CoreLogic®

HPI Forecast Validation Report

February 2020

Forecast Validation – Latest Performance Results

The CoreLogic® HPI Forecast Validation Report validates our performance results by comparing the increase in HPI Forecast™ to the actual increase in the CoreLogic HPI™ Index over the most recent 12-month period ending on November 30, 2019 at both the National and metro-levels. Our latest testing and analysis found:

- The HPI Forecast predicted a national change of 5.8%, compared to the actual index value of 3.5% — a 2.3% difference. The summer and fall of 2019 caused much of this difference, when long-term affordability concerns and supply challenges had an impact on home buyer demand in many markets.
- 14 of the Top 50 metros had forecasts with a difference of 1% or less vs. actual home prices over the 12-month period.
- Six of the Top 50 metros had forecasts almost perfectly in line with actual values. Notable metros included Milwaukee-Waukesha-West Allis, Minneapolis-St.Paul-Bloomington, and Phoenix-Mesa-Scottsdale
- Dallas-Plano-Irving, with a population of over 7 million had forecasts within 0.2% of actual values.
- The San Francisco area had the largest forecasting gap, with an 11% over estimation of actual home prices. Homebuyer concern over long term affordability and supply challenges were contributing factors to the decrease in demand. The San Jose-Sunnyvale-Santa Clara area had a smaller over estimation of 8% but had similar issues.
- Per our Market Condition Indicators which analyzes the relationship between Income per Capita growth and Home Price growth, Bridgeport-Stamford-Norwalk metro continues to be the most undervalued market with a population size of over 600,000 with Hartford-West Hartford-East Hartford closely following. Miami metro continues to top our list of most overvalued markets.
- We're closely monitoring the major metros that have seen the highest degree of change. over the 12-month period and our forecast performance.

Market Condition Indicators – Markets to Watch

Overvalued Metro Areas:

- **Miami**
  73% Overvalued
- **Austin-Round Rock**
  62% Overvalued
- **Deltona-Daytona Beach and Cape Coral-Fort Myers**
  53% Overvalued

Undervalued Metro Areas:

- **Bridgeport-Stamford-Norwalk**
  37% Undervalued
- **Hartford-West Hartford-East Hartford**
  34% Undervalued
- **New Haven-Milford**
  30% Undervalued

Our Market Condition Indicators are derived from long-term fundamental values—home-price "norms" based on the correlation of home prices with real disposable income per capita. Metrics above are for Single Family Combined. They are available in the CoreLogic HPI product, and Forecasts are available in CoreLogic HPI Forecast.

Top 10 Most Accurately Forecasted Metros Out of the Top 50 Metros

Ranking	Market	Population	HPI Actual Change	Forecasted Change	Difference
1	Milwaukee-Waukesha-West Allis, WI	1,576,000	5.1%	5.2%	0.1%
2	Minneapolis-St. Paul-Bloomington, MN-WI	3,629,000	4.6%	4.7%	0.1%
3	Dallas-Plano-Irving, TX	7,539,000	2.6%	2.4%	−0.2%
4	Cincinnati, OH-KY-IN	2,190,000	5.4%	5.6%	0.2%
5	Indianapolis-Carmel-Anderson, IN	2,048,000	6.2%	6.4%	0.2%
6	Charlotte-Concord-Gastonia, NC-SC	2,569,000	5.4%	5.1%	−0.3%
7	San Antonio-New Braunfels, TX	1,530,000	3.6%	3.2%	−0.4%
8	Philadelphia, PA	6,096,000	5.8%	5.3%	−0.5%
9	Nashville-Davidson--Murfreesboro--Franklin, TN	1,931,000	4.5%	4.0%	−0.5%
10	Phoenix-Mesa-Scottsdale, AZ	4,858,000	6.3%	5.7%	−0.6%

Market Risk Indicators – A New Way to Identify At-Risk Markets

Most economists believe that the economy will enter a recession by the middle of 2021*. With the threat of recession comes the threat of home price declines. While it is predicted any housing market downturns will be regional in nature, such down turns still pose a significant threat to businesses. This instability can impact how lenders and investors make decisions surrounding the housing market and businesses need a solution to help make sounder choices. Market Risk Indicators, available as an add on to HPI and HPI Forecast products, is our solution to help provide accurate planning in a time of market uncertainty.

Market Risk Indicators are an analytic product that provides probability scores for home price declines in the top 392 metro areas as well as all states. Designed by the same CoreLogic data scientists that created our HPI and HPI Forecasts, Market Risk Indicators combines many different analytic assets from both CoreLogic and leading economic data partners. Market Risk Indicators are designed to predict the probability of a home price decline over a 12-month period, delivering probability predictions for two price decline severities. Every month, clients will receive data based on the latest economic and housing analytics and insights and will get a probability for two price decline severities.

Based on our latest Price Decline Risk Probability scores the following States have the highest degree of risk over the next 12 months:

- Nevada
- Florida
- Arizona
- Connecticut

*National Association for Business Economics, December 2019

Top Markets with large degree of price change over the 12-month period

CoreLogic is closely monitoring the Top 50 major metros that have been experiencing the largest price change over the last 12 months. Here is a look at how our Forecast compared with actual values in these markets. Many of these major metros have had complex economic, market demand and supply factors over the last year.

Despite the complex dynamics, in many of these metros, our forecast was very close to actual values in high price appreciation areas such as Philadelphia, Houston, Orlando and St. Louis.

Rank	Major Metro	Change in CoreLogic Home Price Index – 12 months	Change in CoreLogic Home Price Forecast – 12 months	Difference
1	Philadelphia, PA	6.3%	5.7%	-0.6%
2	Cleveland-Elyria, OH	6.2%	5.5%	-0.8%
3	Houston-The Woodlands-Sugar Land, TX	6.2%	6.4%	0.3%
4	Orlando-Kissimmee-Sanford, FL	5.8%	5.3%	-0.4%
5	St. Louis, MO-IL	5.4%	6.2%	0.7%
6	Cambridge-Newton-Framingham, MA	5.4%	5.1%	-0.3%
7	Chicago-Naperville-Arlington Heights, IL	5.4%	5.6%	0.2%
8	Miami-Miami Beach-Kendall, FL	5.1%	5.2%	0.0%
9	Seattle-Bellevue-Everett, WA	4.8%	5.7%	0.9%
10	Atlanta-Sandy Springs-Roswell, GA	4.8%	0.5%	-4.2%
11	Milwaukee-Waukesha-West Allis, WI	4.6%	4.7%	0.1%
12	Oakland-Hayward-Berkeley, CA	4.6%	6.8%	2.2%
13	Denver-Aurora-Lakewood, CO	4.5%	7.6%	3.1%
14	Montgomery County-Bucks County-Chester County, PA	4.5%	4.0%	-0.5%
15	Portland-Vancouver-Hillsboro, OR-WA	4.5%	5.5%	1.1%

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CoreLogic HPI Forecasts Validation Methodology

HPI Data
Each month, CoreLogic publishes the CoreLogic Home Price Index. The HPI contains the current and historical index values going back to January 1976. There is a 5-week lag between the HPI release date and the most current index value.

As new sales transactions are recorded and made available to the HPI, index values for previous months are restated to reflect the new sales data. Given the varying rates at which counties record sales transactions, all historical HPI values are subject to revision. Large restatements will, in general, be limited to the last 3 months of index values.

HPI Version 4.0 was first calculated in April 2016 and first published in June 2016. Each month, CoreLogic stores the published HPI for future back testing purposes.

HPI Forecast Data
Each month, CoreLogic publishes the CoreLogic HPI Price Forecasts (HPIF). The HPIF contains the predicted monthly HPI values for the ensuing 30 years.

HPIF Version 4.4 was first calculated in April 2016 and first published in June 2016. Each month, CoreLogic stores the HPIF for future back testing purposes.

Back-Testing Approach
Each month, CoreLogic conducts an ex-post back-test to determine how accurately the HPIF is predicting the HPI increase 12 months into the future. The analysis is done at for Tier 11 (Single Family Combined) at the national and state level as well as for the largest 50 CBSAs.

The back-test analysis compares the actual HPI increase in the preceding 12 months to the HPIF predicted increase from 12 months earlier. For example, we compared the actual HPI increase from November 2018 – November 2019 with the increase forecast by the HPIF. Because of the HPI revisions, we back-test using HPI values after they have undergone 1 month of revision (i.e., we use index values from the prior release month.) In the "Top Markets with large degree of absolute change" analysis, the degree of change was calculated by determining the absolute difference between the index at the beginning of the time period and the index at the end of the time period.

CoreLogic HPI™

Built on industry-leading public record, servicing, and securities real-estate databases, CoreLogic HPI™ incorporates more than 40 years of repeat sales transactions for analyzing historic, current, and future home price trends and producing multi-tier, multi-level market evaluations.

Learn more at **corelogic.com/HPI**

CoreLogic HPI Forecasts™

Based on a two-stage, error-correction econometric model that combines the equilibrium home price—as a function of real disposable income per capita—with short-run fluctuations caused by market momentum, mean-reversion, and exogenous economic shocks like changes in the unemployment rate.

Learn more at **corelogic.com/HPIF**

For detailed methodology and back testing information, visit corelogic.com/HPIValidation.

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