Appendix to New-Tenant Rent Passthrough and the Future of Rent Inflation

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Semi-Structural Model of Rent Inflation

To simulate consumer price index (CPI) tenant rent, we create a set of all possible tenure lengths that can be observed in a given month. While in theory this set is infinite, it is limited by the fact that the CoreLogic single-family rent index (SFRI) starts in January 2004, so for January 2024, the longest tenure length we can observe is 20 years.[1] However, even given current mobility rates, this covers the vast majority of rental units in the United States.

We create weights for each tenure length based on mobility rates derived from the American Community Survey (ACS). This allows us to approximate the distribution of tenure lengths in the actual rental market. For example, given a mobility rate of x percent per year, we would expect that x percent of rental-unit leases would be signed within the past year. The weight on these units is $\theta = x$. The probability of observing a lease that is one year old but less than two years old is $x*(1-x)$, which is the probability of a person's having moved last year multiplied by the probability that they did not move this year. We allow this mobility rate to vary over time so that the probability of observing a unit with tenancy length of three years in year t is $x_{t-2}(1 - x_{t-1})(1 - x_t)$.

Each tenure length is assigned a "rent" equal to the new-tenant rent index level in the month of tenure start, and this is then updated each year upon "lease renewal" to a level between its previous rent and the six-month lag of the new tenant rent, determined by the level of passthrough, ρ_t. This rent increase is calculated as follows:

$$\text{rent}_t = \text{rent}_{t-12} + \rho_t(SFRI_{t-6} - rent_{t-12}) \qquad (1)$$

This equation implies that when a lease is renewed, the new rent is the old rent plus some fraction of the gap between the old rent and the level of six-month-lagged SFRI. The six-month lag assumed in Equation 1 can account for multiple aspects of the rental market, including the time between when a lease is renegotiated and when it actually starts, the time between when rent is actually reset and when this fact becomes known to the CPI, and the time it takes for information about new-tenant rent inflation to pass through to market participants. The parameter ρ_t is the passthrough of the rent gap to continuing tenants.

Our estimation procedure for ρ is the following: In a given month, given new-tenant rent inflation, the mobility rate, CPI tenant rent inflation, and last year's simulation-based rent level, we can solve for a ρ_t that results in our year-on-year simulation-implied inflation exactly matching annual CPI tenant rent inflation.[2] Once we have solved for ρ_t, we can follow the same procedure to solve for ρ_{t+1}. However, the implied values for ρ from this process can be well above one or below zero, levels which we consider to be unrealistic since they imply that the passthrough of new-tenant rents to continuing-tenant rents can be above 100 percent or negative. We therefore bind ρ to be between

[1] Since the SFRI starts in January 2004, for February 2004 we can calculate rents for only two types of units: those for which the tenancy started in January 2004 and those for which the tenancy started in February 2004. This is clearly not representative of the national distribution of rents in the economy; however, once we reach 2018, we have a large distribution of leases that are more representative of the overall US rental market.

[2] We take Equation 2 and set it equal to annual CPI tenant rent inflation. Taking values in $t-12$ as given, the only unknown is ρ.

one and zero. We then take a three-month moving average centered on month t as our estimate of ρ_t (in the last month, we assume that ρ_{t+1} is equal to 20 percent) and rerun the simulation.

We then take the weighted average of outstanding rents in a given period as our measure of the aggregate average rent and calculate the year-over-year inflation rate as the 12-month log difference. In particular, the 12-month simulated rent inflation in any given month t is given by

$$\pi_t^{12} = \log\left(\overline{rent}_t / \overline{rent}_{t-12}\right) = \log\left[\sum_j \theta_{j,t}(rent_{j,t}) \Big/ \sum_j \theta_{j,t-12}(rent_{j,t-12})\right] \quad (2)$$

where π_t^{12} is 12-month rent inflation at time t, $rent_t$ is the average rent in time t, $\theta_{j,t}$ is the approximate probability of observing a unit with tenancy-length j at time t, and $rent_{j,t}$ is the rent level of all units of tenancy length j in time t.