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Housing Services Price Inflation

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The cost of housing services constitutes more than 30 percent of the cost of the consumer basket used to measure the consumer price index (hereafter, CPI), a major indicator of inflation in the consumer prices produced by the Bureau of Labor Statistics (BLS). Thus, understanding housing services price inflation is important for understanding the aggregate fluctuations of prices in the economy.

In this article, we provide an explanation of how inflation of the price of housing services is measured by the BLS and describe alternative approaches. We then describe the contribution of inflation of the price of housing services to inflation in the CPI during the Great Recession and its aftermath.[1] Finally, we examine new data series that provide additional information about the rental market for housing services and use this information to evaluate the direction of the pressure on housing services price inflation (hereafter, housing services inflation).

Between 2005 and 2007, housing services inflation, as measured by the CPI, was rising, while house price inflation exhibited a steep decline. Such periods, i.e., when the CPI measure of housing services inflation diverges particularly far from house price inflation, often reignite the debate about whether the CPI adequately reflects the cost of housing services.

This debate fails to recognize that the CPI program measures the price of the services provided by housing and not the price of the asset (i.e., house) itself. If the household buys the housing services in

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[1] In the analysis, we use data up through the second quarter of 2012.

the market, i.e., rents an apartment, then the rental price is the price of the services. If the household owns the housing unit that provides housing services, then the price of the flow of housing services that the household receives must be imputed because the price is not observed. Given that a majority of U.S. households own their housing, the imputation procedure is one of the main issues associated with calculating the CPI. The measure of the hypothetical rent paid by homeowners is the major component of the CPI and is called the owner's equivalent rent (OER).

This article argues that the changes in the price of housing services should not necessarily move with the changes of house prices. In particular, currently, the BLS calculates the owner's equivalent rent using a rental-equivalence approach, in which only data on rental prices are collected. Under this approach, the house prices are reflected in the CPI to the extent that they are reflected in the current rent in the ongoing rent contracts. An alternative imputation mechanism for the owner's equivalent rent is the user cost approach. The user cost approach is arguably more attractive conceptually because it explicitly treats a house as an asset. The user cost approach shows directly that the cost of housing services depends not only on the contemporaneous house prices but also on their expected change. Despite being conceptually more attractive, the user cost approach has proven hard to implement in practice.

Currently, the monthly CPI housing services inflation is measured by a repeat-rent index, which represents the monthly average of the change in the rental price of rental units over the last six months. Recently, new data on the rental housing market, which reflect month-to-month changes, have become available. Examining the series that describe month-to-month changes can help gauge the direction of changes of the CPI housing services inflation index in upcoming months. We examine the behavior of the new series on residential rents, rental vacancies, and rent concessions. The developments in the rental housing market suggest that since 2010 there has been increasing upward pressure on housing services inflation.

The remainder of the article is organized as follows. The next section describes the measurement of housing services price inflation. Section 2 summarizes the recent behavior of housing services price inflation as measured by the BLS. Section 3 examines new additional series that describe the rental housing market. Section 4 concludes.

1. ACCOUNTING FOR HOUSING SERVICES PRICE INFLATION

Current Accounting for Housing in the CPI

The CPI is a cost of living index, that is, the cost of generating a certain level of consumption for a certain time period, usually a month. The construction of the CPI views housing units as capital goods rather than as consumption items. The relevant consumption item for the CPI is shelter—the service that the housing unit provides. The CPI Shelter constitutes the major part of the CPI.

The CPI Shelter represents a weighted average of the four component indexes: (1) rent of primary residence (CPI Rent), (2) owners' equivalent rent of primary residence (CPI OER), (3) lodging away from home, and (4) tenants' and household insurance. Residential rents and OER data are collected from the CPI Housing Survey. The other two components, lodging away from home and tenants' and household insurance, are obtained from the CPI Commodities and Services Survey.

The CPI program calculates the price of the housing services of the owner-occupied housing using the rental equivalence approach. Under this approach, the cost of the shelter services provided by owner-occupied housing is the implicit rent (i.e., the amount the owner would pay for rent or would earn from renting his home in a competitive market) that is imputed from the actual rental prices collected from renters. The BLS employs the re-weighting method to the rental equivalence approach of calculating the hypothetical rents paid by homeowners. Under this method, the owners' equivalent of rent is calculated by re-weighting the rent sample to represent owner-occupied units.

Essentially, the CPI Rent and the CPI OER are the repeat-rent indexes, the information for which is collected from rental units. The idea behind the index is to obtain the price change between period t and period $t+1$ for the same rental unit, and then aggregate these price changes. The rent information in period t and in $t+1$ is collected from the same unit to ensure that recoded change in rent is because of inflation rather than the quality difference between t and $t+1$. The quality difference is an issue because it is conceivable that in the case with housing, rental or owner-occupied, there are large unmeasured differences in the quality. Each rental unit is surveyed every six months. Thus, the CPI Rent and the CPI OER define the month-to-month change in the price of housing services as the average monthly price change over the last half year. The Appendix contains details on (1)

how the data on rental prices are collected, and (2) how the data are used to construct the CPI Rent and the CPI OER.[2]

For cost efficiency, each rental unit is surveyed every six months. The CPI Rent is a weighted average of the change in the same-unit rents where the weights reflect the quality distribution of rental units. The CPI OER is a weighted average of the same rent changes (minus the cost of utilities if they are included in the rent) where the weights reflect the OER characteristics in the sample. The CPI Rent and the CPI OER define the month-to-month change in the price of housing services as the average monthly price change over the last half year.

A few additional notes are in order. First, for segments that contain largely owner-occupied housing, the CPI program selects rental units from the nearby segments. Second, for the vacant rental units, the estimated current rent is its previous rent times the average rent change of newly occupied units. Third, some rental units represent only rental units (for example, rental units under rent control), while other rental units represent only owner-occupied units. The CPI program's handling of the rental units under rent control and the differences between economic and pure rent contribute to the differences between OER and Rent indexes.

As described above, the existing CPI approach to accounting for owner-occupied housing services simply re-weights the rent sample to represent owner-occupied units. Prior to 1999, the BLS employed the matching method to the rental equivalence approach (Diewert and Nakamura 2009). Under this method, information is collected from both renter and owner samples. Then, the owner's unit is matched with a renter's unit with similar characteristics (i.e., location, structure type, age, number of rooms, type of air conditioning, and other attributes). The change in implicit rent is derived from the change in the pure rents of its matched set of renters. However, this method requires large cost associated with collecting data from both renters and owners and is no longer used.

We can identify two main problems associated with the current accounting for housing in the CPI. First, most rental contracts are long-term, and rents are sticky in the ongoing contracts. There is also considerable evidence that the rents are sticky not only within the contracts but also within the entire tenure of a renter with a particular

[2] In this section we largely follow the BLS description of the measurement of CPI inflation (see Bureau of Labor Statistics [2007, 2009)]). See Diewert and Nakamura (2009); Diewert, Nakamura, and Nakamura (2009); and Crone, Nakamura, and Voith (2010) for a description of the current measurement approach. Wolman (2011) provides an alternative inflation measure that uses a different aggregation procedure for the existing CPI components.

landlord (for example, Genesove [2003]). Thus, houses cannot likely be rented at the same price as the rental units in ongoing rent contracts. Consequently, the rents in newly signed leases, which reflect the contemporaneous house prices and rental vacancies, might better reflect the implicit rent of owner-occupied housing. Second, rental housing might not be that close a substitute for owner-occupied housing.[3] An alternative approach to calculating the rental price of owner-occupied housing, the user cost approach, explicitly recognizes that a house is a capital good and addresses some of these concerns. We discuss the user cost approach next.

User Cost Approach

The user cost approach to owner-occupied housing treats the services provided by owner-occupied dwellings differently from the services provided by rental dwellings. The user cost of housing services can be thought of as a cost to a household of purchasing a house at the beginning of the period, living in it during the period, and then selling it at the end of the period at the prevailing market price.

Kudlyak (2009) uses a similar approach to measure the firm's labor cost. Since employment relationships often last for more than one period, wage usually does not represent the period's labor cost but rather it is an installment payment on an employment contract. Kudlyak empirically constructs the user cost of labor, which is the difference between the present discounted value of wages to be paid to a worker hired in the current period and the expected present discounted value of wages to be paid to a worker hired the next period. Importantly, she finds that the user cost of labor is much more procyclical than the average wage or the wage of newly hired workers in the economy because of the effect the economic conditions at the time of hiring have on future wages within the employment relationship.

To introduce the user cost, let V_t^v denote the purchase price of a v-year durable in year t, u_t^v denote the end-of-period value of the period t services provided by this durable, O_t^v denote the operating expenses, and r_t denote the nominal interest rate. Assuming, in equilibrium, the purchase price of a durable equals the expected present discounted value of its net benefits yields the following expression for the expected user cost of housing services in period t, $E_t u_t^v$,

$$E_t u_t^v = r_t V_t^v + E_t O_t^v - (E_t V_{t+1}^{v+1} - V_t^v). \tag{1}$$

[3] Prescott (1997) provides a good description of the problems associated with defining real consumption from owner-occupied housing and medical insurance.

Equation (1) states that the expected user cost in period t equals the foregone interest rate payments, $r_t V_t^v$, the expected operating costs (maintenance plus property taxes), $E_t O_t^v$, and the expected change in the house price, $E_t V_{t+1}^{v+1} - V_t^v$, where the superscript on V_t^v takes into account depreciation. In a frictionless equilibrium with risk-neutral landlords and no transaction costs, the user cost of housing equals the rent.

An early theoretical application of the user cost approach to the measurement of the price of services of owner-occupied housing is found in Dougherty and Van Order (1982), and recent estimates of the user cost are provided by Garner and Verbrugge (2007) and Verbrugge (2008). Verbrugge (2008) calculates a one-year user cost as follows:

$$E_t u_t = P_t \left(r_t + \gamma - E_t \pi_t \right), \tag{2}$$

where P_t is the price of the house; r_t is the nominal interest rate; γ is the sum of depreciation, maintenance and repair, insurance, and property taxes (all assumed constant); and π_t is the four-quarter constant-quality home price appreciation between year t and year $t+1$.

Rewriting equation (2) shows that the change in the user cost is a function of the change in the house prices and the change in the second term, $(r_t + \gamma - E_t \pi_t)$, i.e.,

$$d \ln E_t u_t = d \ln P_t + d \ln \left(r_t + \gamma - E_t \pi_t \right). \tag{3}$$

The change in the second term, $(r_t + \gamma - E_t \pi_t)$, is governed by the movements in $(r_t - E_t \pi_t)$, which can be thought of as the real interest rate, and is less volatile the larger is the fixed cost, γ. Thus, unless expected house price changes move in sync with nominal interest rates, i.e., $d \ln \left(r_t + \gamma - E_t \pi_t \right) = 0$, the user cost, $d \ln E_t u_t$, is more volatile than house prices, $d \ln P_t$.

To calculate the user cost, Verbrugge (2008) obtains information on the current market value of the house from the Consumer Expenditure Survey. Then, he estimates the expected price change, $E_t \pi_t$, using four-quarters-ahead forecasts from the regional house price indexes. Because the period under study is characterized by a substantial house price appreciation, the second term in equation (2), $\left(r_t + \gamma - E_t \pi_t \right)$, can be negative. Thus, whenever the estimated $E_t \pi_t$ delivers negative $E_t u_t$, Verbrugge sets $E_t u_t$ to 0.

Garner and Verbrugge (2007, Figure 1) show Verbrugge's user cost series (logarithm of the levels) and the two rental series, the official CPI Rent Index, and the series constructed by Verbrugge (2008) that tracks only rental units comparable to those used in the house price indexes (i.e., detached properties) from 1980–2005. Their figure shows that there is little evidence that the user costs and rents are equivalent measures. In fact, the user costs do not exhibit a positive trend

observed in rents. After 1997, the rent series are higher than the user cost series; this suggests that owning is cheaper than renting and can explain the increase in the homeownership rates during that period. However, it also suggests the presence of non-exploited arbitrage or large transaction costs of converting owner units into rentals.

The fact that house prices were rising steadily over the period up to 2005 while the user cost shows no such trend suggests that the movements in the user cost were dominated by the movements in the second term in equation (2). As Garner and Verbrugge (2007) note, expected house price appreciation is responsible for user cost not tracking the rise in house prices. Importantly, Verbrugge (2008) notes that if instead of the forecast house price changes, $\widehat{E_t\pi_t}$, the expected CPI inflation is used, then the user cost measure is much closer to the rent index measure. Poole, Ptacek, and Verbrugge (2005) revisit the user cost approach to examine whether the user cost can reflect the rapidly rising house prices in 2005. They conclude that the user cost approach would not mirror the increase in house prices.

The literature lists the following factors that can explain possible divergence of the user costs and rents: (i) rent stickiness during the tenant's tenure with the landlord, even beyond one-year rent contracts; (ii) the thinnest of the rental market for luxury homes; and (iii) the differential tax treatments. For example, Diaz and Luengo-Prado (2008) show that a rental equivalence approach, as compared to a user cost approach, overestimates the cost of shelter services provided by owner-occupied housing because owner-occupied housing services are not taxed and mortgage interest payments are deductible.

The Bureau of Economic Analysis and the BLS attempted to develop the user cost approach in the 1980s. However, these attempts were abandoned because the researchers concluded that it was impossible to estimate the user cost without directly or indirectly using the rent information (Gillingham [1980]; see a discussion in Diewert and Nakamura [2009]). Summarizing, despite the fact that the user cost approach is (arguably) conceptually more attractive for the measurement of the price of the flow of services provided by an asset, the approach has proved hard to implement in practice.

One way to modify the expression for the user cost is to recognize that the owners usually have a mortgage on the house and distinguish between the return on equity and the mortgage interest rate in equation (1). Early implementations of the mortgage payments in the price of the housing services provided by owner-occupied housing are studied by Kearl (1979) and Gillingham (1980).

Diewert and Nakamura (2009) incorporate debt into an alternative approach that explicitly takes into account the financing of the house

purchase, which they refer to as the opportunity cost approach. They seek to compare the implications for homeowner wealth of selling the property at the beginning of a period with an alternative of planning to keep the house for m more years and then either renting or occupying for the coming year. The opportunity cost is defined as the greater of the rental opportunity cost (which is an implicit rent) and the "financial opportunity cost." Thus, there is never an issue of running into a negative financial opportunity cost.

Diewert and Nakamura specify the financial user cost of owning a home in period t as follows (abstracting from depreciation):

$$E_t u_t = r_t^D D_t + r_t \left(V_t - D_t\right) + E_t O_t^v - \left(E_t \overline{V_{t+1}} - V_t\right), \tag{4}$$

where D_t is a debt owned on the house, i.e., $V_t - D_t$ is the value of equity in the house, which is assumed to be nonnegative; $\overline{V_{t+1}}$ is the value of the home at the beginning of period $t+1$ plus the expected average appreciation of the home value over the number of years before the owner plans to sell; and r_t^D is the nominal interest on the debt owned. Note that if $r_t^D = r_t$, i.e., if the homeowners who have mortgages on their homes are charged an interest rate on their debt that equals the rate of return on their financial investments, then equation (4) reduces to the usual expression for the user cost (equation [1]) (except for the details on the definition of the $E_t\overline{V_{t+1}}$ term). Examining equation (4) shows that for a homeowner with low-cost borrowing, i.e., $r_t^D < r_t$, the user cost of owning is lower than that for a homeowner with high-cost borrowing, i.e., $r_t^D > r_t$. The financial opportunity cost component of Diewert and Nakamura can be thought of as the user cost approach with debt. To our knowledge, this version of the user cost has not been implemented empirically.

Diewert and Nakamura (2009) provide an insightful review of alternative approaches to the accounting for housing in a consumer price index. In particular, they describe an acquisitions approach and a payment approach. Under the acquisitions approach, the entire cost of a purchase of the house is charged to the period. The objective of the approach is to measure the average change in the price of a product irrespective of whether the product is fully used in the period or fully paid in the period. However, only the goods that the household sector purchases from other sectors are included. Thus, the housing-related expenditures that enter a CPI are mostly expenditures on new dwellings, while the secondhand dwellings and land are excluded. The payments approach only measures actual cash outflows associated with the owner-occupied housing: cost of repairs, maintenance, house insurance, local authority charges, and mortgage interest.

Table 1 CPI-U: City-Average Expenditure Category Relative Importance

Expenditure Category and Items	Expenditure Share, March 2012
Food and Beverages	15.11
Housing	40.59
Shelter	31.26
Rent of Primary Residence	6.49
Lodging Away from Home	0.81
Owners' Equivalent Rent of Residences	23.66
Owners' Equivalent Rent of Primary Residence	22.29
Tenants' and Household Insurance	0.34
Fuels and Utilities	5.26
Household Energy	4.10
Water and Sewer and Trash Collection Services	1.16
Household Furnishings and Operations	4.07
Apparel	3.61
Transportation	17.58
Medical Care	7.05
Recreation	6.01
Education and Communication	6.71
Other Goods and Services	3.34

Notes: Category "Other Goods and Services" includes tobacco, smoking products, and personal care.

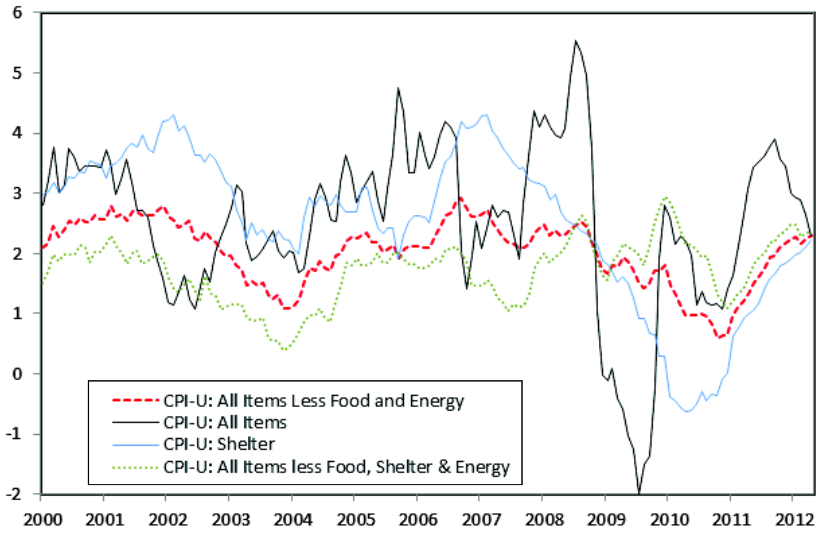
Source: BLS

2. HOUSING SERVICES PRICE INFLATION

CPI Measures of Housing Services Price Inflation and CPI Inflation

Shelter, the service that housing units provide to consumers, constitutes the major part of the consumer market basket, which is used to construct the consumer price index. Table 1 shows that in 2012 households allocated 31.3 percent of their consumption expenditures to shelter. The expenditure shares are the weights by which different component price indexes are aggregated. The CPI Shelter represents a weighted average of the four component indexes: (1) rent of primary residence (6.49 percent of the CPI); (2) owners' equivalent rent of residences (23.66 percent of the CPI, including the owners' equivalent rent of primary residence, which constitutes 22.29 percent of the CPI); (3)

Figure 1 CPI and CPI Shelter Inflation, Percent Year-Over-Year



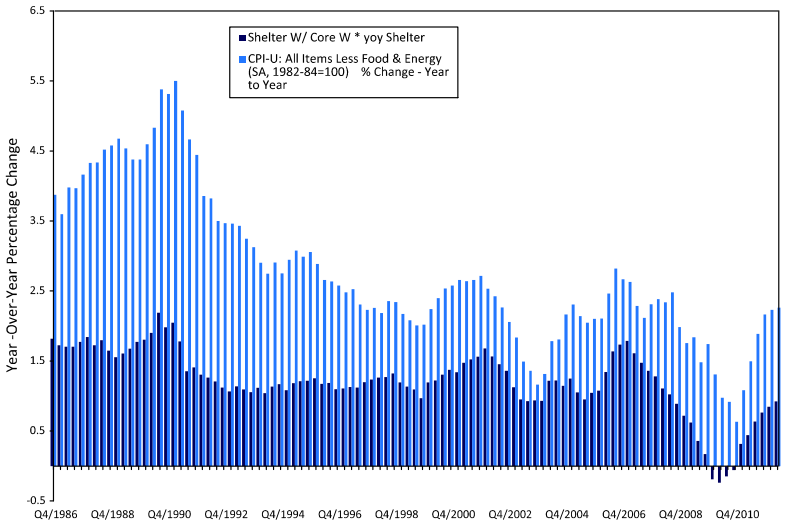
lodging away from home (0.81 percent of the CPI); and (4) tenants' and household insurance (0.34 percent of the CPI).[4]

The expenditure shares are estimated from the data reported by sampled households in the Consumer Expenditure Interview Survey, which includes both renters and homeowners, and is updated approximately every two years. Shelter is part of a larger category, housing, which also includes fuels and utilities and household furnishings and operations. "Housing" constitutes approximately 41 percent of the CPI.

From its recent peak, the first quarter of 2007, to its recent trough, the fourth quarter of 2010, CPI Shelter inflation declined from 4.3 percent to −0.44 percent (monthly, year-over-year). In April 2012, CPI Shelter inflation stood at 2.23 percent. Figure 1 shows inflation in the CPI All Items; the CPI All Items Less Food and Energy; the CPI Less Food, Energy, and Shelter; and the CPI Shelter. During 2001–2008, CPI Shelter inflation was always higher than CPI All Items Less

[4] At the beginning of 2010, the BLS moved the expenditure weight of second homes from "lodging away from home" to a new item, "owners' equivalent rent of residences," which includes secondary and primary residences, and did not revise prior data. The new series "owners' equivalent rent of residences" contain data for second homes only starting in January 2010. The series "lodging away from home" contains data on second homes up to December 2009.

Figure 2 Contribution of CPI Shelter Inflation to Core CPI Inflation, Year-Over-Year



Source: Author's calculations using BLS data.

Food and Energy Inflation (hereafter, core CPI inflation). However, from the fourth quarter of 2008 up until the first quarter of 2012, the situation is reversed: Core CPI inflation exceeds CPI Shelter inflation.

Figure 2 shows the contribution of CPI Shelter inflation to core CPI inflation calculated as a product of the CPI Shelter weight in the core CPI and its year-over-year inflation rate. The figure shows that CPI Shelter inflation contributed 1.38 percent out of 2.63 percent of core CPI inflation in the first quarter of 2007. The contribution proceeded to decline until it became negative in 2010. The contribution of CPI Shelter to core CPI inflation has been steadily increasing since then.

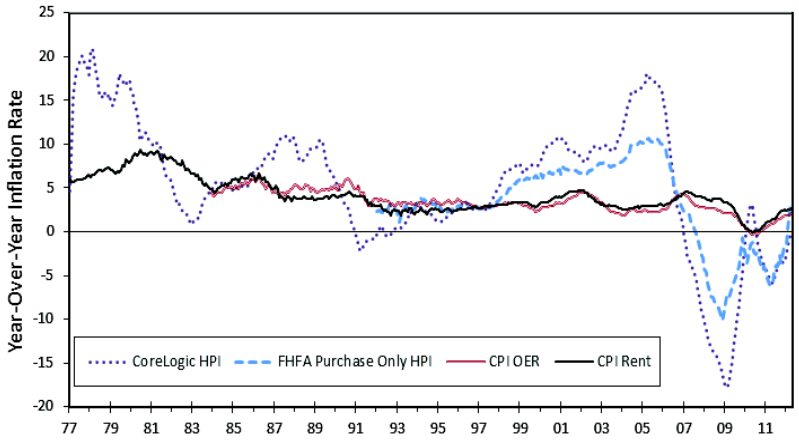
Table 2 shows the change in consumer price index inflation by major expenditure category during the Great Recession, from December 2007 to June 2009, and its aftermath, from June 2009 to April 2012.

Table 2 Change of Inflation During the Great Recession and its Aftermath, by Major Expenditure Category, Percent

Expenditure Category and Items	December 2007–June 2009	June 2009–April 2012
CPI-U: All Items	1.56	6.73
CPI-U: All Items Less Shelter	1.22	8.65
CPI-U: All Items Less Food, Shelter, and Energy	3.23	5.60
Food and Beverages	5.27	7.04
Housing	2.10	2.58
Shelter	2.25	2.78
Rent of Primary Residence	4.38	3.82
Lodging Away from Home	−8.28	7.83
Owners' Equivalent Rent of Residences	2.99	2.68
Owners' Equivalent Rent of Primary Residence	2.99	2.68
Fuels and Utilities	1.00	6.07
Household Energy	−0.74	3.53
Water and Sewer and Trash Collection Services	9.18	16.13
Household Furnishings and Operations	2.26	−2.59
Apparel	0.76	4.49
Transportation	−6.52	20.70
Medical Care	4.53	9.46
Recreation	2.29	−0.07
Education and Communication	4.97	4.73
Other Goods and Services	9.73	5.22

Notes: Author's calculations using BLS data.

Figure 3 CPI Rent Inflation, CPI OER Inflation, and House Price Inflation, Year-Over-Year



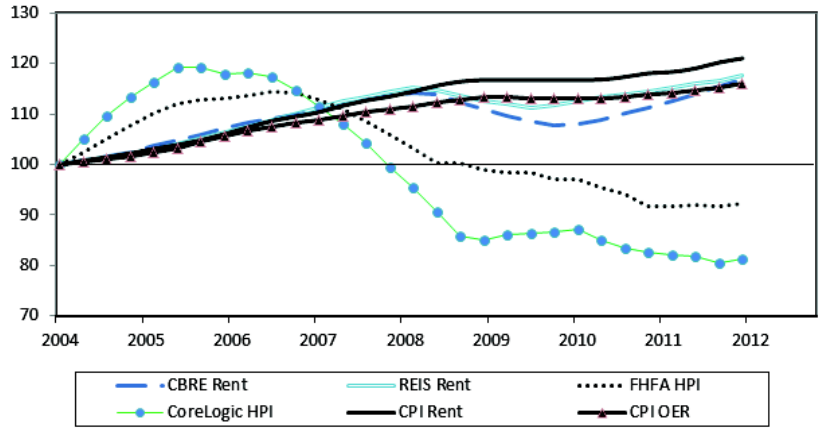
CPI Measures of Housing Services Price Inflation and House Prices

As can be seen from Table 1, the main components of the CPI Shelter are the CPI Rent of Primary Residence (CPI Rent) and the CPI Owners' Equivalent Rent of Primary Residence (CPI OER). Figure 3 shows CPI Rent inflation and CPI OER inflation along with inflation in house prices as measured by the Core Logic house price index and the Federal Housing Finance Agency Purchase Only Index (see Figure 4).

Figure 3 shows that house price inflation fluctuates significantly more than CPI Rent or CPI OER inflation. It is especially evident during 2004–2010. The figure also shows that house price inflation and inflation in the CPI measures of housing often do not move in the same direction. Between 2002 and 2004, house price inflation was rising while inflation in the CPI housing indexes was falling. During 2005–2009, when house price inflation rapidly fell from 15–20 percent in 2005 to −15 to −20 percent in 2009, CPI housing inflation was fluctuating around 4 percent and started decreasing only after 2008.

The periods when the CPI measure of inflation diverges particularly far from house price inflation often reignite a debate about whether the CPI Rent and CPI OER adequately reflect the cost of shelter. As emphasized in Section 1, it is important to recognize that the cost of

Figure 4 CPI Rent, CPI OER, and the Rent and House Price Indexes



Notes: Q1:2004 = 100.

Source: Author's calculations using BLS data.

housing services should not necessarily move with house prices. The CPI program's indexes of housing inflation measure inflation in the prices of housing services rather than inflation in house prices. Given the method that the BLS currently uses to measure the cost of the housings services of owner-occupied units, house prices are reflected in the CPI index to the extent that they are reflected in the current rent in the ongoing rent contracts (via the supply and demand of rental units and the substitution between renting and owning). Alternatively, the user cost approach to measuring the cost of owner-occupied housing shows more directly that the cost of shelter depends both on current house prices and on their expected change.

3. RECENT DEVELOPMENTS IN THE RENTAL HOUSING MARKET

As described above, the current accounting for price of housing services in the CPI almost entirely relies on the data on rental prices from rental units. In addition, the monthly price changes used for calculation of the inflation in the price of housing services is the monthly average of the price change over the last half year. Thus, a direct examination of the

recent developments in the rental market can be useful in gauging the direction of changes of housing services price inflation. Recently, new data series that describe the aggregate rental market became available. In contrast to the CPI housing services price indexes, these series reflect month-to-month changes and, thus, can serve as leading indicators of the changes in rental prices. In this section, we describe the behavior of different indicators of the rental market and the behavior of alternative measures of rent price inflation.

Additional Indicators of the Rental Market

Rent Concessions

One way to gauge the pressure on rent prices is to examine the series of discounts that landlords are willing to extend to renters. Figure 5 shows the difference between the asking rent and the effective rent as a share of asking rent obtained from Reis Inc. The larger the difference, the more concessions a landlord is willing to provide to a renter. The figure shows that the discount is at its lowest level of the last 10 years. It has declined from its peak of 6.3 percent in the second quarter of 2009 to 4.8 percent in the first quarter of 2012. Reis Inc. forecasts a further decline in concessions to 3.23 percent by 2016.

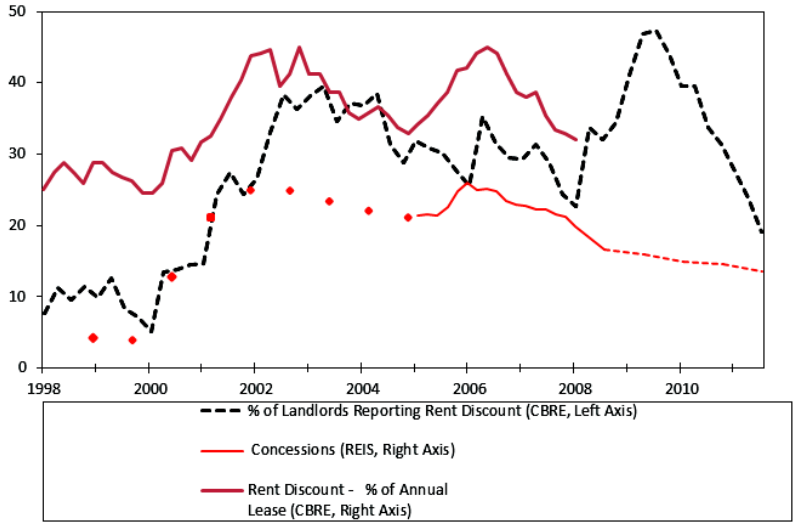
Figure 5 also shows the share of properties offering a discount and the average discount in the annual rent, the series obtained from CB Richard Ellis (hereafter, CBRE). The share of properties offering a discount has declined from approximately 47 percent in the first quarter of 2010 to 19 percent in the first quarter of 2012. The average annual discount has also been declining during this period.

Rental Vacancy Rates and Net Absorption

An alternative way to examine the direction of the pressure on the rent prices is to examine the supply of the properties available for rent. The vacancy rate for renter-occupied housing is defined as the number of vacant units for rent over the stock of vacant and occupied units for rent. Figure 6 shows the vacancy rate series from the Census, CBRE, and Reis Inc. The three series show a decline in the vacancy rates since mid-2009. In particular, Reis data show that the vacancy rate has declined from 8 percent in mid-2009 to 4.9 percent in the first quarter of 2012.

The net absorption, NA_t, as measured by Reis Inc., is the difference between the occupied stock of rental units in the current period, O_t, and in the last period, O_{t-1}, which is the difference between the number of newly signed leases and the number of leases that were terminated

Figure 5 Measures of Rent Discounts



Notes: Concessions are the ratio of the difference between asking rent and effective rent to the asking rent. Markers indicate annual observations.

Source: CBRE and Reis Inc.

and not renewed, $NA_t \equiv O_t - O_{t-1} = NR_t - TR_t$. Figure 7 shows the net absorption as a share of the previous period stock of occupied rental vacancies. As can be seen from the figure, after mid-2008 the net absorption has been positive and increasing since 2011.

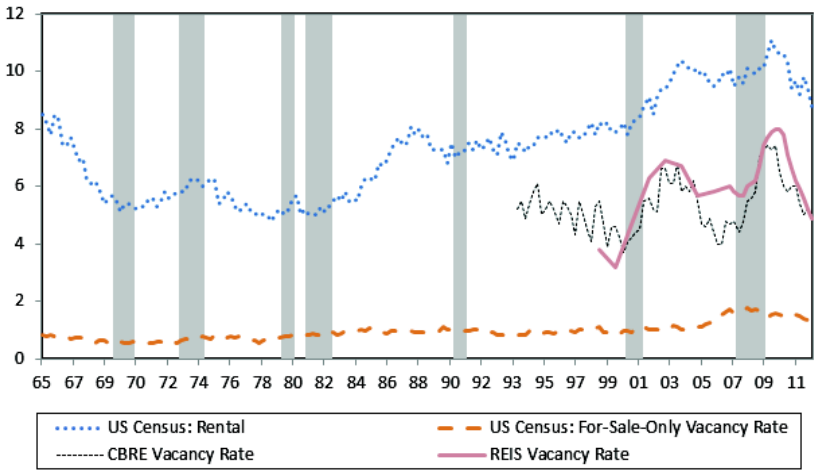
The increase in the net absorptions has been feeding into the recent rapid decline in vacancy rates. To see this, note that the evolution of the number of vacancies, v_t, can be described by the following equation

$$v_t = v_{t-1} + (NCompl_t + NConv_t) - NR_t + TR_t, \tag{5}$$

where $NCompl_t$ is the number of new completions and $NConv_t$ is the number of net conversions into the rental units.

Assuming that the change in the stock of rental properties from $t-1$ to t is negligible as compared to the change in the number of vacancies, equation (5) shows that the decrease in the vacancy rate from $t-1$ to t can be brought by a decrease in net completions, a decrease in net conversions, or by an increase in the net number of newly signed rental contracts, $(NR_t - TR_t)$. Reis Inc. predicts an increase in net completions from 39,400 properties in 2011 to 66,500

Figure 6 Rental Vacancy Rates



Source: Census Bureau, CBRE, and Reis Inc.

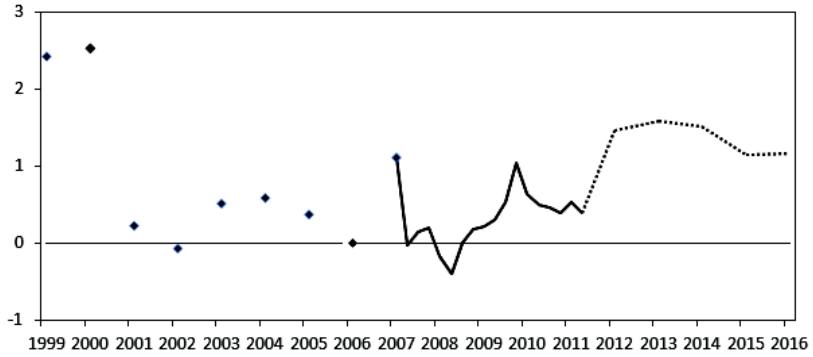
properties in 2012. Given the negligible role of net conversions, the decrease in the vacancy rent is mostly because of an increased demand for rental units.

The series of the rental vacancy rates and the rent concessions suggest that there is an upward pressure on the rent prices.

Alternative Indicators of Rent Price Inflation

There are two alternative rent indexes that measure aggregate rent inflation. The first index is the REIS Rent Index, which is provided by Reis Inc. The second index is the CBRE Rent Index, provided by CBRE. Reis Inc. collects data on the asking rent, Reis Asking rent, and on the effective rent in newly signed leases, Reis Effective rent. The rent data do not include information from the renewed leases and Reis Inc. does not collect information on the rents in ongoing lease contracts. The rent information for the CBRE Rent Index is obtained by asking the managers of the properties about what the rent would be if they were to rent a unit in the current market, regardless of whether the unit is currently occupied or vacant. Thus, the recoded information might be on the rents in ongoing contracts as well as on the

Figure 7 Net Absorptions of Rental Properties



Notes: The figure shows net absorptions as the share of the previous period stock of occupied rental units. Net absorption is the difference between the occupied stock of rental units in the current period and the occupied stock in the previous period. The figure shows annual observations prior to 2007 and quarterly observations thereafter. The dotted line indicates forecast.

Source: Reis Inc.

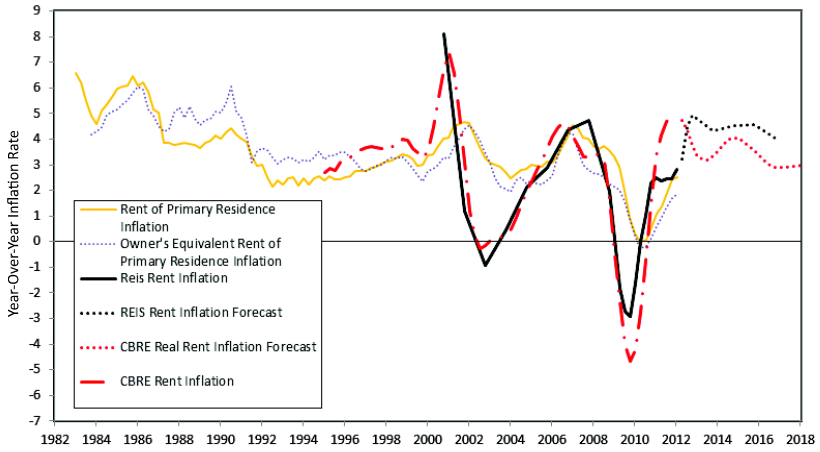
perceived effective new rents. Thus, both indexes contain information about month-to-month changes in rental prices.

The Reis Asking rent and the CBRE Rent Index both provide information on the apartment rents in the multi-housing market, with some differences in the coverage. Data from Reis Inc. cover rental complexes consisting of 40 or more units (except for California metropolitan areas, where complexes of 15 or more units are included). Data for the CBRE Rent Index cover multi-housing properties with five or more units.[5] Housing data from the U.S. Census Bureau has a much wider scope. The Census uses residential properties regardless of rent restrictions and does not have a restriction on the number of rental units. The CPI Rent also includes data on rent-controlled properties.

Figure 8 shows quarterly year-over-year inflation in the CPI Rent, the CPI OER, the Reis Effective rent, and the CBRE Rent. All four inflation series show a decline during the 2001 and 2007–2009 recessions. The figure suggests that Reis Rent Index inflation and CBRE Rent inflation appear to lead the CPI Rent and CPI OER inflation measures.

[5] This information was obtained from CBRE and Reis Inc. representatives in June 2011.

Figure 8 Rent Inflation



Source: BLS, CBRE, and Reis Inc.

A particularly striking feature of Figure 8 is that Reis Rent Index inflation and CBRE Rent inflation experienced a significantly larger drop during 2007–2009 as compared to the CPI inflation measures. Such a discrepancy between Reis Rent Index inflation or CBRE Rent inflation and the CPI housing services inflation can, at least partially, be attributed to the different time reference period of these measures. Recall from Section 1 that the CPI month-to-month housing services price inflation measure essentially represents a monthly average over the past six-month change, while Reis Rent Index inflation and CBRE Rent inflation represent month-to-month changes.

Inflation as measured by the CBRE Rent Index has been increasing from its recent trough of −4.95 percent in the fourth quarter of 2009 to 4.67 percent in the first quarter of 2012. During the same period, inflation as measured by the Reis Rent Index has increased from its trough of −2.92 percent to 2.83 percent in the first quarter of 2012. CPI Rent inflation and CPI OER inflation lagged the other two inflation measures and reached their troughs, at 0 percent and −0.2 percent, respectively, in the second quarter of 2010. CPI Rent inflation stands at 2.5 percent and CPI OER inflation stands at 1.9 percent in the first quarter of 2012.

4. CONCLUSIONS

The CPI is a cost of living index that measures the price of a constant flow of consumption during a period. One of the challenges of accounting for the price of consumption is accounting for the price of housing services. The issue is that a large fraction of the U.S. population owns their housing. The price of housing services for owner-occupied housing is not observed directly and, thus, the price for the hypothetical market transaction involving the housing services of owner-occupied housing must be imputed.

The Bureau of Labor Statistics employs a particular imputation mechanism, the rental equivalence approach, which implies a close substitutability between rental and owner-occupied housing. An alternative, conceptually more attractive approach to accounting for the price of the flow of services provided by an asset (i.e., by a house) is the user cost approach. Despite its conceptual attractiveness, the approach has proven hard to implement in practice.

Currently, the monthly CPI measures of housing services price inflation represent a repeat-rent index, which is calculated as the monthly average of the past six-month change of the rental price of rental units. The newly available data from the rental housing market, which usually reflects month-to-month changes, can be informative about the direction of changes in the CPI measure of housing services inflation. The data on residential rents, rental vacancies, and rent concessions suggest that since 2010 there has been an increasing upward pressure on rent price inflation.

APPENDIX

Below, we describe (1) how the data on rental prices are collected, and (2) how the data are used to construct the CPI Rent and the CPI OER.

The collection of rent information for construction of the CPI Rent and CPI OER is conducted as follows. The CPI program collects price information from 87 urban areas (i.e., index areas). Each of the index areas is divided into six strata, each representative of the area. Within each stratum, the program defines small segments. For each segment, the CPI program collects information on the number of renter- and owner-occupied units, and the average rent of renter units. Based on this information, the program calculates the total spending on shelter for each segment. The total spending on shelter is the sum of (1)

the product of the number of rental units and the average rent in the segment, and (2) the product of the number of owned units and the average owner's equivalent of rent in the segment. The segments in the stratum are selected with the probability proportional to the segment's size, where the size of the segment corresponds to the segment's estimated total spending on shelter. Finally, the CPI program selects a representative sample of renters in each segment.

The rental units in each of the six strata are interviewed every six months on a panel basis. One of the six panels is priced each month and each panel is priced twice per year. Thus, the month-to-month price changes in housing services are calculated using the six-month changes in rents.

From each rental unit in the sample, information on the economic rent and on the pure rent is collected. The economic rent is the contract rent (including the value of certain rent reductions) adjusted by the value of any changes in the services the landlord provides. A change in what renters obtain for their rents is considered to be a quality change, and the value of any quality change is applied to the current economic rent to make it consistent with the previous data. The pure rent is used in calculations of the owners' equivalent of rent. It is the economic rent minus any utilities included in the contract rent. The utilities paid by homeowners are counted outside the CPI Shelter.

To construct the CPI Rent and CPI OER, the CPI program uses the so-called price relatives. The price relative is the ratio of (weighted) prices from the current month to the (weighted) prices in the previous month. Since each housing unit is interviewed every six months, the monthly price relative is the sixth root of the six-month price change. For example, the six-month change in rent for all renter-occupied units in a segment is the ratio of (1) the sum of the current economic rents for each sampled unit within the segment, weighted by the total renter weight for that segment, and (2) the sum of the economic rents charged six months ago for each sampled unit within the segment, weighted by the total renter weight for that segment. The total renter weight in a segment is the product of the segment's weight, the renters' share in the total renter- and owner-occupied spending on shelter in the segment, and the inverse of the probability of a housing unit in the segment to be selected to the sample. The latter corrects for the sampling design. The segment's weight is the inverse of the probability of its being included in the stratum, where the probability is the ratio of the total spending on shelter in the segment to the total spending on shelter in the stratum.

Consider rental unit i in segment s, which is located in pricing area a. Let W_s denote the segment's s weight. Let S_s denote the renters' share in the total renter- and owner-occupied spending on shelter in

segment s. Let p_s denote the probability of a unit in segment s to be selected to the sample. Then, the monthly relative price change for the CPI Rent for area a, $\Delta_{a,rent}^{t-1,t}$, is

$$\Delta_{a,rent}^{t-1,t} = \sqrt[6]{\frac{\sum_{i\in a}\left[\left(W_s\frac{S_s}{p_s}\right)\text{econ rent}_{i,t}\right]}{\sum_{i\in a}\left[\left(W_s\frac{S_s}{p_s}\right)\text{econ rent}_{i,t-6}\right]}}.$$

The monthly relative price change for the OER index for area a, $\Delta_{a,OER}^{t-1,t}$, is

$$\Delta_{a,OER}^{t-1,t} = \sqrt[6]{\frac{\sum_{i\in a}\left[\left(W_s\frac{1-S_s}{p_s}\right)\text{pure rent}_{i,t}\right]}{\sum_{i\in a}\left[\left(W_s\frac{1-S_s}{p_s}\right)\text{pure rent}_{i,t-6}\right]}}.$$

Then, the CPI Rent and the CPI OER for area a are calculated as follows:

$$\begin{aligned} I_{a,rent}^{t} &= I_{a,rent}^{t-1}\Delta_{a,rent}^{t-1,t} \\ I_{a,OER}^{t} &= I_{a,OER}^{t-1}\Delta_{a,OER}^{t-1,t}. \end{aligned}$$

These measures are then used to aggregate the indexes across all CPI index areas.

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