

FHFA HPI FAQs

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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, it often references the entire suite of indexes 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 (PO) data; and is the data most referenced in press releases, news stories, and social media. FHFA created additional indexes to address questions about house price changes in other market segments such as the all-transactions (AT) index that includes refinances data, or the expanded PO index that includes purchase data on entire single-family property market.

The U.S. Patent and Trademark Office has approved two federally registered trademarks: “FHFA House Price Index[®]” and “FHFA HPI[®]”. These trademarks cover the entire suite of indexes and FHFA intends them to protect Agency branding, usage, and intellectual property. Users can download all indexes from the FHFA HPI main web page.

2. What does the FHFA HPI measure?

The FHFA HPI measures average price changes in sales or refinancings on the same properties. We obtain this information by reviewing transactions on single-family properties with mortgages purchased or securitized by Fannie Mae or Freddie Mac. We update the FHFA HPI as the Enterprises purchase or securitize additional mortgages. The new mortgage acquisitions are used to identify repeat transactions for the most recent period and each subsequent period since 1975.

3. What is the value of the FHFA HPI?

The Agency builds the FHFA HPI suite 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. It uses a fully transparent methodology based upon a weighted, repeat-sales statistical technique to analyze transaction data from Fannie Mae and Freddie Mac. This technique helps to control for differences in the quality of the houses comprising the sample and is why we refer to the FHFA HPI 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 or the Decennial Census) that inherently reflect changes to both the price and quantity of housing. By isolating price changes, the FHFA HPI better reflects the average appreciation in an area.

The FHFA HPI also is a useful analytical tool for many 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 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 releases HPI reports monthly and quarterly. We always post calendar dates at the bottom of the FHFA HPI main webpage or at <https://www.fhfa.gov/DataTools/Downloads/Pages/House-Price-Index.aspx#ReleaseDates>. FHFA announces release dates at the end of every summer for the following calendar year. We post the reports and data at 9 a.m. on those days. 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 flagship “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. We add appraisal values from refinance mortgages to the purchase-only data sample.
- “Expanded-Data” house price index. We append the purchase-only data sample with FHA-backed mortgage transactions as well as sales price information sourced from county recorder offices (with sales prices below the annual loan limit value ceiling). We use this index annually to adjust the maximum conforming loan limit values, which dictate the dollar amount of loans that Fannie Mae and Freddie Mac can acquire.
- “Distress-Free” house price index. We remove sales of bank-owned properties and short sales from the purchase-only dataset prior to estimating the index.
- “Annual” house price index. We use the all-transactions data but construct indexes on a yearly basis to provide data for very small geographic areas like counties, ZIP codes, and census tracts. Data constraints preclude FHFA from producing all types of indexes for every geo- graphic area, but multiple index types are generally available. For individual states, for instance, we make several types of indexes 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?

FHFA employs a modified version of the Case-Shiller® index using a geometric weighted repeat-sales procedure to construct the indexes. A detailed description of the HPI methodology is available at

<https://www.fhfa.gov/PolicyProgramsResearch/Research/Pages/HPI-Technical-Description.aspx>.

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 why we refer to the FHFA HPI as a “constant quality” index.

We calculate the monthly indexes in the same way as the quarterly and annual indexes except that we control for time more directly. In the monthly indexing model, we aggregate all transactions for the same month and estimate separate index values. To construct the quarterly index, we aggregate every transaction from the same quarter and estimate index values using the assigned quarters. We use the same approach with the annual indexes. Advanced data users should know that we do not include dummy or constant variables as additional time-varying controls.

7. How is the FHFA HPI updated?

Monthly, Fannie Mae and Freddie Mac provide FHFA with information on their most recent mortgage transactions. We combine these data with the deliveries from previous periods to establish price differentials on properties with more than one mortgage transaction. We merge the current and prior data to create an updated historical database used to estimate the FHFA HPI.

8. What transactions are covered in the FHFA HPI?

We base the FHFA HPI 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 meets both the underwriting guidelines of Fannie Mae or Freddie Mac and does not exceed the conforming loan limit value. For current and previously announced loan limit values, you can find references such as a table of county-specific limit values and a map at

<https://www.fhfa.gov/DataTools/Downloads/Pages/Conforming-Loan-Limit.aspx>.

Conventional mortgages are loans that FHA, the Department of Veteran’s Affairs, or other federal government entities neither insure nor guarantee.

The flagship FHFA HPI eliminates non-conforming and non-conventional mortgages when producing the index. The sample also restricts data on condominiums, cooperatives, multi-unit properties, and planned unit developments. We apply additional filters 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 using data 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 United States representing a significant share of total outstanding mortgages.

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

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

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 https://www.fhfa.gov/AboutUs/Reports/ReportDocuments/2012-Q2-June_HPI_508.pdf. 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. We analyze how distressed sales affect the FHFA HPI in an FHFA Working Paper released August 2013 at <https://www.fhfa.gov/PolicyProgramsResearch/Research/Pages/Working-Paper-13-1.aspx>.

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 and additional data processing time, FHFA receives data on new originations with a two-month delay. These data allow us to produce FHFA HPI for the new period and leads to revisions of index for previous periods. Data on loans purchased with a longer lag, including seasoned loans, will continue to generate revisions, especially for the most recent periods.

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

We revise historical estimates of the FHFA HPI for three primary reasons:

We base the FHFA HPI on repeat transactions. That is, we base the estimates of appreciation on repeated valuations of the same property over time. Therefore, each time a property "repeats" in the form of a sale or refinance, it influences average appreciation since the prior sale/refinance period.

- Fannie Mae and Freddie Mac purchase seasoned loans, providing new information about prior periods.
- Due to a 30- to 45-day lag from loan origination to Enterprise funding and additional data processing time, FHFA receives data on new originations with a two-month delay. These new data allow to produce FHFA HPI for the new time period and lead to revisions of indexes for previous periods. Data on loans purchased with a longer lag, including seasoned loans, will continue to generate revisions, especially for the most recent periods.

In connection with the release of the 2012Q2 FHFA made a special revision to two historical HPI values. In prior releases, we reported the all-transactions index values for Vermont-1976Q1 and West Virginia-1982Q1 as 100.01. Those values were not correct because; 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. You can download that series and others at <https://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, the 2008 working paper analyzes the methodological and data differences between the two metrics.

One may access a working paper that analyzes the methodological and data differences between the two metrics in detail at https://www.fhfa.gov/PolicyProgramsResearch/Research/PaperDocuments/20080115_RP_RevisitingDifferencesOFHEOSPCaseShillerHPI_N508.pdf. For details on these and other differences, consult the FHFA HPI Technical Description at <https://www.fhfa.gov/PolicyProgramsResearch/Research/Pages/HPI-Technical-Description.aspx> and the Case-Shiller methodology.

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

We provide many of the FHFA HPIs in both seasonally adjusted and non-seasonally adjusted terms. We design the seasonal adjustment to remove recurring calendar year

patterns or seasonal variation from the HPI that would otherwise partially confound month-to-month or quarter-to-quarter comparisons of appreciation.

FHFA uses the Census Bureau’s X-12 autoregressive integrated moving average (ARIMA) procedure, as implemented in the SAS software package. We employ the automated ARIMA model-selection algorithm in X-12, 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 at HPIQuestions@fhfa.gov.

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 that could potentially make up the complete conforming mortgage market. We detail the approach to estimating the expanded-data HPI in the Highlights article published with the 2011Q2 FHFA HPI at https://www.fhfa.gov/DataTools/Downloads/Documents/HPI_Focus_Pieces/2011Q2_HPIFocus_N508.pdf.

In general, the methodology is the same as we use to construct the standard purchase-only index, except we use a supplemented dataset for estimation. The augmented data includes sales price information from Fannie Mae and Freddie Mac mortgages as well as two additional sources: (1) transactions records for houses with mortgages endorsed by FHA and (2) county recorder data from a licensed provider. The county recorder data do not include records in all U.S. counties—particularly rural ones. To ensure that the additional data does not unduly bias index estimates toward price trends in urban areas, we estimate the expanded-data index by weighting price trends in areas with county recorder data coverage. We include details on this sub-area weighting 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 form when some of the largest MSAs divide into parts.

Micropolitan Statistical Areas are even smaller geographic areas but, except for the annual indexes, the FHFA HPI suite reports 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 most current MSA and Division delineations defined by the Office of Management and Budget (OMB). For information about the current MSA delineations, please visit <https://www.whitehouse.gov/omb/information-for-agencies/bulletins/>.

Not all data sources use this same delineation when referring to Core Based Statistical Areas (CBSAs). Differences can arise when OMB releases newer delineations or when it does not retroactively update sources (data in prior years might reflect older geographic boundaries). 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 used during the transaction year. Information for the prior delineations is posted on the FHFA HPI Downloadable Data page under the “Additional Data” section, “Utility Files and Background Information for Index Construction” subsection.

20. 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 American Standard Code for Information Exchange (ASCII) format and may be accessed at <https://www.fhfa.gov/DataTools/Downloads/Pages/House-Price-Index-Datasets.aspx#qpo>. Several of the downloadable files have MSA-level HPIs.

21. 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 as a single ZIP code can be located partially inside and outside of a Metropolitan Area. Thus, developing 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 at 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.

22. What is the ZIP3 and how is it different from the MSA?

For many small- or medium-sized cities, the ZIP3 is almost synonymous with the MSA. Some published mortgage datasets show the “three-digit” ZIP code of the included properties, where it 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 developmental HPIs for such areas. The underlying information we use for index production is the “all-transactions” dataset, which includes information on both home purchases and refinances. We can use FHFA HPIs 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, we can apply the same technique to update the underlying value of securitized mortgage pools. Our choice of applicable index to update home values depends on the geographic information available in the data.

For more information, see the HPI Technical Note at

https://www.fhfa.gov/DataTools/Downloads/Documents/HPI_Focus_Pieces/2014Q4_HPIFocus_N508.pdf.

23. 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

https://www.fhfa.gov/DataTools/Downloads/Documents/HPI_Focus_Pieces/2011Q1_HPIFocus_N508.pdf), we construct the census division indexes from statistics for the component states. For the quarterly all-transactions and purchase-only indexes, we

construct the census division indexes from quarterly growth rate estimates for the underlying state indexes. We “build up” census division index estimates from quarterly growth rate estimates (monthly growth rates for the monthly index) for the component states.

We set the census division indexes equal to 100 in the relevant base periods. Then, we increase (or decrease) the index values for subsequent periods by the weighted average quarterly (or monthly) price change for the underlying states. We calculate index values for periods before the base period in a similar fashion; beginning with the base period value, we sequentially determine preceding index values so that the growth rate in each period always reflects the weighted average growth rate for the component states.

We construct the national FHFA HPI 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. The United States classifies into nine census divisions 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

24. What weights are used in forming the FHFA HPI?

The weights we use to construct 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, we use the share from the relevant census. For intervening years, a state's share is the weighted average of the relevant shares in the prior and subsequent censuses, where the weights change 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, we calculate state shares 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.
- For 2020, the Census Bureau delayed the release of its 2020 ACS 1-year estimates because of the impact of the COVID-19 pandemic on data collection. You can find the full statement at <https://www.census.gov/data/developers/data-sets/acs-1year.2020.html#list-tab-4MOHCRASG9G03KU0CO>. We continued to use the 2019 ACS 1-year estimates.
- For 2021, the estimates are from the annual ACS.
- For 2022 and 2023 we will continue to use 2021 annual ACS estimates, until new survey numbers become available.
- The general rule is, if the latest available ACS is for the year YYYY, we use it to estimate weights for YYYY and use these weights for years YYYY+1 and YYYY+2.

You can access the year-specific estimates of the state shares of U.S. detached housing stock at

https://www.fhfa.gov/DataTools/Downloads/Documents/HPI/state_weights_detached.xlsx.

25. 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 MSA in the United States, and a developmental index for Puerto Rico. OMB recognizes 384 MSAs, 11 of which it 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, we release 404 indexes: 373 for MSAs that do not have Metropolitan Divisions and 31 Division indexes. The starting dates for indexes differ and we determine that by a minimum transaction threshold; we do not provide index values for periods before at least 1,000 transactions accumulate.

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, we provide one-year and five-year rates of change.

USING THE FHFA HPI DATA

26. 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. We use “one-year” and “annual” appreciation 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, we pool together all observations within a given quarter, making no distinction 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.

27. 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, 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 two quarters, use the formula:

$(\text{QUARTER 2 INDEX NUMBER} - \text{QUARTER 1 INDEX NUMBER}) / \text{QUARTER 1 INDEX NUMBER}$

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 made a calculator tool that is available at

<https://www.fhfa.gov/DataTools/Tools/Pages/HPI-Calculator.aspx>.

28. When are the indexes normalized in the downloadable data?

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

29. 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. You can find the associated tables under “Summary Statistics for House Prices” on our downloadable data page, but we have not updated the data series. Alternative data sources such as the U.S. Census Bureau or the National Association of REALTORS® provide data on current house price levels, such as median and mean statistics.

30. Does the FHFA HPI track rent data?

No. The FHFA HPI measures average price changes in sales or refinancings on the same properties. Sometimes we compare rental data 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 tracking 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.

31. 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/DataTools/Downloads/Pages/House-Price-Index.aspx>. 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).”