Forecasting Shelter Inflation

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The shelter inflation component of the CPI, realized at the average value of 2.35% over the period 2009 to 2019. Recently, the Covid crisis pandemic radically changed the housing demand, and shelter inflation peaked at 5.6% in June 2022.

Shelter inflation is crucial to keep track of, considering it is the most significant component of the US core CPI measure with a weight of 39.5%. A simple linear regression demonstrates that the variance of the core CPI can be explained at 58% by housing inflation over the 2004-2019 period.

A thorough analysis of the Bureau of Labor Statistics methodology to compute the shelter CPI will help us model its evolution up to the next 18 months.

The Shelter Inflation Index

Within the measure of US inflation, the housing component is measured as the cost of shelter and is the sum of two parts:

- the first part is known as the Owners Equivalent Rent (OER), calculated by the Bureau of Labor and Statistics. The OER represents an estimate of the rent that owners could charge if they were to rent their homes. Observed actual rents of similar properties partly estimate it. OER has the strongest weight within the shelter inflation measurement, representing about 3/4s of the shelter CPI indicator and thus significantly impacting core CPI measurements.
- the other part of shelter CPI is a measure of rents of primary residences. It represents the actual rents paid by renters.

The two components of shelter inflation have proved to move together with the OER. Since the OER methodology is backward looking, it is possible to find explanatory variables to estimate its future values. The rest of the document focuses on defining a reliable model to forecast the OER CPI.

A Model to forecast the OER

We leverage on the explanatory variables proposed by Brescia (2021) and Bolhuis, Cramer and Summers (2022) to define a model for the OER.

More thoroughly, the dependent variable of our study is the OER CPI, and we observe its YoY realized values between periods t and t+4, with numbers representing quarters. The model is calibrated using quarterly data over 15 years, that is 60 observations.

The most significant independent variable is the measure of real estate prices in the United States: the S&P CoreLogic Case Shiller, US National Home Price Index, measures the change in the value of the US residential market by tracking the purchase prices of single-family homes. Data have been published monthly since 1953. In practice, **we observed the YoY variation of the Case Shiller Index and established that a lag of 2 quarters provides the best explanation for the realized OER CPI one year forward**.

Furthermore, Brescia and al. also propose to introduce a variable involving the supply and demand of the housing market: the **Rental Vacancy Rate**, provided quarterly since 1956, is an explanatory variable that validates the conditions of the p-test at 95%. We retain its **average over one year with 1 quarter lag**. We tested without success another supply variable, calculated as the ratio of US Existing Home Sale Inventory, by the Total Housing Inventory Estimate.

The introduction of **a third explanatory variable, with the Michigan Survey's expected inflation over a year is also perceived as statistically significant. A lag of 2 quarters is used for this variable**. It is also worth noting that **activity variables, such as the change in GDP YoY, industrial production YoY, or Retail Sales, give approximately equivalent results**. We keep these variables as alternative models.

Finally, we do not retain the cross-product between the Case Shiller Index and the Vacancy Rate, as proposed by Brescia. Other variables like the level of Mortgage Rates were also tested and not retained.

We compare models in-sample (fitted from 2004 to 2018) and out-of-sample (periods 1995 to 2003 and after 2018). Table 1 thereafter shows a summary of the different statistics. Models 3 and 4 display the lowest RMSE out-of-sample and are retained for the forecasting exercise.

	Model1	Model2	Model3	Model4	Model5	Model6	Model7
Intercept	2.14	6.61	4.78	4.15	4.57	0.15	4.84
Case Shiller YoY t - 2	0.1163	-	0.1004	0.0994	0.0680	0.0800	0.0758
Rental Vacancy avg Y t - 1	-	-0.4579	-0.2895	-0.3326	-0.2943	-0.3269	-0.3149
Michigan 1Y inflation Expectation t-2	-	-	-	0.3352	-	-	-
Real GDP YoY t-2	-	-	-	-	0.1807	-	-
Industrial Production YoY t-2	-	-	-	-	-	0.0579	-
Retail Sales YoY t-2	-	-	-	-	-	-	0.0731
Adjusted R^2	0.68	0.34	0.81	0.84	0.85	0.85	0.87
RMSE	0.57	0.82	0.45	0.40	0.40	0.39	0.37
F-score	126.72	31.06	123.54	105.10	109.86	83.21	129.06
Out-Of-Sample RMSE	0.78	0.67	0.64	0.59	0.81	0.81	0.81

TABLE 1: Regression Models for OER one year ahead forecasts.

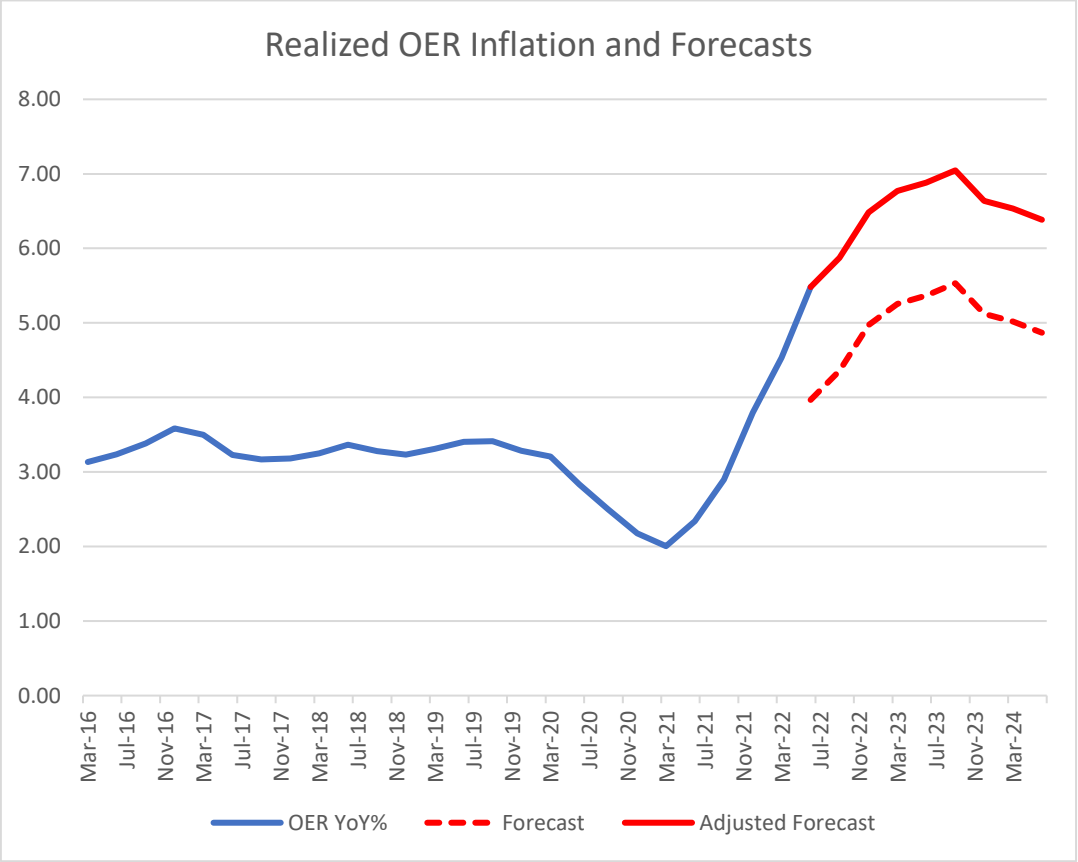
Forecasts for 2023

Based on the recent price surge in home prices, we expect a lagged increase in OER inflation over the rest of 2022 and 2023. As an estimate, we use the average obtained from Models 3 and 4, as displayed in table 1. Considering the error observed as of June 2022, with a prediction of 4.1% versus a realized OER YoY inflation of 5.48%, we can adjust the forecast by the current error to obtain the plain red curve of adjusted projections.

We obtain housing prices projections until 2024 from Fannie Mae research reports dated August 2022: HPI is expected at 17.4% YoY in Q3 2022, 16% in Q4 2022 and declining to 4.4% in Q4 2023. We suppose a constant vacancy rate.

We observe that **OER inflation shall remain above 5.5% with an upside trend until at least Q3 2023.**

Figure 1



Since there is a strong relationship between shelter inflation and core CPI (Core inflation # 0.395 * shelter inflation + 0.96), we identify that **core inflation should be around 3.50% by Q3 2023.**

References

Brescia E. (2021). Housing Insights: Housing Poised to Become Strong Driver of Inflation. Fannie Mae Working Papers.

Bolhuis M., Cramer J., Summers L. (2022). The Coming Rise in Residential Inflation. National Bureau of Economic Research.