonally adjusted terms. The seasonal adjustment is designed to remove recurring calendar year patterns or seasonal variation from the HPI which would otherwise partially confound month-to-month or quarter-to-quarter comparisons of appreciation.

The Census Bureau's X-12 ARIMA procedure is used, as implemented in the SAS software package. The automated ARIMA model-selection algorithm in X-12 is employed, which searches through a series of seasonality structures and selects the first that satisfies the Ljung-Box test for serial correlation.

To obtain more information on the FHFA HPIs contact us via the Data and Research Contact page at http://go.usa.gov/8kN3.

17. **Do you have an FHFA HPI that includes loans which are not purchased or securitized by Fannie Mae or Freddie Mac?**

Yes. The expanded-data index includes purchase-money mortgages from other sources (with sales prices below the annual loan limit ceiling) to provide an index which tries to capture all loans which could potentially make up the complete conforming mortgage market. The approach to estimating the expanded-data HPI is detailed in the Highlights article published with the 2011Q2 FHFA HPI at http://go.usa.gov/8kNm.

In general, the methodology is the same as is used in the construction of the standard purchase-only FHFA HPI, except a supplemented dataset is used for estimation. The augmented data include sales price information from Fannie Mae and Freddie Mac mortgages as well as two new information sources: (1) transactions records for houses with mortgages endorsed by FHA and (2) county recorder data licensed from CoreLogic. The licensed county recorder data do not include records in all U.S. counties—particularly rural ones. To ensure that the addition of the CoreLogic data does not unduly bias index estimates toward price trends in urban areas, the expanded-data index for certain states is estimated by weighting price trends in areas with CoreLogic coverage and other areas. Details on this sub-area weighting can be found in the text of the Highlights piece referenced above.

COVERAGE

18. **What are Metropolitan Statistical Areas (MSAs) and Metropolitan Divisions?**

    A Metropolitan Statistical Area (MSA) comprises the central county or counties containing the core, plus adjacent outlying counties having a high degree of social and economic integration with the central county as measured through commuting. Metropolitan Divisions, or Metropolitan Statistical Area Divisions (MSADs), have a similar definition and are formed when some of the largest MSAs are broken into parts. Micropolitan Statistical Areas are even smaller geographic areas but, with the exception of the annual indexes, the FHFA HPI suite is reported at the metropolitan level which is what we may also refer to as a "city" although that nomenclature may group together multiple legal authorities or chartered jurisdictions.

19. **Which version of city or MSA definition is used by FHFA?**

    FHFA uses the revised Metropolitan Statistical Areas (MSAs) and Divisions as defined by the Office of Management and Budget (OMB) in September 2018. The delineations became effective with the 2018Q4 FHFA HPI release in February 2019. For information about the current MSAs, please visit: https://www.whitehouse.gov/wp-content/uploads/2018/09/Bulletin-18-04.pdf

    Not all data sources use this same delineation when referring to Core Based Statistical Areas (CBSAs). Differences can arise when newer delineations are released by OMB or when sources may not be retroactively updated (data in prior years might reflect older geographic boundaries).

20. **How does FHFA handle previous MSA definitions?**

    We use the most current MSA definitions and do not assign properties into prior definitions that might have been utilized during the transaction year. The 2018Q4

FHFA HPI report has a Technical Note which explains the transition to the newest definitions. The accompanying tables are posted on the FHFA HPI Downloadable Data page under the "Additional Data" section then the "Utility Files and Background Information for Index Construction" subsection. Information for the prior delineations is also posted on that page.

21. **Where can I access MSA-level HPI data for each year and quarter?**

In addition to the information displayed in the MSA tables, FHFA makes available MSA indexes and standard errors. The data are available in ASCII format and may be accessed at http://go.usa.gov/8kXz. Several of the downloadable files have MSA-level HPIs.

22. **How can the FHFA HPI for an MSA be linked to ZIP codes within that MSA (or vice versa)?**

This is a tricky geospatial question. ZIP codes sometimes overlap county boundaries, a single ZIP code can be located partially inside and outside of a Metropolitan Area. Thus, the development of a crosswalk between ZIP codes and Metropolitan Areas is not a straightforward exercise. The Department of Housing and Urban Development has released a lookup table that maps ZIP codes to the Metropolitan Area(s) that they fall within. That lookup file, as well as a discussion of the underlying technical issues, can be found here: https://www.huduser.gov/portal/datasets/usps_crosswalk.html.

Although FHFA has published HPIs for some ZIP codes, those indexes are annual (i.e. quarterly index values are not provided). Researchers needing quarterly values for ZIP codes may be interested in using index values for the applicable metropolitan area.

23. **What is the ZIP3 and how is it different from the MSA area?**

For many small- or medium-sized cities, the ZIP3 is almost synonymous with the MSA area. Some published mortgage datasets show the "three-digit" ZIP code of the included properties, where the three-digit ZIP code is merely the first three digits of the applicable five-digit code. For example, a property whose ZIP code is 91711 would be in the "917" three-digit ZIP code. Three-digit ZIP codes represent larger geographic areas than five-digit ZIP codes.

To aid modelers who have three-digit ZIP codes, FHFA has released a set of experimental HPIs for such areas. The underlying information used for calibrating the indexes is the "all-transactions" dataset, which includes information on both home purchases and refinances. FHFA HPIs can be used to approximate current home values by assuming that prices have changed by the same percentage as the applicable house price index for the local area. Given loan-level data, the same technique can be applied to update the underlying value of securitized mortgage pools. The choice of the applicable index used to update home values depends on the geographic information available in the data.

24. **How are indexes formed for Census Divisions and the nation?**

As discussed in the Highlights article accompanying the 2011Q1 FHFA HPI Release (available for download at http://go.usa.gov/8k5d), the census division indexes are constructed from statistics for the component states. For the quarterly all-transactions and purchase-only indexes, the census division indexes are constructed from quarterly growth rate estimates for the underlying state indexes. Census division index estimates are "built-up" from quarterly growth rate estimates (monthly growth rates for the monthly index) for the component states.

The census division indexes are set equal to 100 in the relevant base periods. Then, the index values for subsequent periods are increased (or decreased) by the weighted average quarterly (or monthly) price change for the underlying states. Index values for periods before the base period are calculated in a similar fashion; beginning with the base period value, the preceding index values are sequentially determined so that the growth rate in each period always reflects the weighted average growth rate for the component states.

The national FHFA HPI is constructed in an analogous fashion, except that the weighted components are census divisions. Because the census divisions measures are themselves weighted averages of state metrics, the U.S. index is equivalent to a state-weighted metric. States are classified into nine census divisions in the United States as follows:

- Pacific: Hawaii, Alaska, Washington, Oregon, California
- Mountain: Montana, Idaho, Wyoming, Nevada, Utah, Colorado, Arizona, New Mexico
- West North Central: North Dakota, South Dakota, Minnesota, Nebraska, Iowa, Kansas, Missouri
- West South Central: Oklahoma, Arkansas, Texas, Louisiana
- East North Central Michigan, Wisconsin, Illinois, Indiana, Ohio
- East South Central: Kentucky, Tennessee, Mississippi, Alabama
- New England: Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut
- Middle Atlantic: New York, New Jersey, Pennsylvania
- South Atlantic: Delaware, Maryland, District of Columbia, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida

25. **What weights are used in forming the FHFA HPI?**

The weights used in constructing the FHFA HPI are estimates for the shares of one-unit detached properties in each state. For years in which decennial census data are available, the share from the relevant census is used. For intervening years, a state's

share is the weighted average of the relevant shares in the prior and subsequent censuses, where the weights are changed by ten percentage points each year. For example, California's share of the housing stock for 1982 is calculated as 0.8 times its share in the 1980 census plus 0.2 times its share in the 1990 census. For 1983, the Pacific Division's share is 0.7 times its 1980 share plus 0.3 times its 1990 share.

For years since 2000, state shares are calculated as follows:

- For the 2001-2005 interval, shares are straight-line interpolated based on the state shares in the 2000 decennial Census and the 2005 values from the American Community Survey (ACS).

- For 2006-2019, the estimates are from the annual ACS.

- Until 2020 ACS estimates become available, shares from the 2019 ACS are used for subsequent periods.

- The Census Bureau has delayed the official release of its 2020 ACS 1-year estimates because of the impact of the COVID-19 pandemic on data collection. The full statement can be found at https://www.census.gov/data/developers/data-sets/acs-1year.html. The 2019 ACS data will continue to be used until their 2020 data are no longer labeled as experimental or the housing stock estimates are deemed reliable for usage.

The year-specific estimates of the state shares of U.S. detached housing stock can be accessed at https://go.usa.gov/xnhpK.

26. **What geographic areas are covered by the FHFA HPI?**

The FHFA HPI includes indexes for all nine census divisions, the 50 states and the District of Columbia, and every Metropolitan Statistical Area (MSA) in the U.S., excluding Puerto Rico. OMB recognizes 384 MSAs, 11 of which are subdivided into a total of 31 Metropolitan Divisions. As noted earlier, FHFA produces indexes for the divisions where they are available, in lieu of producing a single index for the MSA. In total, 404 indexes are released: 373 for the MSAs that do not have Metropolitan Divisions and 31 Division indexes. The starting dates for indexes differ and are determined by a minimum transaction threshold; index values are not provided for periods before at least 1,000 transactions have been accumulated.

In each release, FHFA publishes rankings and appreciation rates (quarterly, annual, and five-year). To be ranked, the MSAs or Metropolitan Divisions must have at least 15,000 transactions over the prior 10 years. For the remaining unranked MSA or MSAD areas, one-year and five-year rates of change are provided.

USING THE FHFA HPI DATA

27. **How do I interpret "four-quarter," "one-year," "annual," and "one-quarter" price changes?**

    The "four-quarter" percentage change in home values is simply the price change relative to the same quarter one year earlier. For example, if the FHFA HPI release is for the second quarter, then the "four-quarter" price change reports the percentage change in values relative to the second quarter of the prior year. It reflects the best estimate for how much the value of a typical property increased over the four-quarter period. "One-year" and "annual" appreciation are used synonymously with "four-quarter" appreciation in the full quarterly FHFA HPI releases.

    The "one-quarter" change estimates the price gains relative to the prior quarter. Please note that, in estimating the quarterly price index, all observations within a given quarter are pooled together; no distinction is made between transactions occurring in different months. As such, the "four-quarter" and "one-quarter" changes compare typical values throughout a quarter against valuations during a prior quarter. The appreciation rates do not compare values at the end of a quarter against values at the end of a prior quarter.

28. **How do I use the manipulatable data (in TXT files) on the Web site to calculate appreciation rates?**

    The index numbers alone (for census divisions and U.S., individual states, and MSAs) do not have significance. They have meaning in relation to previous or future index numbers, because you can use them to calculate appreciation rates using the formula below.

    To calculate appreciation between any 2 quarters, use the formula:

    (QUARTER 2 INDEX NUMBER - QUARTER 1 INDEX NUMBER) / QUARTER 1 INDEX NUMBER

    You can generate annual numbers by taking the four-quarter average for each year or monthly numbers by finding the difference between two months. For ease, we have made a calculator tool that is available at: https://www.fhfa.gov/DataTools/Tools/Pages/HPI-Calculator.aspx

29. **When are the indexes normalized in the downloadable data?**

    The answer depends on geography and type of index flavor. The ASCII data for metropolitan areas are normalized to the first quarter of 1995. That is, the FHFA HPI equals 100 for all MSAs in the first quarter of 1995. States and divisions are normalized to 100 in the first quarter of 1980. The purchase-only indexes are normalized to 100 in the first quarter of 1991. Note that normalization dates do not affect measured appreciation rates.

30. **Does the FHFA HPI measure mean or median house prices?**

    No. The FHFA HPI measures average price changes in sales or refinancings on the same properties. In 2010, FHFA published ad hoc research that describes a technique for producing state and national median and average home price statistics. The working paper is available at https://www.fhfa.gov/PolicyProgramsResearch/Research/PaperDocuments/20100930_RP_CalculatingStateNationalHousePriceStatistics_508.pdf. The associated tables can be found under "Summary Statistics for House Prices" on our downloadable data page but the data series have not been updated. Alternative data sources such as the U.S. Census Bureau or The National Association of REALTORS® provide data on current house price levels, like median and mean statistics.

31. **Does the FHFA HPI track rent data?**

    No. The FHFA HPI measures average price changes in sales or refinancings on the same properties. Sometimes rental data are compared to house prices to demonstrate market tradeoffs. Alternative data sources for single-family rents include the U.S. Bureau of Labor Statistics which provides an owners' equivalent rent or CoreLogic which tracks repeated rental listings for the same properties. Other private companies offer rents across property types and sizes but those underlying sampled units may be less comparable with the homes tracked by our indexes.

32. **Can I use the data in the FHFA HPI and, if so, how should the index be cited?**

    Absolutely! The FHFA HPI data are freely available for download at https://www.fhfa.gov/HPI. To cite the index in an article or story, we suggest at least an attribution like "Source: FHFA HPI®" or "Source: FHFA House Price Index®". Additional clarifications could be helpful to denote the type of index (purchase-only, all-transactions, expanded-data) and whether the data are adjusted for seasonality or inflation. A more detailed citation might be "Source: FHFA HPI® (purchase-only, seasonally-adjusted, nominal)".