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The Pass-through of Gaps between Market Rent and the Price of Shelter

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Abstract:

The gap between market rent and the price of shelter was 6.6 percent larger in December 2023 relative to December 2019. Because shelter prices comprise 36 percent of the Consumer Price Index and therefore influence monetary policy decisions, it is vital to understand the pass-through of this difference, or "market-shelter gap." I use MSA-level variation to answer this question. When there is a positive market–shelter gap, the price of shelter grows faster and market rent grows slower until the gap closes, which takes about five years. Faster shelter-price growth and slower market-rent growth each explain about half of the convergence.

JEL Classifications: E37, E31, E17

Keywords: CPI, shelter, housing, rent, market–shelter gap

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1 Introduction

Shelter is the largest component of the Consumer Price Index (CPI), comprising 36.2 percent as of February 2024. Consequently, the price of shelter can play a crucial role in driving inflation dynamics and in informing central bank decisions. For example, when year-over-year CPI shelter (the shelter-price index) peaked at 8.2 percent in March 2023, core CPI (which excludes food and energy prices) stood at 5.5 percent on a year-over-year basis, but it would have been 3.5 percent without the inclusion of shelter. And from July 2023 to February 2024, core CPI was 3.8 to 4.7 percent, but it would have been 1.8 to 2.4 percent excluding shelter.

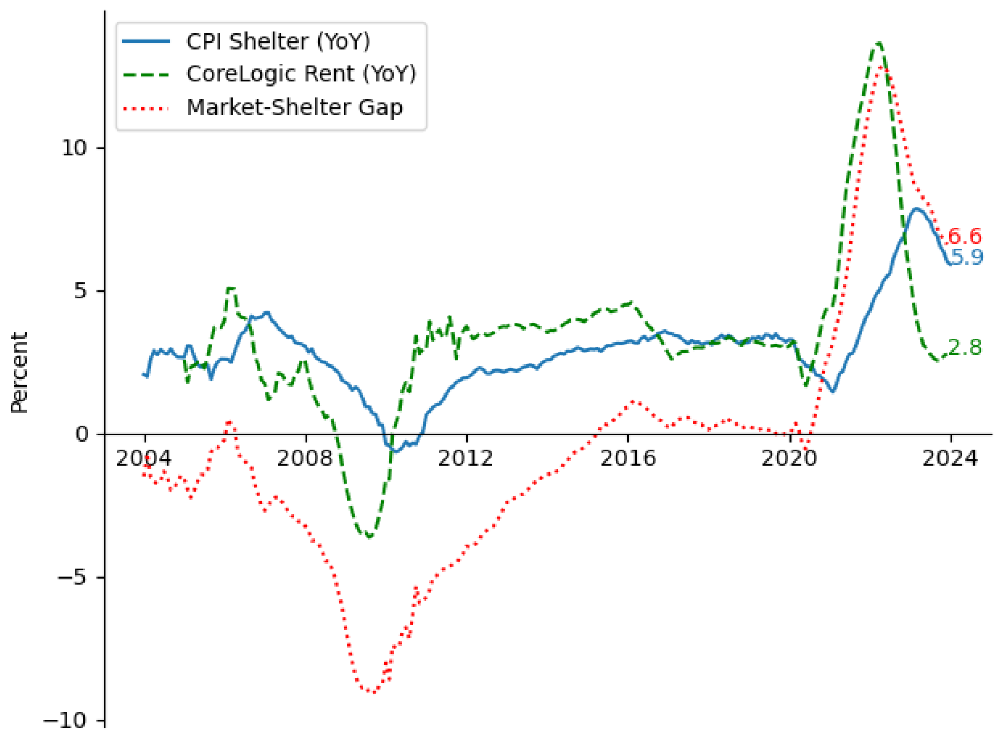
CPI shelter is made up of two main components: (1) CPI rent, which is the direct costs to renters of renting a home, and (2) CPI owners' equivalent rent, which is the indirect costs to owners of living in a home. The latter captures the rent a person would have to pay if they rented rather than owned their home and is constructed using CPI rent. Therefore, it might be expected that the price of shelter will move in line with market rent. However, an important distinction between the price of shelter and market rent is the tenant composition of each measure. Market rent is the average rent paid by new tenants. CPI shelter captures the rent that all tenants pay, including renters that have not moved.

Several papers investigate the consequences of this difference. Bolhuis, Cramer, and Summers (2022); Cotton and O'Shea (2023); Kmetz, Louie, and Mondragon (2023) provide forecasts for how CPI shelter would rise in the near future based on the rapid growth of market rent observed in the period immediately after the onset of the COVID-19 pandemic. Adams et al. (2024) construct separate rent indexes using for new tenants and all tenants from the data underlying CPI shelter. They confirm that the dynamics of new-tenant rent measured using CPI shelter data are indeed similar to those of market rent, which suggests that the differences between market rent and the price of shelter are driven by tenant composition. These papers suggest that CPI shelter will increase following a rise in market rent and peak approximately three to four quarters later.

Figure 1 shows how these dynamics play out in the data. The solid blue line shows year-over-year CPI-shelter growth. The dashed green line shows year-over-year market-rent growth measured using CoreLogic data. In August 2009, during the Great Recession, year-over-year market-rent growth fell to a trough of –3.6 percent, while year-over-year CPI-shelter growth fell to a low of –0.7 percent eight months later, in April 2010. Similarly, in April 2022, during the COVID-19 pandemic, year-over-year market-rent growth climbed to a peak of 13.6 percent, while year-over-year CPI-shelter growth reached a year-over-year peak of 7.8 percent 11 months later, in March 2023.

However, an analysis that looks only at the recent dynamics of market rent and CPI shelter will miss important, longer-term dynamics. The level of CPI shelter might be expected to move in line with market rent in the long-term. In this case, differences in the levels of market rent and CPI shelter (relative to the baseline), which I call the "market-shelter gap," would be expected to return to zero in the long term following temporary deviations. In this sense, the market-shelter gap is an error-correction term in the spirit of Engle and Granger (1987). I plot the market-shelter gap with the dotted red line in Figure 1. In the Great Recession, the market-shelter gap reached a trough of –9.0 percent in August 2009, meaning that the level of market rent fell 9 percent relative to CPI shelter. This was the same month that year-over-year market-rent growth dipped to its nadir. The market-shelter gap stood at –7.5 percent in April 2010, the month when year-over-year CPI-shelter growth dropped to its lowest point. However, over the subsequent five years, the market-shelter gap contracted until it returned to zero in May 2015. By definition, for the market-shelter gap to return to zero, CPI shelter grew at a slower

Figure 1: CPI Shelter and Market Rent Dynamics



Source(s): US Bureau of Labor Statistics, CoreLogic. Note(s): CPI shelter and CoreLogic rent are measured on a year-over-year basis. The market-shelter gap (log market rent minus log CPI shelter) is set to zero in December 2019.

pace than market rent. Indeed, CPI shelter grew more than 1 percent slower than market rent through 2015.

To my knowledge, the literature includes few studies on the market-shelter gap. The only paper I am aware of that studies the impact of the market-shelter gap is a working paper draft by Adams et al. (2024). The authors find that the market-shelter gap "is not a useful predictor" of CPI rent. However, it is important to note that they conducted their analysis using national data. In this paper, I aim to answer three questions about the market-shelter gap: (1) Do market-shelter gaps return to zero without further shocks? (2) How quickly do market-shelter gaps close? (3) Do market-shelter gaps close as a result of changes in CPI-shelter growth or due to changes in market-rent growth?

To answer these questions, I apply data at the metropolitan statistical area (MSA) level. It is difficult to identify the impact of market-shelter gaps using national data because the national data do not begin until 2004, and I focus mainly on a sample that excludes the COVID-19 pandemic period and afterward. [1] Therefore, the national sample is quite limited. Working with MSA-level data allows me to control for common national effects using time fixed effects and to use MSA-level variation to identify the impact of market-shelter gaps. With this approach, I can measure this impact much more precisely. The US Bureau of Labor Statistics (BLS) releases monthly shelter prices for 24 MSAs. I match these data to CoreLogic market-rent data. I then estimate how the market-shelter gap in an MSA will affect CPI-shelter growth and market-rent growth in that MSA going forward. I control for time fixed effects, MSA fixed effects, and past lags of market rent and CPI shelter.

I find three main results. First, market-shelter gaps do converge toward zero in the long term. Second, the convergence is nearly complete after about five years. After four and six years, gaps have closed 81 percent and 88 percent, respectively. Regarding the short term, gaps close only 3.5, 8.4, and 25 percent in the first month, three months, and 12 months, respectively. Third, I find that higher (lower) CPI-shelter growth and lower (higher) market-rent growth each explain about half of the closure of a positive (negative) market-shelter gap. I find that after six years, changes in CPI shelter growth close 43 percent of a gap, while changes in market rent growth close 45 percent of the gap. These results are robust to many alternative specifications. To my knowledge, this paper is also the first to document that market rent is likely to grow less (more) quickly when there is a positive (negative) market-shelter gap relative to when there is no gap.

These results are especially pertinent now. As Figure 1 shows, in the aftermath of the COVID-19 pandemic, market-rent growth surged, reaching a maximum of 13.6 percent year-over-year in April 2022. CPI shelter responded more slowly, growing at a year-over-year peak of 7.8 percent in March 2023. This led to a large gap between market rent and CPI shelter relative to the pre-pandemic period. The market-shelter gap grew to 12.8 percent in May 2022. By December 2023, it had partly closed but still stood at 6.6 percent . I apply my results to estimate how market rent and CPI shelter will evolve going forward and find that CPI shelter will grow 1.03 and 0.82 percentage points more in 2024 and 2025 due to the current market-shelter gap than if there were no gap, respectively. Because shelter makes up 45.5 percent of core CPI (as of February 2024), this estimate implies that core CPI will grow an additional 0.47 and 0.37 percentage point in 2024 and 2025, respectively.

[1] Moreover, I apply a local-projections approach, whereby I examine how the market-shelter gap affects variables up to 72 months later, which further shortens my sample.

Table 1: MSA Details

MSA Name	State	First Date	Last Date	Pop. (000)
Atlanta-Sandy Springs-Roswell	GA	200812m	202312m	6106
Baltimore-Columbia-Towson	MD	200801m	202212m	2844
Boston	MA	200511m	202312m	4944
Chicago-Naperville-Arlington Heights	IL	200501m	202306m	9450
Cleveland-Elyria	OH	200704m	201712m	2185
Dallas-Plano-Irving	TX	200210m	202312m	7637
Detroit-Dearborn-Livonia	MI	200303m	202312m	4392
Honolulu (Urban)	HI	201712m	202312m	1016
Houston-The Woodlands-Sugar Land	TX	199811m	202312m	7149
Los Angeles-Long Beach-Glendale	CA	199503m	202312m	13200
Miami-Miami Beach-Kendall	FL	200911m	202312m	6138
Minneapolis-St. Paul-Bloomington	MN-WI	201712m	202312m	3690
New York-Jersey City-White Plains	NY-NJ	199603m	202312m	20081
Philadelphia	PA	200802m	202212m	6245
Phoenix-Mesa-Scottsdale	AZ	201712m	202306m	4851
Riverside-San Bernardino-Ontario	CA	201712m	202312m	4599
San Diego-Carlsbad	CA	201712m	202312m	3298
San Francisco-Redwood City-South San Francisco	CA	199802m	202312m	4748
Seattle-Bellevue-Everett	WA	199906m	202312m	4018
St. Louis	MO-IL	201712m	202312m	2820
Tampa-St. Petersburg-Clearwater	FL	201712m	202312m	3175
Washington-Arlington-Alexandria	DC-VA-MD-WV	199801m	202212m	6278

Source(s): US Bureau of Labor Statistics, US Census Bureau, CoreLogic. Note(s): Population data are from the US Census Bureau and are measured at the MSA level for 2023.

2 Empirical Approach

I combine two data sets for my study. First, I obtain data on CPI shelter from the BLS. The bureau provides CPI shelter for the country as a whole and for 24 MSAs.[2] The second data set contains information on market rent from CoreLogic. I use Corelogic's "Single-Family Combined" measure, which represents the widest range of properties and includes single-family attached and single-family detached properties. I am able to match 22 of the 24 MSAs to the CoreLogic data. The two MSAs for which I do not have CoreLogic market rent data are Denver and Urban Alaska (Anchorage). The CoreLogic data run through the end of 2023 for most MSAs, though coverage ends several months early for a handful. Therefore, I obtain a monthly data set for 22 MSAs, which is summarized in Table 1. In my analysis, I typically consider the 16-year period from January 2004 through December 2019. I begin in January 2004 because this is when CoreLogic began to measure market rent at a national level and was already surveying market rent for eight MSAs, which means that aggregate time fixed effects were well measured in 2004. I exclude the COVID-19 pandemic period in my baseline results because the pandemic may have induced unusual rent dynamics.[3] I vary the periods I study in robustness checks, and I seasonally adjust the CoreLogic data using X13-ARIMA with default parameters.

My baseline specification is given in Equation (1). t represents the month, and msa represents the MSA. I look at how log CPI shelter responds over various time horizons to the gap between the level of market rent and CPI

[2] The BLS has been measuring CPI shelter for many years for most MSAs, but updated its coverage at the end of 2017, adding several new MSAs and stopping the measurement for Cleveland.

[3] Note that I also exclude any points for which variables changed from before to after December 2019. For example, when looking at the change in CPI shelter over the subsequent 24 months, I would exclude points after December 2017.

shelter in logs. Because both the dependent variable and the independent variable are in logs, the coefficient β captures how much a 1 percentage point rise in the market-shelter gap at time t raises CPI shelter, in percentage points, from time t to time $t+m$. I also consider two additional dependent variables: the change in log market rent and the change in the market-shelter gap. To capture aggregate effects that took place at specific times, I control for time fixed effects, α_t. I also include entity fixed effects, γ_{msa}, to capture average differences in the average growth of the dependent variables or the average of the explanatory variables across MSAs. I include 12 lags of the monthly difference in CPI shelter and market rent for the MSA to capture MSA-level differences in the future path of the dependent variables that are not due to the market-shelter gap. I follow the local projection approach suggested in Jordà (2005) and look at the response of the dependent variables of interest m months ahead. I use Driscoll and Kraay (1998) standard errors, which allows for the possibility of heteroskedasticity, autocorrelation (I allow for a maximum of 11 lags), and correlation between groups.

$$\begin{aligned}\Delta_t^{t+m}\log(CPIShelter_{msa}) &= \alpha_t + \gamma_{msa} + \beta(\log(MarketRent_{msa,t}) - \log(CPIShelter_{msa,t})) \\ &+ \sum_{i=0}^{11}\delta_i\Delta\log(MarketRent_{msa,t-i} + \sum_{i=0}^{11}\delta_i\Delta\log(CPIShelter_{msa,t-i} + u_{msa,t+x} \qquad (1)\end{aligned}$$

In Equation (1), I consider the impact of the market-shelter gap by including the difference in logs of market-rent and CPI shelter. I consider the difference in logs to avoid scaling issues. I do not need to consider the difference relative to a baseline level because the baseline level would be a constant, which is captured by α_{msa}. However, the choice of baseline level does make a difference in Figure 1. In Figure 1, I set the baseline to be the difference (in logs) in December 2019. I choose this month because as Figure 1 shows, it followed several years in which market rent and CPI shelter were stable and the market-shelter gap was effectively unchanged. This choice also enables me to easily compare the pre-pandemic period with the present. An alternative would be to set the baseline as the average of the difference in logs of market rent and CPI shelter throughout my sample. I show the market-shelter gap in this case in Figure A.1. The level of the market-shelter gap is only 0.4 percentage point higher than the December 2019 case. In other words, I find that the market-shelter gap in December 2023 is 6.6 percent when compared with the value in December 2019 and 7.0 percent when compared with the historical average.

3 Results

Table 2 shows the baseline results. Panel A shows the change in CPI shelter associated with a 1 percentage point larger market-shelter gap at time t. The columns look at how CPI shelter changes over the next 1, 3, 6, 12, 24, 48, and 72 months, respectively. Therefore, the coefficient in the first row and last column of Panel A suggests that a 1 percentage point larger market-shelter gap is associated with CPI shelter of 0.43 percentage point over the next 72 months, all else being equal. Therefore, 43 percent of a positive market-shelter gap closes over the next 72 months due to faster growth in CPI shelter. The other numbers below the coefficients are the standard error, the number of observations in the regression, and the R^2 of the regression. Considered collectively, the columns in Panel A suggest that a positive market-shelter gap is associated with a fairly steady increase in CPI shelter over the next six years, although more growth does occur in the first two years than in later years. The coefficients at all maturities are significant at the 0.1 percent level, which suggests a clear

Table 2: Baseline Specification

Months Ahead (m)	1	3	6	12	24	48	72
Panel A: $\Delta_t^{t+m} Log(CPIShelter_{msa})$							
$\log(CorelogicRent_{msa,t}) - \log(CPIShelter_{msa,t})$	0.023***	0.058***	0.093***	0.156***	0.279***	0.366***	0.430***
	(0.003)	(0.007)	(0.011)	(0.016)	(0.021)	(0.035)	(0.042)
N	2540	2496	2430	2298	2111	1751	1391
R^2	0.318	0.478	0.582	0.691	0.780	0.803	0.791
Panel B: $\Delta_t^{t+m} Log(CorelogicRent_{msa})$							
$\log(CorelogicRent_{msa,t}) - \log(CPIShelter_{msa,t})$	-0.012*	-0.026*	-0.037*	-0.091**	-0.235***	-0.445***	-0.454***
	(0.006)	(0.013)	(0.018)	(0.032)	(0.050)	(0.069)	(0.067)
N	2540	2496	2430	2298	2111	1751	1391
R^2	0.220	0.359	0.458	0.565	0.646	0.729	0.809
Panel C: $\Delta_t^{t+m}(Log(CorelogicRent_{msa}) - Log(CPIShelter_{msa})$							
$\log(CorelogicRent_{msa,t}) - \log(CPIShelter_{msa,t})$	-0.035***	-0.084***	-0.130***	-0.246***	-0.515***	-0.811***	-0.884***
	(0.007)	(0.016)	(0.023)	(0.036)	(0.042)	(0.050)	(0.058)
N	2540	2496	2430	2298	2111	1751	1391
R^2	0.283	0.434	0.515	0.614	0.736	0.861	0.914
Controls (same across panels)							
CPI Shelter 12 Lags	*	*	*	*	*	*	*
Corelogic Rent 12 Lags	*	*	*	*	*	*	*
MSA Fixed Effects	*	*	*	*	*	*	*
Time Fixed Effects	*	*	*	*	*	*	*

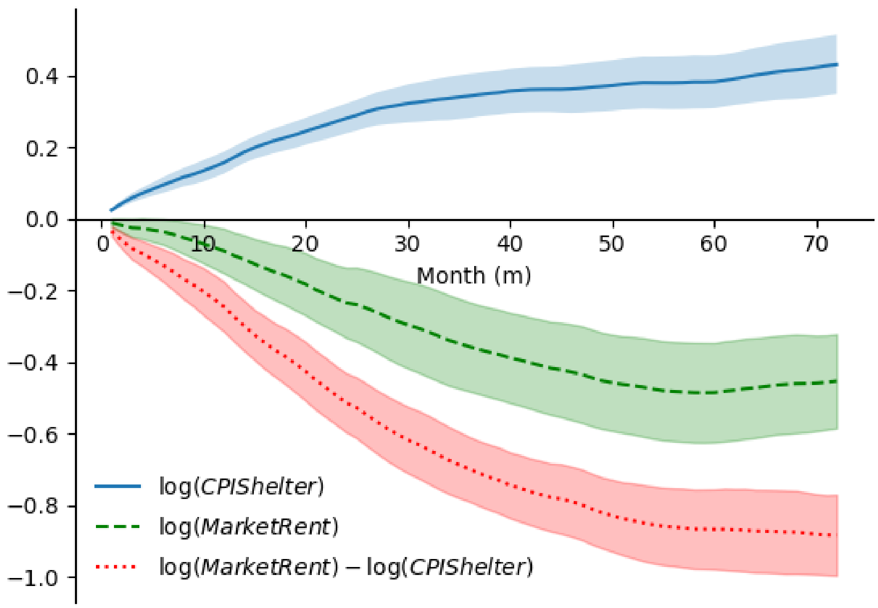
Source(s): US Bureau of Labor Statistics, CoreLogic. Note(s): Driscoll-Kraay standard errors. *, **, and *** represent < 0.05, < 0.01, and < 0.001 significance, respectively.

relationship.

Panel B of Table 2 shows the change in market rent associated with a 1 percentage point larger market-shelter gap at time t. The coefficient in the last column of Panel B implies that a 1 percentage point larger market-shelter gap is associated with a 0.45 percentage point fall in market rent over the next 72 months. Therefore, 45 percent of a positive market-shelter gap closes over the next 72 months due to slower growth in market rent. Market rent responds less than CPI shelter in the first 12 months but more quickly than CPI shelter 24 to 48 months later. All coefficients in Panel A are significant at the 5 percent level, and the coefficients for 24 months or longer are significant at the 0.1 percent level. To my knowledge, this is the first paper to demonstrate that market rent appears to grow less (more) quickly when there is a positive (negative) market-shelter gap. However, the result makes sense intuitively. Market rent captures the rent that new tenants pay, while CPI shelter captures the rent that all tenants pay. A positive market-shelter gap implies that the rent that new tenants pay is higher than the rent that all tenants pay. Therefore, existing tenants with relatively low rents are less likely to move if market rent remains high, which implies market rent needs to fall in relative terms to achieve equilibrium.

Panel C of Table 2 shows how the market-shelter gap evolves in response to a 1 percentage point larger market-shelter gap at time t. The coefficient in the last column of Panel C implies that a 1 percentage point larger market-shelter gap at time t is associated with a decline in the market-shelter gap of 0.88 percentage point over the next 72 months. Therefore, 88 percent of the market-shelter gap closes over the next 72 months. Note that the dependent variables in Panel C are the dependent variable in Panel B minus the negative of the dependent variable in Panel A, so the coefficients in Panel C equal the coefficients in Panel B minus those in Panel A. This reflects how positive market-shelter gaps can either close due to rises in CPI shelter or declines in market rent. And in practice, both occur. All coefficients in Panel C are significant at the 0.1 percent level, negative, and growing, which suggests that when market shelter gaps open, they are likely to be temporary.

Figure 2: Response of Key Variables to Deviation between Market Rent and CPI Shelter



Source(s): US Bureau of Labor Statistics, CoreLogic. Note(s): Bands represent 5 percent confidence intervals estimated with Driscoll-Kraay standard errors. Constructed using the same specification as Table 2.

Figure 2 summarizes the results graphically. It shows how the key variables respond to a 1 percentage point larger market-shelter gap at time t. The solid blue line shows the growth of CPI shelter from time t to time $t+m$, where m is the number of months on the x-axis. The dashed green line shows the growth of market rent from time t to time $t+m$. The dotted red line shows the growth of the deviation in market rent relative to CPI shelter from time t to time $t+m$. The shaded bands show the 5 percent confidence intervals. CPI shelter grows steadily and market rent falls steadily in response to a positive deviation between market rent and CPI shelter. For a 1 percentage point positive deviation between market rent and CPI shelter to close fully, the change in the deviation between market rent and CPI shelter would need to fall by 1 percentage point. On the right-hand side of the graph, the deviation between market rent and CPI shelter almost attains this 1 percentage point fall, so nearly all of the gap between market rent and CPI shelter closes after 72 months.

These results provide clear answers to the questions motivating this paper. First, market-shelter gaps close over time. Second, I find that market-shelter gaps take significant time to close. I find that they take about four to six years to close, and that 3.5 percent of this closure occurs in one month and 24.6 percent in one year. Third, the closure of a positive market-shelter gap is driven approximately equally by increased growth in CPI shelter and reduced growth in market rent. I find that faster CPI-shelter growth closes 43 percent of a positive gap, and slower market-rent growth closes 45 percent. These results fit the national-level dynamics following the Great Recession that can be observed in Figure 1, even though I obtained results using MSA-level data and controlling for time fixed effects. When the market-shelter gap reached a nadir of –9.0 percent in August 2009, it took about six years for the gap to close. The gap contracted more quickly initially. It is notable that in the

Table 3: Robustness Checks Summary

Months Ahead (m)	1	3	6	12	24	48	72
A. Baseline	-0.035***	-0.084***	-0.130***	-0.246***	-0.515***	-0.811***	-0.884***
B. No Time Dummies/Lag Controls	-0.029***	-0.070***	-0.114***	-0.215***	-0.441***	-0.812***	-1.006***
C. No Lag Controls	-0.035***	-0.086***	-0.125***	-0.232***	-0.497***	-0.828***	-0.961***
D. No Market Rent Controls	-0.032***	-0.083***	-0.141***	-0.273***	-0.540***	-0.822***	-0.891***
E. No CPI Controls	-0.041***	-0.092***	-0.119***	-0.215***	-0.480***	-0.816***	-0.948***
F. 2 Year Lags	-0.041***	-0.104***	-0.152***	-0.252***	-0.479***	-0.743***	-0.832***
G. MSAs Beginning A-I	-0.045***	-0.110***	-0.164***	-0.321***	-0.654***	-0.899***	-0.914***
H. MSAs Beginning J-Z	-0.027**	-0.060**	-0.099***	-0.185***	-0.393***	-0.706***	-0.818***
I. 2004–2009	-0.049**	-0.115**	-0.168**	-0.323***	-0.645***	-0.707***	-0.629***
J. 2010–2019	-0.049***	-0.123***	-0.214***	-0.412***	-0.858***	-1.369***	-1.236***
K. 2000–2019	-0.017***	-0.045***	-0.082***	-0.167***	-0.324***	-0.605***	-0.855***
L. Detrended Error Correction	-0.037***	-0.087***	-0.143***	-0.290***	-0.650***	-1.056***	-1.128***
M. 2000–2019 + Detrended Error	-0.030***	-0.078***	-0.144***	-0.304***	-0.621***	-0.998***	-1.181***
N. 2004–2023	-0.037***	-0.092***	-0.160***	-0.336***	-0.655***	-0.983***	-1.086***
O. CPI Rent	-0.026***	-0.068***	-0.122***	-0.238***	-0.499***	-0.797***	-0.906***
P. CPI Owners' Equivalent Rent	-0.026***	-0.072***	-0.133***	-0.266***	-0.536***	-0.830***	-0.868***

Source(s): US Bureau of Labor Statistics, CoreLogic, Zillow. Note(s): Coefficients from a regression of the change in the market-shelter gap from month t to month $t+m$ on the market-shelter gap at time t. The first row is the same as the third panel of Table 2. *, **, and *** represent < 0.05, < 0.01, and < 0.001 significance, respectively, under Driscoll-Kraay standard errors.

early 2010s, market rent grew faster than it did in the late 2010s, and CPI shelter grew slower than it did in the late 2010s, which suggests that the negative market-shelter gap may have boosted market-rent growth and slowed CPI-shelter growth. This, in turn, suggests that high market-rent growth and low CPI-shelter growth both helped to close the negative market-shelter gap.

The results appear to be robust, as shown in Table 3, where each row captures a different robustness check. In each row, I report how a positive 1 percentage point larger market-shelter gap at time t is associated with the growth in the market-shelter gap over the next 1, 3, 6, 12, 24, 48, and 72 months. These coefficients correspond to Panel C of Table 2. Row A reports the baseline coefficients from that table. For market-shelter gaps to close, the coefficient should be -1, which it is approximately in the baseline case at about 48 and 72 months.

I start by considering alternative sets of controls. For row B, I omit time dummies, lagged market rent, and lagged CPI shelter controls. For row C, I omit lagged market rent and lagged CPI shelter controls. For row D, I omit lagged market rent controls. For row E, I omit lagged CPI shelter controls. In row F, I include two yearly lags for market rent and CPI shelter rather than 12 monthly lags. Each of these checks yields results that are similar to the baseline case, which suggests that the choice of controls is not important in determining the results.

In rows G and H, I split the MSAs into the half that have names beginning with A through I and the half that have names beginning with J through Z. This yields approximately similar results, which suggests that no MSA is driving the results. I also show graphically the CPI-shelter and market-rent dynamics in each MSA in Appendix B. In rows I and J, I examine how splitting the sample into an earlier period and a later period affects the results. I find that the market-shelter gap closes to a similar degree in the short term but to a greater extent in the long term in the 2010–2019 period. In row K, I include data that go back to 2000. I find less though still significant closure of the market-shelter gap in earlier months but similar closure in later months.

One issue here is that market rent and CPI shelter may show different trends, perhaps because they cover slightly different geographic areas or housing types. In this case, in a long sample, the market-shelter gap may have less explanatory power. To control for this possibility, I detrend the error correction term in row L, which yields results similar to the baseline case. Applying the detrended error correction term to the 2000–2019 period in row M also yields results similar to the baseline case. In row N, I extend the results through 2023 to cover the COVID-19 pandemic and the period after the COVID-19 pandemic. I find stronger results than in the baseline case. I examine the degree of pass-through in this period in more detail in a policy note that extends the analysis in this paper (Cotton, 2024). I also consider how the results change when I look at the response of CPI rent and CPI owners' equivalent rent in rows O and P rather than CPI shelter. I find similar results. I provide summaries for the response of the change in CPI shelter and market rent in Appendix C. Each of the specifications I consider is presented in full in Appendix C.

The estimates in this paper have implications for policy. As Figure 1 shows, market rent was 6.6 percent higher than CPI shelter in December 2023 relative to December 2019. This implies that there remains a large market-shelter gap that will pass through into CPI shelter and market rent in coming years. Applying my estimates, I find the current large market-shelter gap means CPI shelter will grow 1.03 and 0.82 percentage points more in 2024 and 2025 than if there were no gap, respectively, and throughout the next six years, it will grow by an additional 2.84 percentage points on a non-annualized basis.[4] Shelter made up 45.5 percent of core CPI as of February 2024. Therefore, these forecasts suggest that core CPI will grow an additional 0.47 and 0.37 percentage point in 2024 and 2025, respectively, and 1.29 percentage points overall over the next six years as a result of the current market-shelter gap. I also find that market rent will grow 0.60 and 0.95 percentage point slower in 2024 and 2025, respectively, and throughout the next six years, it will grow an additional 3.00 percentage points more slowly on a non-annualized basis.

4 Conclusion

To my knowledge, this is the first paper to explore in detail the pass-through of the market-shelter gap. I do so through an MSA-level approach that allows me to control for common time fixed effects by identifying this pass-through using the variation in market-shelter gaps across MSAs. I find three results. First, market-shelter gaps close over time. Second, it takes about four to six years for such gaps to close, with about 25 percent of the gap closing in the first year. Third, about half of the closure is due to faster shelter price growth and half due to slower market rent growth. This has important implications for policy. The level of market rent was 6.6 percentage points higher than CPI shelter in December 2023 relative to December 2019. This large market-shelter gap implies that CPI shelter will grow 1.03 and 0.82 percentage points in 2024 and 2025 more than if there were no market-shelter gap, respectively. Because shelter made up 45.5 percent of core CPI as of February 2024, faster shelter-price growth in turn implies that core CPI will grow an additional 0.47 and 0.37 percentage point in 2024 and 2025, respectively.

My paper also has broader implications. First, I believe it is the first to demonstrate that the degree to which market rent rises depends on the existing level of market rent (for new tenants) relative to the rent paid by all tenants. This has important implications for the determination and forecasting of new rents. Second, in the literature that looks at how inflation affects the distribution of wealth across heterogeneous households, one notable paper, Doepke and Schneider (2006), finds that inflation leads to a redistribution from the old to

[4] In a policy note that extends this paper, I show that conducting this estimation using only data from after the start of the pandemic suggests that CPI shelter is likely to respond more quickly in the short term.

the young. I find that existing tenants who do not move are likely to experience lower rent relative to new tenants for several years. And because existing tenants are likely to be older than new tenants, the results in this paper may indicate a partial reversal of this wealth redistribution, as younger renters bear more of the costs of inflation, but only in the short to medium term before deviations between market rent (new tenants) and the price of shelter (all tenants) close.

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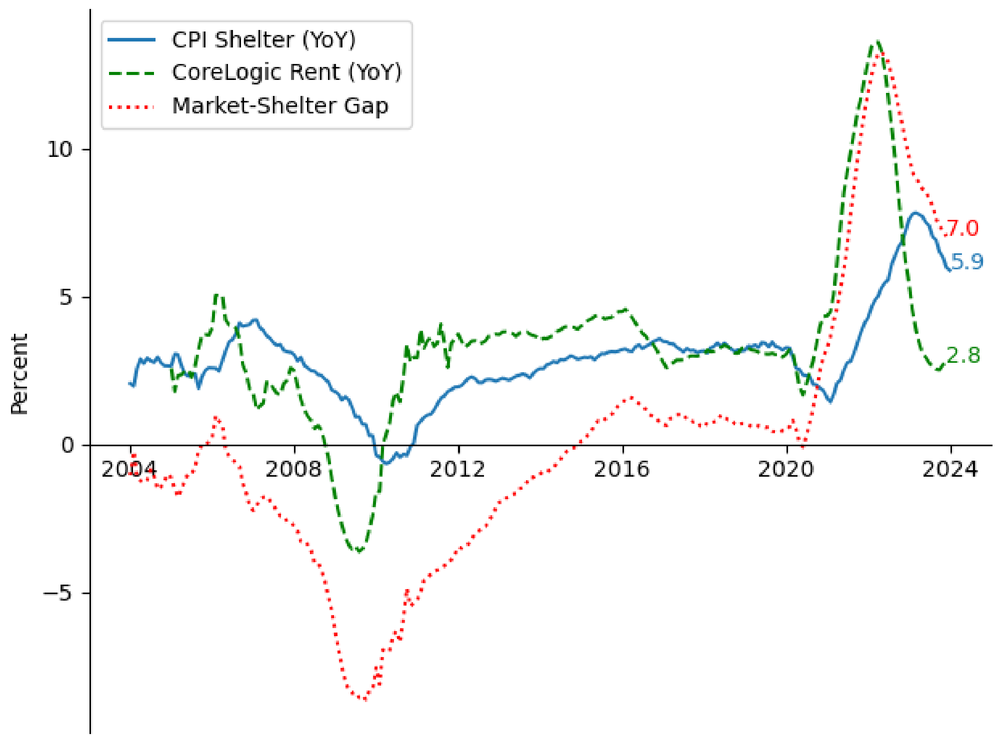
Online Appendix

A CPI-shelter and Market-rent Dynamics: Additional National Graphs

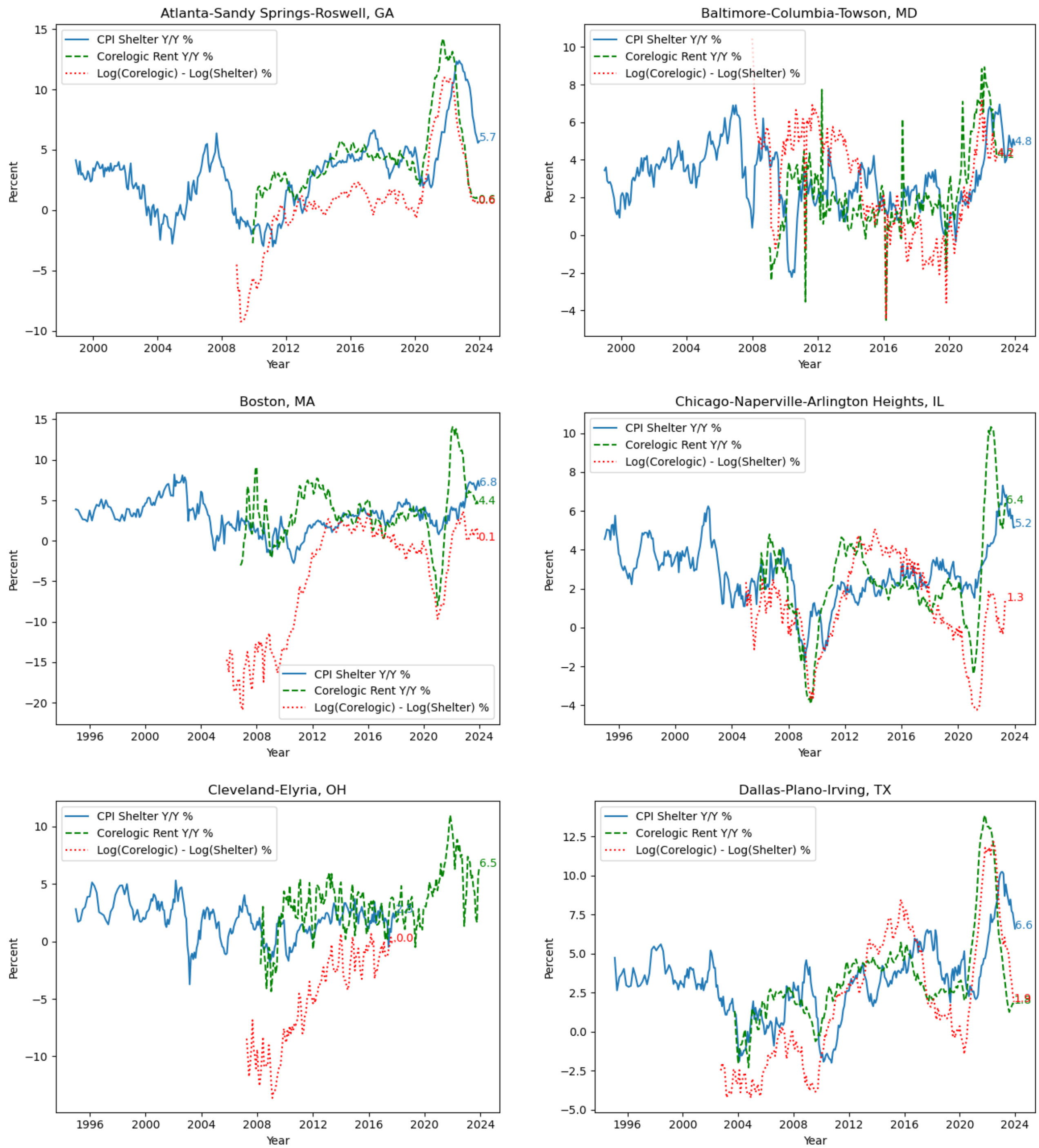
Figure A.1: CPI-shelter and Market-rent Dynamics: Demeaned Error Correction



Source(s): US Bureau of Labor Statistics, CoreLogic. Note(s): CPI shelter and CoreLogic rent are measured on a year-over-year basis. The error correction term (log market rent minus log CPI shelter) is demeaned.

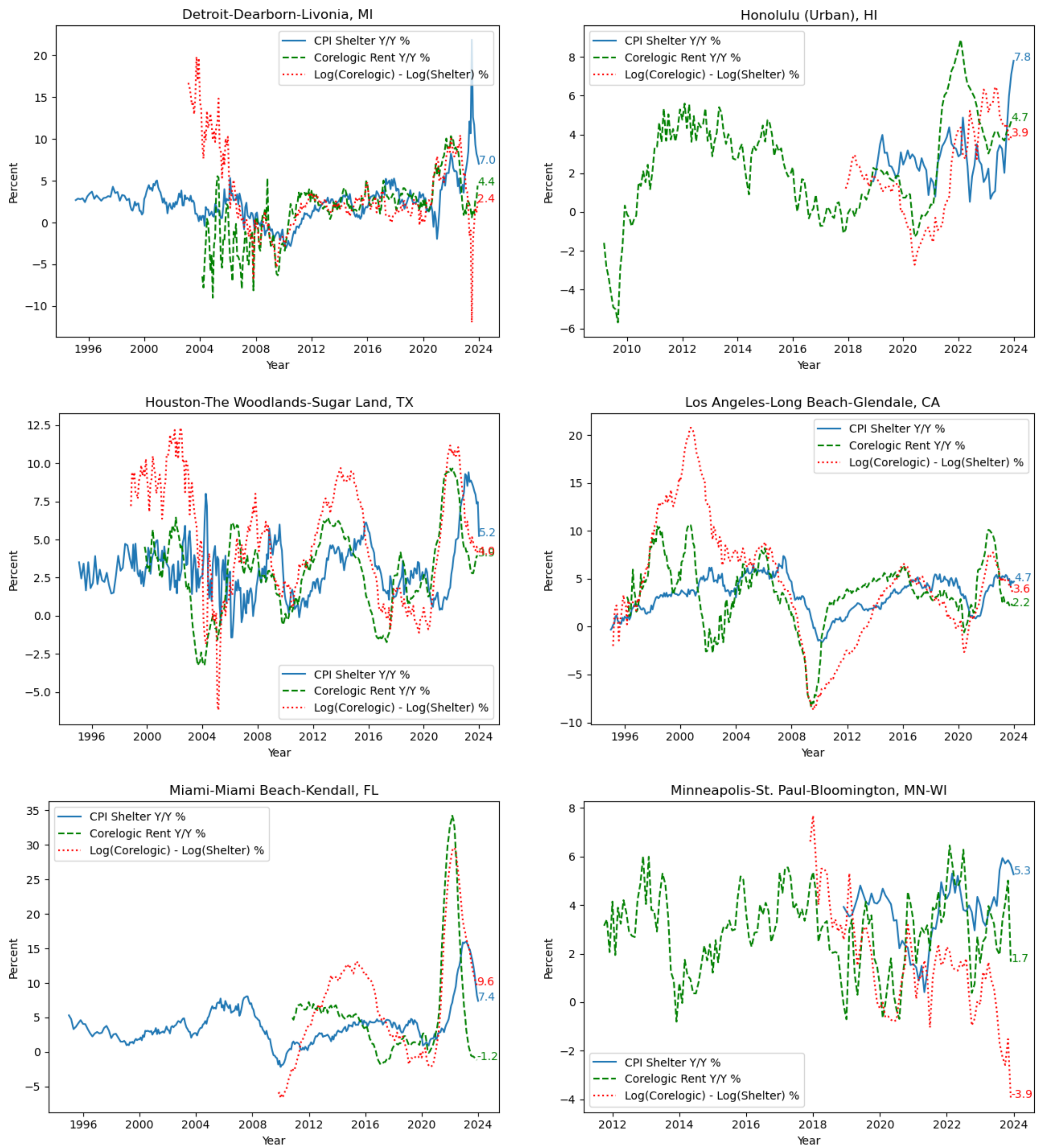
B CPI-shelter and Market-rent Dynamics: MSA Graphs

Figure B.1: CPI-shelter and Market-rent Dynamics: Atlanta–Dallas



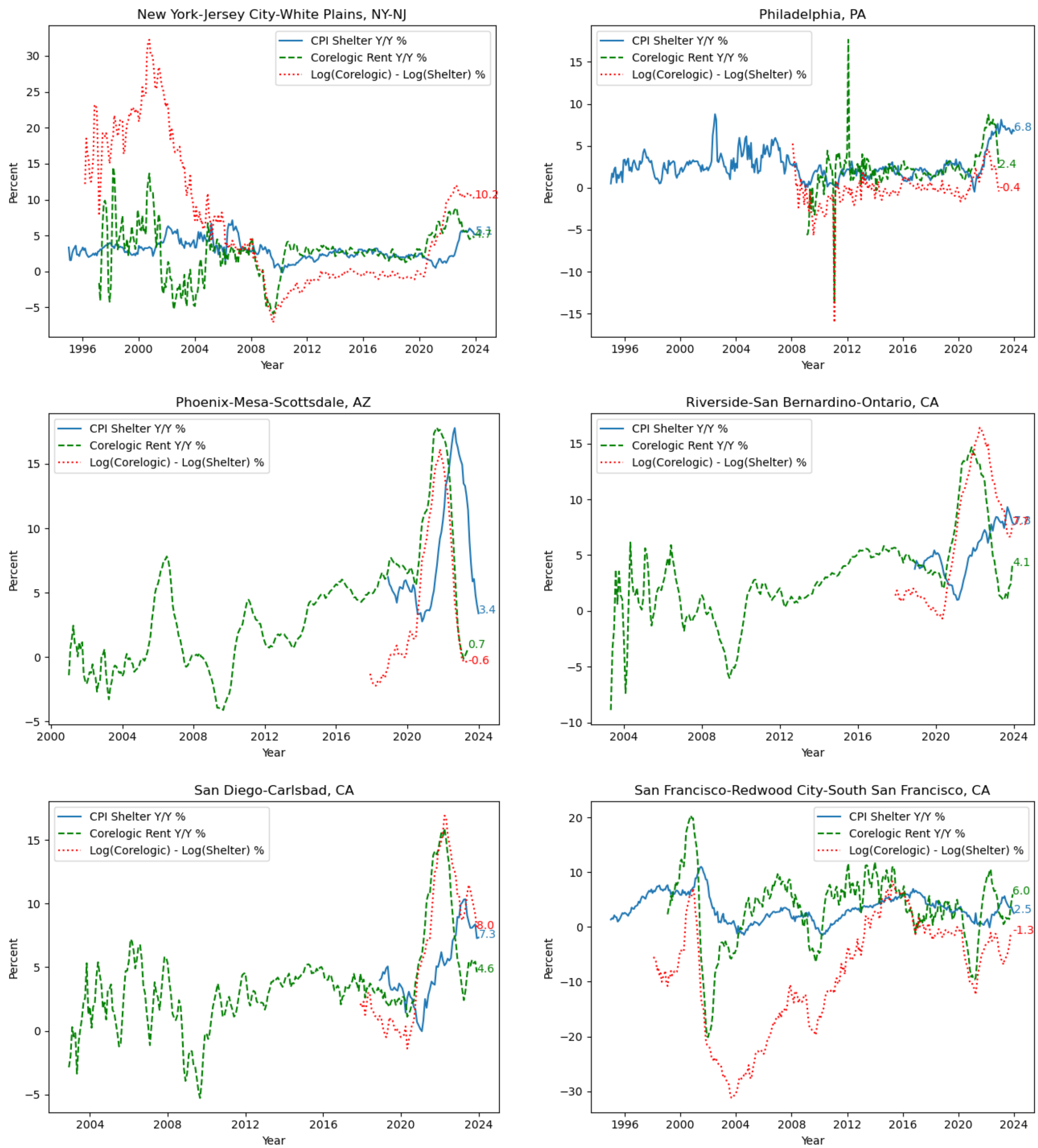
Source(s): US Bureau of Labor Statistics, CoreLogic. Note(s): CPI shelter and CoreLogic rent are measured on a year-over-year basis. The error correction term (log market rent minus log CPI shelter) is set to be zero in 2019:M12 except for Cleveland, where it is set to be zero in 2017:M12.

Figure B.2: CPI-shelter and Market-rent Dynamics: Detroit–Minneapolis



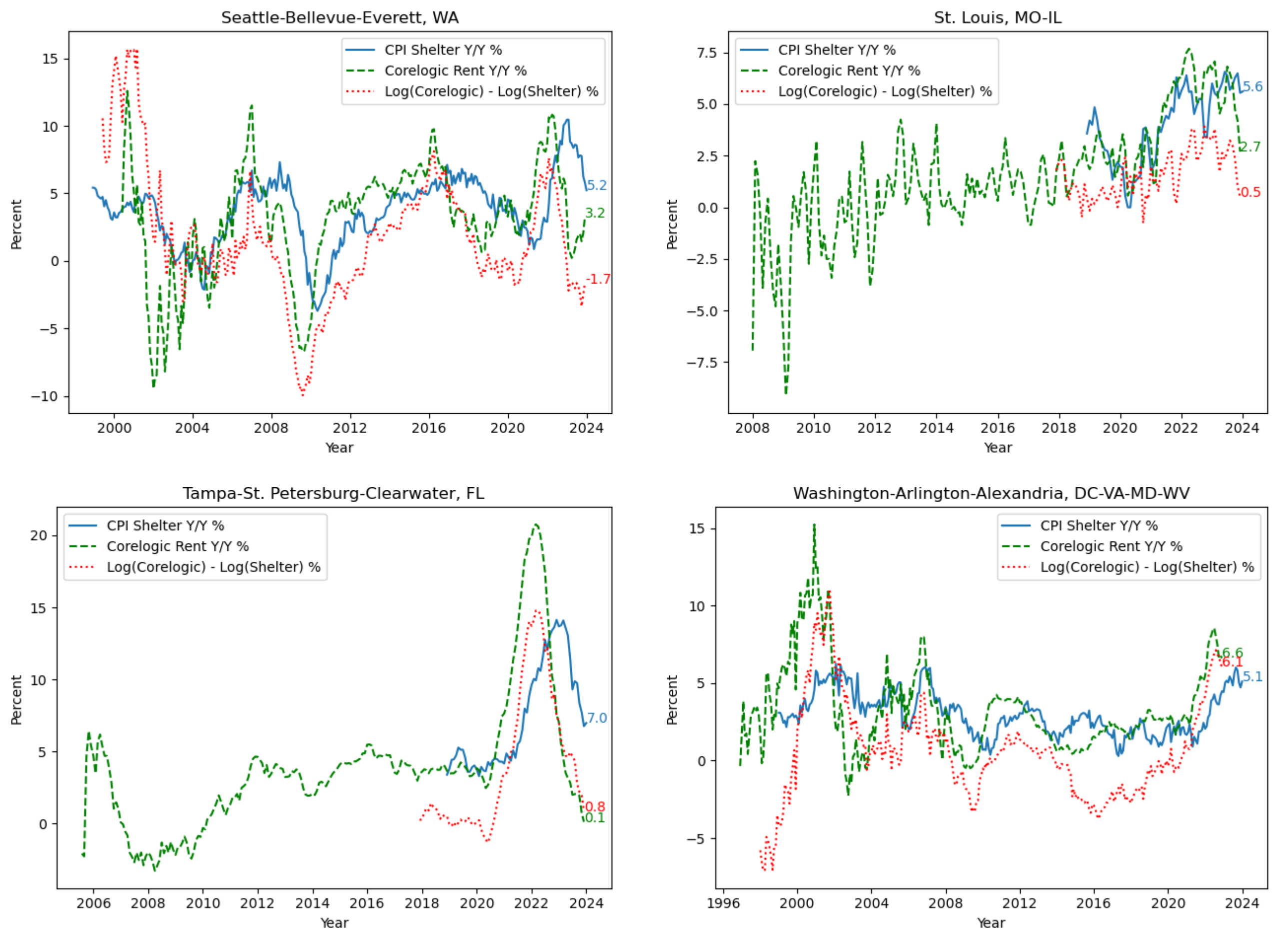
Source(s): US Bureau of Labor Statistics, CoreLogic. Note(s): CPI shelter and CoreLogic rent are measured on a year-over-year basis. The error correction term (log market rent minus log CPI shelter) is set to be zero in 2019:M12.

Figure B.3: CPI-shelter and Market-rent Dynamics: New York–San Francisco



Source(s): US Bureau of Labor Statistics, CoreLogic. Note(s): CPI shelter and CoreLogic rent are measured on a year-over-year basis. The error correction term (log market rent minus log CPI shelter) is set to be zero in 2019:M12.

Figure B.4: CPI-shelter and Market-rent Dynamics: Seattle–Washington, DC



Source(s): US Bureau of Labor Statistics, CoreLogic. Note(s): CPI shelter and CoreLogic rent are measured on a year-over-year basis. The error correction term (log market rent minus log CPI shelter) is set to be zero in 2019:M12.

C Robustness Checks for Main Specification

Table C.1: Robustness Checks Summary: Response of CPI Shelter

Months Ahead (m)	1	3	6	12	24	48	72
A. Baseline	0.023***	0.058***	0.093***	0.156***	0.279***	0.366***	0.430***
B. No Time Dummies/Lag Controls	0.023***	0.060***	0.100***	0.174***	0.343***	0.566***	0.579***
C. No Lag Controls	0.022***	0.061***	0.108***	0.186***	0.326***	0.424***	0.465***
D. No Market Rent Controls	0.022***	0.059***	0.101***	0.170***	0.281***	0.345***	0.413***
E. No CPI Controls	0.025***	0.060***	0.099***	0.164***	0.306***	0.421***	0.470***
F. 2 Year Lags	0.024***	0.060***	0.096***	0.147***	0.270***	0.381***	0.496***
G. MSAs Beginning A-I	0.028***	0.071***	0.108***	0.183***	0.313***	0.212***	0.231***
H. MSAs Beginning J-Z	0.020***	0.048***	0.083***	0.147***	0.285***	0.508***	0.634***
I. 2004–2009	0.041***	0.097***	0.143***	0.238***	0.382***	0.389***	0.420***
J. 2010–2019	0.028***	0.072***	0.127***	0.188***	0.294***	0.283***	0.443***
K. 2000–2019	0.014***	0.035***	0.059***	0.101***	0.199***	0.398***	0.563***
L. Detrended Error Correction	0.024***	0.062***	0.100***	0.172***	0.307***	0.382***	0.421***
M. 2000–2019 + Detrended Error	0.019***	0.049***	0.083***	0.140***	0.257***	0.443***	0.570***
N. 2004–2023	0.024***	0.060***	0.094***	0.153***	0.218***	0.214**	0.213**
O. CPI Rent	0.013***	0.040***	0.075***	0.132***	0.234***	0.320***	0.452***
P. CPI Owners' Equivalent Rent	0.013***	0.042***	0.086***	0.164***	0.282***	0.360***	0.391***

Source(s): US Bureau of Labor Statistics, CoreLogic, Zillow. Note(s): Coefficients from a regression of the change in the log of CPI shelter from month t to month $t+m$ on the change in the logs of market rent and CPI shelter at time t. The first row is the same as the first panel of Table 2. *, **, and *** represent < 0.05, < 0.01, and < 0.001 significance, respectively, under Driscoll-Kraay standard errors.

Table C.2: Robustness Checks Summary: Response of Market Rent

Months Ahead (m)	1	3	6	12	24	48	72
A. Baseline	-0.012*	-0.026*	-0.037*	-0.091**	-0.235***	-0.445***	-0.454***
B. No Time Dummies/Lag Controls	-0.005	-0.011	-0.014	-0.041	-0.098	-0.246*	-0.427***
C. No Lag Controls	-0.013^{+}	-0.024^{+}	-0.016	-0.046	-0.171***	-0.404***	-0.496***
D. No Market Rent Controls	-0.010^{+}	-0.024^{+}	-0.040*	-0.102**	-0.259***	-0.477***	-0.479***
E. No CPI Controls	-0.016^{+}	-0.032*	-0.020	-0.051	-0.174***	-0.396***	-0.478***
F. 2 Year Lags	-0.018*	-0.044**	-0.056*	-0.105*	-0.209**	-0.362***	-0.336***
G. MSAs Beginning A-I	-0.017^{+}	-0.038^{+}	-0.056^{+}	-0.139*	-0.341***	-0.687***	-0.683***
H. MSAs Beginning J-Z	-0.007	-0.012	-0.016	-0.038	-0.108	-0.198^{+}	-0.185*
I. 2004–2009	-0.009	-0.019	-0.025	-0.085	-0.263***	-0.318***	-0.209***
J. 2010–2019	-0.022*	-0.051*	-0.087**	-0.224***	-0.564***	-1.086***	-0.793***
K. 2000–2019	-0.003	-0.010	-0.022	-0.066	-0.126	-0.206*	-0.293***
L. Detrended Error Correction	-0.013^{+}	-0.025	-0.042^{+}	-0.119**	-0.343***	-0.674***	-0.707***
M. 2000–2019 + Detrended Error	-0.011	-0.029	-0.061	-0.164^{+}	-0.364*	-0.555***	-0.611***
N. 2004–2023	-0.012*	-0.032*	-0.066*	-0.183**	-0.437***	-0.769***	-0.873***
O. CPI Rent	-0.013*	-0.028*	-0.047**	-0.106***	-0.265***	-0.477***	-0.454***
P. CPI Owners' Equivalent Rent	-0.013*	-0.030*	-0.047*	-0.102**	-0.253***	-0.470***	-0.477***

Source(s): US Bureau of Labor Statistics, CoreLogic, Zillow. Note(s): Coefficients from a regression of the change in the log of CoreLogic rent from month t to month $t+m$ on the change in the logs of market rent and CPI shelter at time t. The first row is the same as the second panel of Table 2. *, **, and *** represent < 0.05, < 0.01, and < 0.001 significance, respectively, under Driscoll-Kraay standard errors.

Table C.3: Alternative Specification: No Time Dummies/Lag Controls

Months Ahead (m)	1	3	6	12	24	48	72
Panel A: $\Delta_t^{t+m} Log(CPIShelter_{msa})$							
$\log(CorelogicRent_{msa,t}) - \log(CPIShelter_{msa,t})$	0.023***	0.060***	0.100***	0.174***	0.343***	0.566***	0.579***
	(0.002)	(0.006)	(0.012)	(0.019)	(0.036)	(0.070)	(0.071)
N	2540	2496	2430	2298	2111	1751	1391
R^2	0.211	0.372	0.487	0.607	0.652	0.583	0.528
Panel B: $\Delta_t^{t+m} Log(CorelogicRent_{msa})$							
$\log(CorelogicRent_{msa,t}) - \log(CPIShelter_{msa,t})$	-0.005	-0.011	-0.014	-0.041	-0.098	-0.246*	-0.427***
	(0.005)	(0.013)	(0.020)	(0.043)	(0.094)	(0.104)	(0.066)
N	2540	2496	2430	2298	2111	1751	1391
R^2	0.109	0.196	0.233	0.274	0.313	0.459	0.626
Panel C: $\Delta_t^{t+m}(Log(CorelogicRent_{msa}) - Log(CPIShelter_{msa})$							
$\log(CorelogicRent_{msa,t}) - \log(CPIShelter_{msa,t})$	-0.029***	-0.070***	-0.114***	-0.215***	-0.441***	-0.812***	-1.006***
	(0.006)	(0.014)	(0.023)	(0.043)	(0.075)	(0.066)	(0.052)
N	2540	2496	2430	2298	2111	1751	1391
R^2	0.156	0.256	0.276	0.338	0.514	0.733	0.852
Controls (same across panels)							
CPI Shelter 12 Lags	*	*	*	*	*	*	*
Corelogic Rent 12 Lags	*	*	*	*	*	*	*
MSA Fixed Effects	*	*	*	*	*	*	*

Source(s): BLS, CoreLogic. Note(s): Driscoll-Kraay standard errors. *, **, and *** represent < 0.05, < 0.01, and < 0.001 significance, respectively. Similar to Table 2 except that I exclude time fixed effects, lag market rent controls, and lag CPI shelter controls.

Table C.4: Alternative Specification: No Lag Controls

Months Ahead (m)	1	3	6	12	24	48	72
Panel A: $\Delta_t^{t+m} Log(CPIShelter_{msa})$							
$\log(CorelogicRent_{msa,t}) - \log(CPIShelter_{msa,t})$	0.022***	0.061***	0.108***	0.186***	0.326***	0.424***	0.465***
	(0.002)	(0.006)	(0.009)	(0.011)	(0.014)	(0.022)	(0.027)
N	2710	2666	2600	2468	2204	1837	1477
R^2	0.208	0.345	0.479	0.669	0.749	0.774	0.775
Panel B: $\Delta_t^{t+m} Log(CorelogicRent_{msa})$							
$\log(CorelogicRent_{msa,t}) - \log(CPIShelter_{msa,t})$	-0.013$^+$	-0.024$^+$	-0.016	-0.046	-0.171***	-0.404***	-0.496***
	(0.007)	(0.014)	(0.020)	(0.030)	(0.041)	(0.052)	(0.071)
N	2710	2666	2600	2468	2204	1837	1477
R^2	0.123	0.215	0.375	0.496	0.591	0.705	0.801
Panel C: $\Delta_t^{t+m}(Log(CorelogicRent_{msa}) - Log(CPIShelter_{msa})$							
$\log(CorelogicRent_{msa,t}) - \log(CPIShelter_{msa,t})$	-0.035***	-0.086***	-0.125***	-0.232***	-0.497***	-0.828***	-0.961***
	(0.008)	(0.016)	(0.023)	(0.035)	(0.042)	(0.050)	(0.061)
N	2710	2666	2600	2468	2204	1837	1477
R^2	0.153	0.260	0.400	0.570	0.721	0.858	0.911
Controls (same across panels)							
MSA Fixed Effects	*	*	*	*	*	*	*
Time Fixed Effects	*	*	*	*	*	*	*

Source(s): BLS, CoreLogic. Note(s): Driscoll-Kraay standard errors. *, **, and *** represent < 0.05, < 0.01, and < 0.001 significance, respectively. Similar to Table 2 except that I exclude lag market rent and lag CPI shelter controls.

Table C.5: Alternative Specification: No Market Rent Controls

Months Ahead (m)	1	3	6	12	24	48	72
Panel A: $\Delta_t^{t+m} Log(CPIShelter_{msa})$							
$\log(CorelogicRent_{msa,t}) - \log(CPIShelter_{msa,t})$	0.022***	0.059***	0.101***	0.170***	0.281***	0.345***	0.413***
	(0.003)	(0.006)	(0.010)	(0.011)	(0.012)	(0.025)	(0.031)
N	2624	2580	2514	2382	2118	1751	1391
R^2	0.221	0.361	0.497	0.691	0.780	0.801	0.789
Panel B: $\Delta_t^{t+m} Log(CorelogicRent_{msa})$							
$\log(CorelogicRent_{msa,t}) - \log(CPIShelter_{msa,t})$	-0.010$^+$	-0.024$^+$	-0.040*	-0.102**	-0.259***	-0.477***	-0.479***
	(0.006)	(0.013)	(0.019)	(0.034)	(0.046)	(0.064)	(0.070)
N	2624	2580	2514	2382	2118	1751	1391
R^2	0.211	0.352	0.459	0.570	0.645	0.727	0.808
Panel C: $\Delta_t^{t+m}(Log(CorelogicRent_{msa}) - Log(CPIShelter_{msa})$							
$\log(CorelogicRent_{msa,t}) - \log(CPIShelter_{msa,t})$	-0.032***	-0.083***	-0.141***	-0.273***	-0.540***	-0.822***	-0.891***
	(0.007)	(0.017)	(0.025)	(0.040)	(0.045)	(0.056)	(0.064)
N	2624	2580	2514	2382	2118	1751	1391
R^2	0.226	0.360	0.458	0.609	0.733	0.861	0.914
Controls (same across panels)							
Corelogic Rent 12 Lags	*	*	*	*	*	*	*
MSA Fixed Effects	*	*	*	*	*	*	*
Time Fixed Effects	*	*	*	*	*	*	*

Source(s): BLS, CoreLogic. Note(s): Driscoll-Kraay standard errors. *, **, and *** represent < 0.05, < 0.01, and < 0.001 significance, respectively. Similar to Table 2 except that I exclude lag market rent controls.

Table C.6: Alternative Specification: No CPI Controls

Months Ahead (m)	1	3	6	12	24	48	72
Panel A: $\Delta_t^{t+m} Log(CPIShelter_{msa})$							
$\log(CorelogicRent_{msa,t}) - \log(CPIShelter_{msa,t})$	0.025***	0.060***	0.099***	0.164***	0.306***	0.421***	0.470***
	(0.003)	(0.006)	(0.011)	(0.017)	(0.024)	(0.034)	(0.032)
N	2626	2582	2516	2384	2197	1837	1477
R^2	0.304	0.466	0.570	0.671	0.750	0.774	0.776
Panel B: $\Delta_t^{t+m} Log(CorelogicRent_{msa})$							
$\log(CorelogicRent_{msa,t}) - \log(CPIShelter_{msa,t})$	-0.016$^+$	-0.032*	-0.020	-0.051	-0.174***	-0.396***	-0.478***
	(0.009)	(0.015)	(0.022)	(0.031)	(0.043)	(0.066)	(0.055)
N	2626	2582	2516	2384	2197	1837	1477
R^2	0.130	0.220	0.373	0.490	0.592	0.705	0.802
Panel C: $\Delta_t^{t+m}(Log(CorelogicRent_{msa}) - Log(CPIShelter_{msa})$							
$\log(CorelogicRent_{msa,t}) - \log(CPIShelter_{msa,t})$	-0.041***	-0.092***	-0.119***	-0.215***	-0.480***	-0.816***	-0.948***
	(0.009)	(0.016)	(0.023)	(0.033)	(0.038)	(0.051)	(0.052)
N	2626	2582	2516	2384	2197	1837	1477
R^2	0.207	0.336	0.463	0.572	0.723	0.858	0.911
Controls (same across panels)							
CPI Shelter 12 Lags	*	*	*	*	*	*	*
MSA Fixed Effects	*	*	*	*	*	*	*
Time Fixed Effects	*	*	*	*	*	*	*

Source(s): BLS, CoreLogic. Note(s): Driscoll-Kraay standard errors. *, **, and *** represent < 0.05, < 0.01, and < 0.001 significance, respectively. Similar to Table 2 except that I exclude lag CPI shelter controls.

Table C.7: Alternative Specification: Two-Year Lags

Months Ahead (m)	1	3	6	12	24	48	72
Panel A: $\Delta_t^{t+m} Log(CPIShelter_{msa})$							
$\log(CorelogicRent_{msa,t}) - \log(CPIShelter_{msa,t})$	0.024***	0.060***	0.096***	0.147***	0.270***	0.381***	0.496***
	(0.002)	(0.005)	(0.009)	(0.018)	(0.033)	(0.056)	(0.076)
N	2351	2321	2276	2186	2006	1646	1286
R^2	0.234	0.378	0.508	0.710	0.802	0.823	0.809
Panel B: $\Delta_t^{t+m} Log(CorelogicRent_{msa})$							
$\log(CorelogicRent_{msa,t}) - \log(CPIShelter_{msa,t})$	-0.018*	-0.044**	-0.056*	-0.105*	-0.209**	-0.362***	-0.336***
	(0.007)	(0.014)	(0.022)	(0.041)	(0.075)	(0.094)	(0.094)
N	2351	2321	2276	2186	2006	1646	1286
R^2	0.135	0.249	0.425	0.564	0.665	0.745	0.809
Panel C: $\Delta_t^{t+m} (Log(CorelogicRent_{msa}) - Log(CPIShelter_{msa})$							
$\log(CorelogicRent_{msa,t}) - \log(CPIShelter_{msa,t})$	-0.041***	-0.104***	-0.152***	-0.252***	-0.479***	-0.743***	-0.832***
	(0.008)	(0.015)	(0.022)	(0.039)	(0.057)	(0.060)	(0.052)
N	2351	2321	2276	2186	2006	1646	1286
R^2	0.169	0.288	0.427	0.594	0.734	0.865	0.911
Controls (same across panels)							
CPI Shelter 2 Year Lags	*	*	*	*	*	*	*
Corelogic Rent 2 Year Lags	*	*	*	*	*	*	*
MSA Fixed Effects	*	*	*	*	*	*	*
Time Fixed Effects	*	*	*	*	*	*	*

Source(s): BLS, CoreLogic. Note(s): Driscoll-Kraay standard errors. *, **, and *** represent < 0.05, < 0.01, and < 0.001 significance, respectively. Similar to Table 2 except that I include 2 annual lags for market rent and CPI shelter, that is, the change for 0–12 and 12–24 months ago.

Table C.8: Alternative Specification: MSAs Beginning A through I

Months Ahead (m)	1	3	6	12	24	48	72
Panel A: $\Delta_t^{t+m} Log(CPIShelter_{msa})$							
$\log(CorelogicRent_{msa,t}) - \log(CPIShelter_{msa,t})$	0.028***	0.071***	0.108***	0.183***	0.313***	0.212***	0.231***
	(0.008)	(0.017)	(0.023)	(0.026)	(0.029)	(0.059)	(0.068)
N	1274	1256	1229	1175	1078	886	694
R^2	0.406	0.519	0.608	0.669	0.783	0.848	0.893
Panel B: $\Delta_t^{t+m} Log(CorelogicRent_{msa})$							
$\log(CorelogicRent_{msa,t}) - \log(CPIShelter_{msa,t})$	-0.017$^+$	-0.038$^+$	-0.056$^+$	-0.139*	-0.341***	-0.687***	-0.683***
	(0.009)	(0.022)	(0.030)	(0.058)	(0.093)	(0.099)	(0.105)
N	1274	1256	1229	1175	1078	886	694
R^2	0.347	0.445	0.481	0.548	0.659	0.796	0.876
Panel C: $\Delta_t^{t+m} (Log(CorelogicRent_{msa}) - Log(CPIShelter_{msa})$							
$\log(CorelogicRent_{msa,t}) - \log(CPIShelter_{msa,t})$	-0.045***	-0.110***	-0.164***	-0.321***	-0.654***	-0.899***	-0.914***
	(0.011)	(0.025)	(0.040)	(0.064)	(0.097)	(0.070)	(0.058)
N	1274	1256	1229	1175	1078	886	694
R^2	0.391	0.504	0.544	0.624	0.778	0.919	0.953
Controls (same across panels)							
CPI Shelter 12 Lags	*	*	*	*	*	*	*
Corelogic Rent 12 Lags	*	*	*	*	*	*	*
MSA Fixed Effects	*	*	*	*	*	*	*
Time Fixed Effects	*	*	*	*	*	*	*

Source(s): BLS, CoreLogic. Note(s): Driscoll-Kraay standard errors. *, **, and *** represent < 0.05, < 0.01, and < 0.001 significance, respectively. Similar to Table 2 except that I only consider MSAs with names beginning A–I.

Table C.9: Alternative Specification: MSAs Beginning J through Z

Months Ahead (m)	1	3	6	12	24	48	72
Panel A: $\Delta_t^{t+m} Log(CPIShelter_{msa})$							
$\log(CorelogicRent_{msa,t}) - \log(CPIShelter_{msa,t})$	0.020***	0.048***	0.083***	0.147***	0.285***	0.508***	0.634***
	(0.003)	(0.009)	(0.017)	(0.030)	(0.047)	(0.068)	(0.063)
N	1266	1240	1201	1123	1033	865	697
R^2	0.412	0.569	0.662	0.794	0.862	0.837	0.759
Panel B: $\Delta_t^{t+m} Log(CorelogicRent_{msa})$							
$\log(CorelogicRent_{msa,t}) - \log(CPIShelter_{msa,t})$	-0.007	-0.012	-0.016	-0.038	-0.108	-0.198$^+$	-0.185*
	(0.009)	(0.017)	(0.023)	(0.045)	(0.081)	(0.119)	(0.093)
N	1266	1240	1201	1123	1033	865	697
R^2	0.308	0.453	0.590	0.688	0.743	0.751	0.801
Panel C: $\Delta_t^{t+m}(Log(CorelogicRent_{msa}) - Log(CPIShelter_{msa}))$							
$\log(CorelogicRent_{msa,t}) - \log(CPIShelter_{msa,t})$	-0.027**	-0.060**	-0.099***	-0.185***	-0.393***	-0.706***	-0.818***
	(0.009)	(0.019)	(0.028)	(0.051)	(0.082)	(0.078)	(0.066)
N	1266	1240	1201	1123	1033	865	697
R^2	0.368	0.521	0.616	0.698	0.780	0.864	0.915
Controls (same across panels)							
CPI Shelter 12 Lags	*	*	*	*	*	*	*
Corelogic Rent 12 Lags	*	*	*	*	*	*	*
MSA Fixed Effects	*	*	*	*	*	*	*
Time Fixed Effects	*	*	*	*	*	*	*

Source(s): BLS, CoreLogic. Note(s): Driscoll-Kraay standard errors. *, **, and *** represent < 0.05, < 0.01, and < 0.001 significance, respectively. Similar to Table 2 except that I only consider MSAs with names beginning J–Z.

Table C.10: Alternative Specification: 2004–2009

Months Ahead (m)	1	3	6	12	24	48	72
Panel A: $\Delta_t^{t+m} Log(CPIShelter_{msa})$							
$\log(CorelogicRent_{msa,t}) - \log(CPIShelter_{msa,t})$	0.041***	0.097***	0.143***	0.238***	0.382***	0.389***	0.420***
	(0.008)	(0.019)	(0.029)	(0.033)	(0.023)	(0.030)	(0.051)
N	705	705	705	705	705	705	705
R^2	0.393	0.547	0.636	0.735	0.828	0.856	0.820
Panel B: $\Delta_t^{t+m} Log(CorelogicRent_{msa})$							
$\log(CorelogicRent_{msa,t}) - \log(CPIShelter_{msa,t})$	-0.009	-0.019	-0.025	-0.085	-0.263***	-0.318***	-0.209***
	(0.011)	(0.031)	(0.040)	(0.065)	(0.070)	(0.088)	(0.041)
N	705	705	705	705	705	705	705
R^2	0.351	0.430	0.533	0.628	0.738	0.866	0.893
Panel C: $\Delta_t^{t+m}(Log(CorelogicRent_{msa}) - Log(CPIShelter_{msa}))$							
$\log(CorelogicRent_{msa,t}) - \log(CPIShelter_{msa,t})$	-0.049**	-0.115**	-0.168**	-0.323***	-0.645***	-0.707***	-0.629***
	(0.016)	(0.045)	(0.064)	(0.095)	(0.074)	(0.067)	(0.024)
N	705	705	705	705	705	705	705
R^2	0.425	0.569	0.646	0.707	0.845	0.956	0.952
Controls (same across panels)							
CPI Shelter 12 Lags	*	*	*	*	*	*	*
Corelogic Rent 12 Lags	*	*	*	*	*	*	*
MSA Fixed Effects	*	*	*	*	*	*	*
Time Fixed Effects	*	*	*	*	*	*	*

Source(s): BLS, CoreLogic. Note(s): Driscoll-Kraay standard errors. *, **, and *** represent < 0.05, < 0.01, and < 0.001 significance, respectively. Similar to Table 2 except that I only consider the 2004–2009 period.

Table C.11: Alternative Specification: 2010–2019

Months Ahead (m)	1	3	6	12	24	48	72
Panel A: $\Delta_t^{t+m} Log(CPIShelter_{msa})$							
$\log(CorelogicRent_{msa,t}) - \log(CPIShelter_{msa,t})$	0.028***	0.072***	0.127***	0.188***	0.294***	0.283***	0.443***
	(0.004)	(0.007)	(0.010)	(0.017)	(0.026)	(0.042)	(0.085)
N	1835	1791	1725	1593	1406	1046	686
R^2	0.277	0.439	0.581	0.703	0.804	0.847	0.923
Panel B: $\Delta_t^{t+m} Log(CorelogicRent_{msa})$							
$\log(CorelogicRent_{msa,t}) - \log(CPIShelter_{msa,t})$	-0.022*	-0.051*	-0.087**	-0.224***	-0.564***	-1.086***	-0.793***
	(0.010)	(0.020)	(0.032)	(0.052)	(0.086)	(0.112)	(0.086)
N	1835	1791	1725	1593	1406	1046	686
R^2	0.219	0.340	0.423	0.581	0.691	0.863	0.966
Panel C: $\Delta_t^{t+m}(Log(CorelogicRent_{msa}) - Log(CPIShelter_{msa})$							
$\log(CorelogicRent_{msa,t}) - \log(CPIShelter_{msa,t})$	-0.049***	-0.123***	-0.214***	-0.412***	-0.858***	-1.369***	-1.236***
	(0.011)	(0.024)	(0.038)	(0.061)	(0.103)	(0.086)	(0.029)
N	1835	1791	1725	1593	1406	1046	686
R^2	0.228	0.357	0.462	0.638	0.785	0.923	0.962
Controls (same across panels)							
CPI Shelter 12 Lags	*	*	*	*	*	*	*
Corelogic Rent 12 Lags	*	*	*	*	*	*	*
MSA Fixed Effects	*	*	*	*	*	*	*
Time Fixed Effects	*	*	*	*	*	*	*

Source(s): BLS, CoreLogic. Note(s): Driscoll-Kraay standard errors. *, **, and *** represent < 0.05, < 0.01, and < 0.001 significance, respectively. Similar to Table 2 except that I only consider the 2010–2019 period.

Table C.12: Alternative Specification: 2000–2019

Months Ahead (m)	1	3	6	12	24	48	72
Panel A: $\Delta_t^{t+m} Log(CPIShelter_{msa})$							
$\log(CorelogicRent_{msa,t}) - \log(CPIShelter_{msa,t})$	0.014***	0.035***	0.059***	0.101***	0.199***	0.398***	0.563***
	(0.002)	(0.007)	(0.011)	(0.018)	(0.038)	(0.072)	(0.074)
N	2931	2887	2821	2689	2502	2142	1782
R^2	0.207	0.362	0.461	0.575	0.579	0.508	0.539
Panel B: $\Delta_t^{t+m} Log(CorelogicRent_{msa})$							
$\log(CorelogicRent_{msa,t}) - \log(CPIShelter_{msa,t})$	-0.003	-0.010	-0.022	-0.066	-0.126	-0.206*	-0.293***
	(0.004)	(0.011)	(0.019)	(0.043)	(0.090)	(0.095)	(0.070)
N	2931	2887	2821	2689	2502	2142	1782
R^2	0.099	0.167	0.190	0.172	0.205	0.334	0.479
Panel C: $\Delta_t^{t+m}(Log(CorelogicRent_{msa}) - Log(CPIShelter_{msa})$							
$\log(CorelogicRent_{msa,t}) - \log(CPIShelter_{msa,t})$	-0.017***	-0.045***	-0.082***	-0.167***	-0.324***	-0.605***	-0.855***
	(0.005)	(0.012)	(0.021)	(0.041)	(0.074)	(0.057)	(0.045)
N	2931	2887	2821	2689	2502	2142	1782
R^2	0.128	0.200	0.212	0.242	0.399	0.634	0.787
Controls (same across panels)							
CPI Shelter 12 Lags	*	*	*	*	*	*	*
Corelogic Rent 12 Lags	*	*	*	*	*	*	*
MSA Fixed Effects	*	*	*	*	*	*	*

Source(s): BLS, CoreLogic. Note(s): Driscoll-Kraay standard errors. *, **, and *** represent < 0.05, < 0.01, and < 0.001 significance, respectively. Similar to Table 2 except that I consider the data for 2000–2019.

Table C.13: Alternative Specification: Detrended Error Correction

Months Ahead (m)	1	3	6	12	24	48	72
Panel A: $\Delta_t^{t+m} Log(CPIShelter_{msa})$							
$\log(CorelogicRent_{msa,t}) - \log(CPIShelter_{msa,t})$	0.024***	0.062***	0.100***	0.172***	0.307***	0.382***	0.421***
	(0.004)	(0.010)	(0.016)	(0.025)	(0.039)	(0.057)	(0.065)
N	2540	2496	2430	2298	2111	1751	1391
R^2	0.311	0.466	0.566	0.672	0.756	0.783	0.771
Panel B: $\Delta_t^{t+m} Log(CorelogicRent_{msa})$							
$\log(CorelogicRent_{msa,t}) - \log(CPIShelter_{msa,t})$	-0.013$^+$	-0.025	-0.042$^+$	-0.119**	-0.343***	-0.674***	-0.707***
	(0.008)	(0.017)	(0.024)	(0.042)	(0.063)	(0.088)	(0.097)
N	2540	2496	2430	2298	2111	1751	1391
R^2	0.219	0.357	0.458	0.567	0.655	0.745	0.821
Panel C: $\Delta_t^{t+m} (Log(CorelogicRent_{msa}) - Log(CPIShelter_{msa})$							
$\log(CorelogicRent_{msa,t}) - \log(CPIShelter_{msa,t})$	-0.037***	-0.087***	-0.143***	-0.290***	-0.650***	-1.056***	-1.128***
	(0.009)	(0.020)	(0.030)	(0.046)	(0.048)	(0.062)	(0.095)
N	2540	2496	2430	2298	2111	1751	1391
R^2	0.278	0.423	0.502	0.602	0.730	0.860	0.907
Controls (same across panels)							
CPI Shelter 12 Lags	*	*	*	*	*	*	*
Corelogic Rent 12 Lags	*	*	*	*	*	*	*
MSA Fixed Effects	*	*	*	*	*	*	*
Time Fixed Effects	*	*	*	*	*	*	*

Source(s): BLS, CoreLogic. Note(s): Driscoll-Kraay standard errors. *, **, and *** represent < 0.05, < 0.01, and < 0.001 significance, respectively. Similar to Table 2 except that I use the detrended error correction term. To detrend the error correction term, I regress it on a time trend by MSA.

Table C.14: Alternative Specification: 2000–2019 + Detrended Error

Months Ahead (m)	1	3	6	12	24	48	72
Panel A: $\Delta_t^{t+m} Log(CPIShelter_{msa})$							
$\log(CorelogicRent_{msa,t}) - \log(CPIShelter_{msa,t})$	0.019***	0.049***	0.083***	0.140***	0.257***	0.443***	0.570***
	(0.003)	(0.008)	(0.014)	(0.022)	(0.057)	(0.117)	(0.115)
N	2931	2887	2821	2689	2502	2142	1782
R^2	0.209	0.367	0.469	0.582	0.577	0.476	0.488
Panel B: $\Delta_t^{t+m} Log(CorelogicRent_{msa})$							
$\log(CorelogicRent_{msa,t}) - \log(CPIShelter_{msa,t})$	-0.011	-0.029	-0.061	-0.164$^+$	-0.364*	-0.555***	-0.611***
	(0.008)	(0.022)	(0.040)	(0.087)	(0.151)	(0.154)	(0.113)
N	2931	2887	2821	2689	2502	2142	1782
R^2	0.100	0.171	0.199	0.195	0.253	0.390	0.527
Panel C: $\Delta_t^{t+m} (Log(CorelogicRent_{msa}) - Log(CPIShelter_{msa})$							
$\log(CorelogicRent_{msa,t}) - \log(CPIShelter_{msa,t})$	-0.030***	-0.078***	-0.144***	-0.304***	-0.621***	-0.998***	-1.181***
	(0.009)	(0.022)	(0.040)	(0.077)	(0.104)	(0.066)	(0.065)
N	2931	2887	2821	2689	2502	2142	1782
R^2	0.134	0.213	0.236	0.290	0.492	0.730	0.845
Controls (same across panels)							
CPI Shelter 12 Lags	*	*	*	*	*	*	*
Corelogic Rent 12 Lags	*	*	*	*	*	*	*
MSA Fixed Effects	*	*	*	*	*	*	*

Source(s): BLS, CoreLogic. Note(s): Driscoll-Kraay standard errors. *, **, and *** represent < 0.05, < 0.01, and < 0.001 significance, respectively. Similar to Table 2 except that I consider the data for 2000–2019 and apply the detrended error correction term.

Table C.15: Alternative Specification: 2004–2023

Months Ahead (m)	1	3	6	12	24	48	72
Panel A: $\Delta_t^{t+m} Log(CPIShelter_{msa})$							
$\log(CorelogicRent_{msa,t}) - \log(CPIShelter_{msa,t})$	0.024***	0.060***	0.094***	0.153***	0.218***	0.214**	0.213**
	(0.004)	(0.009)	(0.012)	(0.015)	(0.030)	(0.070)	(0.077)
N	3500	3456	3390	3258	2994	2466	2021
R^2	0.283	0.484	0.637	0.785	0.811	0.777	0.757
Panel B: $\Delta_t^{t+m} Log(CorelogicRent_{msa})$							
$\log(CorelogicRent_{msa,t}) - \log(CPIShelter_{msa,t})$	-0.012*	-0.032*	-0.066*	-0.183**	-0.437***	-0.769***	-0.873***
	(0.005)	(0.013)	(0.026)	(0.060)	(0.101)	(0.128)	(0.120)
N	3500	3456	3390	3258	2994	2466	2021
R^2	0.249	0.430	0.559	0.618	0.701	0.725	0.714
Panel C: $\Delta_t^{t+m}(Log(CorelogicRent_{msa}) - Log(CPIShelter_{msa})$							
$\log(CorelogicRent_{msa,t}) - \log(CPIShelter_{msa,t})$	-0.037***	-0.092***	-0.160***	-0.336***	-0.655***	-0.983***	-1.086***
	(0.007)	(0.017)	(0.032)	(0.064)	(0.082)	(0.087)	(0.087)
N	3500	3456	3390	3258	2994	2466	2021
R^2	0.247	0.407	0.520	0.605	0.694	0.796	0.822
Controls (same across panels)							
CPI Shelter 12 Lags	*	*	*	*	*	*	*
Corelogic Rent 12 Lags	*	*	*	*	*	*	*
MSA Fixed Effects	*	*	*	*	*	*	*
Time Fixed Effects	*	*	*	*	*	*	*

Source(s): BLS, CoreLogic. Note(s): Driscoll-Kraay standard errors. *, **, and *** represent < 0.05, < 0.01, and < 0.001 significance, respectively. Similar to Table 2 except that I consider the data for 2004–2023.

Table C.16: Alternative Specification: CPI Rent

Months Ahead (m)	1	3	6	12	24	48	72
Panel A: $\Delta_t^{t+m} Log(CPIRent_{msa})$							
$\log(CorelogicRent_{msa,t}) - \log(CPIRent_{msa,t})$	0.013***	0.040***	0.075***	0.132***	0.234***	0.320***	0.452***
	(0.002)	(0.006)	(0.010)	(0.014)	(0.019)	(0.043)	(0.071)
N	2540	2496	2430	2298	2111	1751	1391
R^2	0.303	0.444	0.566	0.687	0.738	0.738	0.745
Panel B: $\Delta_t^{t+m} Log(CorelogicRent_{msa})$							
$\log(CorelogicRent_{msa,t}) - \log(CPIRent_{msa,t})$	-0.013*	-0.028*	-0.047**	-0.106***	-0.265***	-0.477***	-0.454***
	(0.005)	(0.011)	(0.017)	(0.032)	(0.051)	(0.066)	(0.086)
N	2540	2496	2430	2298	2111	1751	1391
R^2	0.214	0.357	0.461	0.566	0.646	0.728	0.808
Panel C: $\Delta_t^{t+m}(Log(CorelogicRent_{msa}) - Log(CPIRent_{msa})$							
$\log(CorelogicRent_{msa,t}) - \log(CPIRent_{msa,t})$	-0.026***	-0.068***	-0.122***	-0.238***	-0.499***	-0.797***	-0.906***
	(0.006)	(0.014)	(0.023)	(0.037)	(0.042)	(0.050)	(0.076)
N	2540	2496	2430	2298	2111	1751	1391
R^2	0.222	0.373	0.484	0.632	0.754	0.868	0.919
Controls (same across panels)							
CPI Rent 12 Lags	*	*	*	*	*	*	*
Corelogic Rent 12 Lags	*	*	*	*	*	*	*
MSA Fixed Effects	*	*	*	*	*	*	*
Time Fixed Effects	*	*	*	*	*	*	*

Source(s): BLS, CoreLogic. Note(s): Driscoll-Kraay standard errors. *, **, and *** represent < 0.05, < 0.01, and < 0.001 significance, respectively. Similar to Table 2 except that I consider CPI rent rather than CPI shelter.

Table C.17: Alternative Specification: CPI Owners' Equivalent Rent

Months Ahead (m)	1	3	6	12	24	48	72
Panel A: $\Delta_t^{t+m} Log(CPIOER_{msa})$							
$\log(CorelogicRent_{msa,t}) - \log(CPIOER_{msa,t})$	0.013***	0.042***	0.086***	0.164***	0.282***	0.360***	0.391***
	(0.002)	(0.006)	(0.012)	(0.021)	(0.024)	(0.033)	(0.039)
N	2540	2496	2430	2298	2111	1751	1391
R^2	0.324	0.456	0.530	0.656	0.755	0.791	0.781
Panel B: $\Delta_t^{t+m} Log(CorelogicRent_{msa})$							
$\log(CorelogicRent_{msa,t}) - \log(CPIOER_{msa,t})$	-0.013*	-0.030*	-0.047*	-0.102**	-0.253***	-0.470***	-0.477***
	(0.006)	(0.014)	(0.020)	(0.033)	(0.049)	(0.067)	(0.067)
N	2540	2496	2430	2298	2111	1751	1391
R^2	0.218	0.357	0.462	0.565	0.644	0.728	0.808
Panel C: $\Delta_t^{t+m}(Log(CorelogicRent_{msa}) - Log(CPIOER_{msa})$							
$\log(CorelogicRent_{msa,t}) - \log(CPIOER_{msa,t})$	-0.026***	-0.072***	-0.133***	-0.266***	-0.536***	-0.830***	-0.868***
	(0.007)	(0.016)	(0.026)	(0.041)	(0.048)	(0.054)	(0.065)
N	2540	2496	2430	2298	2111	1751	1391
R^2	0.236	0.385	0.486	0.620	0.742	0.859	0.909
Controls (same across panels)							
CPI OER 12 Lags	*	*	*	*	*	*	*
Corelogic Rent 12 Lags	*	*	*	*	*	*	*
MSA Fixed Effects	*	*	*	*	*	*	*
Time Fixed Effects	*	*	*	*	*	*	*

Source(s): BLS, CoreLogic. Note(s): Driscoll-Kraay standard errors. *, **, and *** represent < 0.05, < 0.01, and < 0.001 significance, respectively. Similar to Table 2 except that I consider CPI owners' equivalent rent rather than CPI shelter.