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Late Payment Fees and Nonpayment in Rental Markets, and Implications for Inflation Measurement: Theoretical Considerations and Evidence*

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Abstract

Accurate rent measurement is essential for constructing a consumer price index (CPI) and for measuring household welfare. Late payment fees and nonpayment of rent are common components of rental expenditures and thus belong in CPIs. Late payment fees are often excluded; we offer a novel critique. In the US CPI, nonpayment is ostensibly included, but, we show, severely undermeasured. Moreover, the manner of its inclusion renders the CPI extremely sensitive to nonpayment variations; we show how to fix this. Nonpayment undermeasurement suggests at least a +1 ppt overestimate in 2020 CPI shelter inflation. Timely nonpayment and late fee measurement is challenging; we offer a practical solution.

JEL Classification— E31; R31; R32

Keywords— shelter inflation, nonpayment, eviction, COVID collapse, CPI mismeasurement

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Late Payment Fees and Nonpayment in Rental Markets, and Implications for Inflation Measurement: Theoretical Considerations and Evidence

Extended Abstract: Accurate rent measurement is essential for constructing a consumer price index (CPI), for measuring aggregate consumption, and for measuring household welfare. The US CPI seeks to measure the expenditures needed to maintain a fixed standard of living. Late payment fees and nonpayment of rent are common components of rental expenditures, and thus belong in CPIs. Late payment fees are often excluded; we offer a novel critique. Nonpayment is ostensibly included, but, we show, severely undermeasured (i.e., almost undetected). Moreover, the manner of its inclusion renders the CPI extremely sensitive to nonpayment variations, so that if nonpayment were properly detected, the CPI would be unacceptably volatile. We show how to fix this. Nonpayment undermeasurement suggests at least a +1 ppt overestimate in 2020 CPI shelter inflation. Timely nonpayment and late fee measurement is challenging; we offer a practical solution.

JEL Classification— E31; R31; R32

Keywords— shelter inflation, nonpayment, eviction, COVID collapse, CPI mismeasurement

1 Introduction

Accurate rent measurement is critical for measuring inflation, consumption, and household welfare. The global standard in measuring owner-occupied housing consumption is the owners' equivalent rent (OER) approach, meaning that movements in market rents are critical inputs into measuring housing consumption.[1] In many countries, OER is also the approach taken to measure inflation for homeowners. Since housing represents such a large share of total consumption, rents ultimately become the largest item in consumer price indexes; for instance, rent drives 32 percent of the US consumer price index (CPI). CPIs in turn are used for indexing wages and other payments, in setting financial contracts, for measuring growth in living standards, and as a critical input to monetary policy. Given the importance of rent in GDP accounting and in the CPI, any bias in rent measurement is quite consequential (Lebow and Rudd (2003); Diewert et al. (2009); Ambrose et al. (2018); and Hill et al. (2020)). Recently, the accuracy of the rent and OER indexes of the CPI has been repeatedly questioned (for example, Crone et al. (2010); McCarthy, Peach, and Ploenzke (2015);

[1] For more details, see Diewert et al. (2020).

Coy (2018); Nothaft (2018); Ambrose, Coulson, and Yoshida (2015, 2018, 2022); Reher (2020); and Adams and Verbrugge (2021)). In this paper, we call attention to a new and quite large source of inaccuracy in rent inflation measurement in the US CPI.[2]

According to the *BLS Handbook of Methods*, the CPI answers the hypothetical question: "what expenditure level is needed to achieve a standard of living attained in a base period at current market prices?"[3] This implies that in the rental market context, the CPI should measure what households actually pay, rather than the sticker price. Generally speaking, this is what the CPI attempts to do in the rent context—although we explain below how its practices are quite deficient in this regard. And tracking actual expenditures is consistent with CPI practice for other commodities and services: the CPI will track the expenditures incurred to acquire a particular good or service, rather than its sticker price, if the two deviate in an important way. For instance, college tuition reflects both sticker price and adjusted prices, based on financial aid. Failing to accurately track actual expenditures will lead to misleading conclusions regarding consumer welfare.

Both late payment fees and nonpayment of rent are of nonnegligible magnitude, and both are part of the actual expenditures required to obtain the flow of rental services. Thus both should be included in the CPI (as well as in the experimental CPI for lower- and higher-income households; see Klick and Stockburger (2021)). As we explain below, the argument for including both is particularly compelling for OER, since theoretically, the opportunity cost facing an owner who lives in her own home (rather than renting it out) is the forgone rental payment stream.

We study the treatment of late payment fees and nonpayment of rent in the US CPI context. We find notable deficiencies and offer our suggestions. At present, late fees are excluded from the CPI. We argue that this exclusion is misguided, given their importance in the US rental market, and given that the rationale for their exclusion equates two concepts that are distinct in US law. In contrast, nonpayment is included in the CPI. However, we argue that nonpayment is treated in a manner that is inconsistent with existing BLS practice for an essentially identical situation, namely, its treatment of new tenant discounts. This inconsistency is quite consequential: we demonstrate that the CPI's treatment of nonpayment renders the rent and OER

[2]Errors in CPI shelter index movements will also translate into errors in GDP accounting and in welfare measurement.

[3]The CPI is used for many purposes, and its measurement goal should determine measurement procedures. Our view coincides with that of the *BLS Handbook of Methods*: "The CPI is widely used as a cost-of-living index, which answers the hypothetical question concerning what expenditure level is needed to achieve a standard of living attained in a base period at current market prices. The ratio of this hypothetical cost to the actual cost of the base-period consumption basket in the base period is the cost-of-living index."

indexes so sensitive to nonpayment fluctuations that shelter inflation will exhibit large collapses and subsequent booms. However, nonpayment has not (yet) driven any such episode of collapse or boom. Why not? Because the BLS, we establish, severely undermeasures nonpayment. This severe measurement problem has (historically) prevented any spurious collapses of shelter inflation from materializing. A corollary is that the collapse in rent inflation during the Great Recession was not, contrary to some commentary, driven by measured nonpayment. However, given stated BLS policies and procedures, a back-of-the-envelope calculation suggests that CPI shelter inflation was overestimated by about 1 percentage point per month (annualized), and probably more, in 2020. A miss of this magnitude is considered very large indeed (see Lebow and Rudd (2003); Moulton (2018)), an unacceptably large miss. Statistical agencies exert great effort to eliminate errors that are minuscule compared to this problem.

Eliminating spurious collapses and booms is straightforward to rectify, once nonpayment is measured properly: the BLS can simply treat nonpayment the same way it treats large one-month discounts in rent. But there is a significant challenge to properly measuring both late fees and nonpayment: field staff may have no way of knowing, at the time they actually collect the rent, whether there will be a late fee or a nonpayment. (Indeed, at present, they often enter a textitforecast, even though statistical agencies are usually extrememly reluctant to use anything other than actual measured data in their statistics.) We provide a solution to this dilemma, one that would allow the BLS to implement changes that would incorporate these features appropriately, and end its use of relying upon forecasts, while not departing from its current rent inflation measurement framework. This solution involves collecting late fee and nonpayment information *from the previous month*. In this context, the associated information lag is quite defensible, in that the CPI is thus rendered far more accurate.

Owing to the difficulty of measuring nonpayment, a statistical agency might decide that it should eschew measuring rent expenditures per se, and pursue a contractual obligation approach, as this would appear to obviate the need to track nonpayment. But we demonstrate that even in this case—which would entail deviating from the theoretical underpinnings of the CPI—measuring nonpayment is necessary.

2 Background: How the BLS calculates Rent and OER inflation

To understand the implications of late fees and nonpayment for CPI shelter inflation, as well as to understand how we measure nonpayment using CPI microdata, some details about BLS practices and procedures are necessary. We study the rent of primary residence index ("Rent") and the owners' equivalent rent of primary residence index ("OER").

The BLS maintains a sample of about 43,000 rental units and collects the rent on a given unit *every six months*. Each month, the average six-month change in that month's sample is converted into a monthly change by taking its sixth root, using Equation (1) below. This *six-month orientation* has an important implication: a given rent collection effectively represents not just the actual payment for that particular month, but the average payment over a six-month period. This orientation is reflected in how the BLS currently treats one-month rent discounts, but (as shown below) is seemingly ignored in how it currently treats nonpayment.

Prior to use in an index, collected rents receive various appropriate adjustments such as aging bias adjustments, structural change adjustments, and adjustments for changes in amenities; for simplicity, we will denote the post-adjustments rent used in the Rent index as $rent_i^*(t)$ and the post-adjustments rent used in the OER index as $rent_i^{*,O}(t)$.Then the Rent index for a particular geographic region is constructed as

$$I^R(t) = \left(\frac{\Sigma_i w_i rent_i^*(t)}{\Sigma_i w_i rent_i^*(t-6)} \right)^{1/6} I^R(t-1) \tag{1}$$

The monthly change in the OER index $I^O(t)$ is constructed analogously, except using OER rents and OER weights. OER weights differ from Rent weights, so that the rents collected better represent owner expenditures on housing.[4]

During estimation and review, the BLS also computes a unit-level "rent relative" that is used in data review, but also as a constraint on the adjusted rent, $rent_i^*(t)$, as follows. The rent relative is $RR_i^*(t) = \frac{rent_i^*(t)}{rent_i^*(t-6)}$, with an analogous expression for OER. Extreme rent and OER relatives are always flagged and

[4]Since owners pay for their own utilities and these are priced separately in the CPI, the rents used in OER construction receive a utilities adjustment; see Verbrugge (2012) for details. Adams and Verbrugge (2021) demonstrate that the OER weights should reflect structure type as well. For more details on BLS index construction (and how rent and OER indexes differ), see, e.g., Verbrugge and Poole (2010) or the *BLS Handbook of Methods*.

reviewed, to prevent errors from being introduced into the index. But even if the collected rent at (t) is deemed valid, the adjusted $rent_j^*(.)$ and/or $rent_i^{*,O}(.)$ might nonetheless be subject to a type of winsorization, to remove noise from the index. In particular, for use in Equation (1) in period t, $rent_i^*(t)$ will be winsorized if the relative is below 0.05, and $rent_i^*(t-6)$ will be winsorized if the relative is above 20, so as to ensure that the relative ends between 0.05 and 20.[5]

3 Late payment fees for rent, and the OER concept

Most landlords impose a late payment fee, often 5 percent of the rent, when a tenant fails to pay his or her rent on time. Using Experian RentBureau data, Kim (2020) found that in the Atlanta area from 2002-2010, the average tenant pays rent late about once a year on average. While common, such late payment fees are typically not thought to be a substantial source of revenue for landlords, unlike the case historically in the video rental market (see, e.g., Sarangi and Verbrugge (2000) and Fabrikant (2001)). That is partly due to legal restrictions: states typically set limits on late fees, although in many states this limit is vaguely specified (e.g., late fees must be "reasonable"[6]) and left to the courts to determine on a case-by-case basis. Still, late payment fees are large enough that they should not be ignored: a 5 percent increase in rent for a month is non-trivial; like eviction, late payment fees appear to be more prevalent for low-income tenants; some states (such as Illinois and Wisconsin) allow late fees to be as high as 20 percent of the rent; and some landlords do make a substantial portion of their income on late fees (see Raymond et al. (2018) and Garboden and Rosen (2019)).[7]

The existence of late payment fees means that renters—particularly low-income renters—often pay more than the sticker price. Hence, failing to measure late fees implies mismeasurement in the changes in expenditures required to maintain a fixed standard of living, and leads to misleading conclusions regarding renter welfare.

In the US, late fees on rents are considered out of scope for the index, and are not measured. The

[5] As stated in BLS (2020): "Note that a free or $0 price in the CPI is adjusted to a small positive value, typically a value equal to a 95-percent reduction from the previous price. (Prices of zero do not work well in the formulas used to compute the CPI.)"

[6] https://sparkrental.com/late-fees-for-rent-state/.

[7] Nathaniel Decker relates that it is more common for bigger players to use late fees and application fees as revenue sources (personal communication); see Decker (2021), who studies underpricing by small-property landlords.

rationale for this policy is that these fees are considered finance charges for short-term loans, and all financial assets are considered out of scope. Quoting from the *BLS Handbook of Methods*:[8] "The CPI covers the consumption sector of the U.S. economy, which is defined as the purchase of goods and services for use by households. Consequently, the CPI excludes investment items, such as stocks, bonds, real estate, and business expenses... Gambling losses, fines, cash gifts to individuals or charities, and child support and alimony payments [and] Interest costs and finance charges are also out of scope. The CPI excludes illegal goods and services and the value of home-produced items because of the practical difficulties of collecting the data." There appears to be fairly broad consensus on this point; for example, both Canada and the UK also treat late fees as out of scope for the CPI, and the EU's Harmonised Index of Consumer Prices (HICP) also excludes late fees on the same basis.

But we question the rationale for treating such fees as finance charges. Both legally and theoretically, late fees and finance charges are distinct from one another. A late fee is a penalty for missing a payment deadline specified in a contract. A finance charge, however, is interest that accrues on an amount overdue, calculated using a fixed or variable interest rate, and these usually compound. Late fees and finance charges are distinguished in state laws (e.g., State of Wisconsin (2023)) and by the Consumer Financial Protection Bureau (Consumer Financial Protection Bureau (2023)). But even aside from the fact that late fees and finance charges are legally distinct, there are several other reasons that late fees should be included in rent expenditures. Late fees are an expenditure tied to an ordinary living expense (rent) rather than a purely financial transaction (like a payday loan). They are effectively part of the ordinary cost of rent for many households,[9] and thus more akin to sales taxes (which are in-scope) than finance charges. Their magnitude is so large that ignoring them represents a notable underestimate of the cost of living for low-income tenants. Finally, late fees are sometimes imposed by specifying a *discount* on "early" rent payment; and in this (essentially identical) case, the CPI computes the actual payment.

The argument for including late fees is even more compelling for OER. The OER approach is built upon an opportunity cost notion, i.e., the notion that the correct measurement of the homeowner's shelter cost

[8] https://www.bls.gov/opub/hom/cpi/

[9] Imagine that a particular rental contract specified a given monthly payment plus a random component: each month, with probability 1/12, the tenant would owe an additional 5 percent. If price collection occurred in a month that the tenant was unlucky and had to pay the additional 5 percent, the BLS would include that additional payment as part of the rent that month. We argue that late payment fees are much closer to this hypothetical scenario than to payday loans.

is the rent that an owner is forgoing by not renting out her home.[10] But the "forgone rent" from a given property is the *actual rental payment stream* that this property would obtain, rather than a sticker price on a contract. Putting this differently, once an owner puts her home on the rental market, she will, as a new landlord, face the prospect of late payments (and missed payments) —and she might well obtain late fee revenue. Thus for OER at least, both late fees and nonpayment should be included in the CPI.

But including late fees in the CPI is not straightforward. CPI collection of prices occurs over the month. At the time that a rent is collected on a given unit, a tenant may not yet have paid the rent. But it will often be too early to determine whether the rent will be paid in full (with or without an assessed late fee), or whether it will remain unpaid. To measure the current month's payment accurately (and thus avoid costly follow-up and inflation revisions), price-collection staff in this circumstance would have to enter a *forecast* of future uncertain events. This is contrary to best practice: CPIs in most countries typically eschew using forecasts.

How might one appropriately address this challenging dilemma? We defer the answer to our recommendations in Section 5 below.

4 Nonpayment

In the 2004 *Consumer Price Index Manual* (International Labour Office et al. (2004)), nonpayment of rent is noted explicitly as a landlord cost that should be included in market rents; thus including nonpayment of rent is considered an international best practice. BLS procedures are consistent with this, inasmuch as the BLS seeks to measure nonpayment and include it in both rent and OER indexes. However, nonpayment of rent poses several measurement challenges. As with late fees, it is difficult to determine nonpayment in real time. But a second issue is related to the six-month orientation of the shelter indexes, and what we call "the $0 rent problem." First, though, it is important to clarify BLS nonpayment procedures (as of 2020).[11]

[10] Diewert et al. (2009) suggest that the opportunity cost should be the maximum of the internal user cost and the rental equivalence value, citing earlier work (Diewert and Nakamura (2009)), which states: "For each household living in owner occupied housing (OOH), the opportunity cost is the maximum of what the dwelling could have been rented out for, which is the rental equivalent, and the financial user cost of the funds tied up by owning the property." From that perspective, this paper is clarifying the rental equivalent component of the opportunity cost.

[11] BLS procedures have been altered (modestly) since 2020, as a result of this paper, to clarify the measurement target. The BLS also provided updated guidance to field staff. However, these updated procedures are still largely subject to the criticisms herein.

4.1 BLS procedures

The BLS intends to enter a $0 rent in the case of nonpayment. According to BLS (2020),

When an unusually large price change is reported by a respondent [such as when the contract rent is $1000, but the reported rental payment this month is $0]*, the data collector typically attempts to investigate the situation and confirm the change. For instance, if a tenant reports a large decline, the data collector will attempt to confirm this with the landlord or property manager. Relevant to the COVID-19 pandemic, when a tenant reports being unable to pay rent, the data collector is instructed as follows (from the manual used by CPI data collectors):*

Be sure to probe these situations to determine if any rent obligation will be forgiven.

- *If the landlord expects payment in full, regardless of when, enter the full rent amount that is due.*
- *If some or all of the rent is being forgiven, enter the amount the landlord/manager has agreed to accept.*
- *If the rent is not paid or not expected to be paid AND the landlord/manager is unsure about the future, enter $0.00.*

These are all longstanding procedures, with the exception of the final bullet addressing situations of uncertainty, which have generally not arisen in the past.

We call attention to several key points. The first bullet point indicates that if the landlord "expects" payment in full at a later date, the rent that is used in constructing the CPI index is the contract rent. Since this rent has not been paid, then, as in the case of late fees, such an entry corresponds to using a forecast, not an actual payment. Forecast errors thus enter the index, and our results below suggest that landlords typically overestimate the probability of eventual full payment. The second and third bullets reveal several points. First, the BLS intends to track actual payments, not simply the contract rent. This makes the treatment of nonpayment distinct from that of shoplifting.[12] Second, in case of nonpayment, the BLS intends to record $0. Third, given the six-month orientation of the index, the BLS treats any agreed-upon rent concession (or nonpayment) as a reduced payment (or nonpayment) that will continue unabated for the next five months. As shown below, this is at variance with existing BLS procedures for a nearly identical case.

[12] Unlike shoplifting, nonpayment is perfectly observed, and a landlord can take a nonpaying renter to court. Not doing so is a tacit forgiveness of the rent.

4.2 The $0 rent problem, versus "first month's rent free"

A policy of entering a $0 rent whenever a unit experiences a nonpayment will result in excess sensitivity of the CPI to variations in rental nonpayment. This results from the six-month orientation of the index, and the sensitivity of statistical moments to outliers. We demonstrate below that under a $0 treatment, if the fraction of units in nonpayment status rises by 1.5 percentage points—quite plausible at the onset of a recession—then aggregate rent inflation will fall by about 3 percentage points.

The $0 rent treatment in the CPI is at variance with how the CPI treats an almost identical case, namely, "first month's rent free" (FMRF). In an FMRF case, the tenant signs a 12-month contract at a given rent r, but the contract specifies that no rent is due for the first month. In other words, the rent owed in the first month is $0. But recall from the discussion in Section 2 that, in the CPI, a given rent collection represents six months of rent payments. From a six-month perspective, then, a rent r is due for each of the next five months, yielding a six-month total of $5r$. And this is exactly how the CPI treats FMRF: instead of using $0, the BLS treats the reduction in rent as being spread out over this month and the next five months. Hence, BLS FMRF procedures stipulate that the price should enter the index as $(5/6)r$ (i.e., a 1/6 or 16.7 percent drop), a number that corresponds to the average rental payment over the next six months.

Both theory and pragmatic considerations support this "5/6" treatment. Theoretically, signing a contract obligates one to a stream of payments over the course of the contract, and the sum of those payments (appropriately discounted) is the total cost of that contract. If one wished to convert this into a "monthly" cost, neither the logic of the economics nor basic accounting principles would suggest that the cost in the first month is zero.[13] Pragmatically, using $0 would introduce significant noise into the index, since averages are very sensitive to outliers. We demonstrate next the extent of this noise, and how the "5/6" rule yields less volatile, and more sensible, inflation estimates.

To do so, we use a very simplified and stark example, depicted in Figure 1a. The figure depicts the units in the rent index associated with a given month (say, January), whose rents are collected every January and July. For simplicity, we assume that: all units have equal weight in the rent index; contract rent six months ago was $1000 for all units; when rents adjust, rent increases by 3 percent, to $1030; and between the last collection period and today, half of the units will have received contract renewals. FMRF units are depicted

[13] We note in passing that the logic herein implies that when field staff encounter a new tenant in a unit, the BLS should determine whether the new tenant received a free month in a *previous* month. This is not currently done.

in dark or light blue; units that experienced rent increases are depicted in light blue (no contract renewal) or yellow (new contract); and we assume that FMRF can occur at most once in a 12-month period. Arrows depict flows from one rent category in time t-6, to other rent categories in time t.

We compare two alternative treatments of FMRF rents. In the first, we counterfactually assume that FMRF rents are coded as \$0—which, given BLS procedures, will instead be winsorized into something close to 5 percent of the contract rent. For simplicity, we code this either as \$55 (for units whose current contract rent is \$1000) or as \$56.6 (for units whose current contract rent is \$1030).

In the second, we assume that FMRF rents are coded as 5/6 rents. If the contract rent specified \$1000, then this would be entered as \$833.3; similarly, if the contract rent specified \$1030, then this would be entered as \$858.3.

We assume that in the steady state, 3 percent of rents are in FMRF status; and starting this month, say, July (in time t), the number of units in FMRF status rises from 3 percent of units to 4 percent of units.

[Figure 1a and Figure 1b here]

We just stated that we assume that the proportion of FMRF units has risen to 4 percent. But for intuition, temporarily assume that the proportion of FMRF units remained at 3 percent. In this steady-state situation, 3 percent of units are experiencing a 95 percent drop in rent (or a 1/6 drop), and 3 percent of the units are experiencing a (roughly) 1800 percent increase (or a 6/5 increase). These "cancel out." Using Equation (1) and using *either* "\$0" rents (i.e., \$55 or \$56.6 rents) *or* 5/6 rents, annualized rent inflation equals 3.08 percentage points. In steady state, the proportion of units experiencing FMRF has no impact on measured inflation.

Now go back to the case where FMRF instead changes, namely, by rising to 4 percent. Applying the BLS 5/6 rule, Equation (1) yields inflation at 2.7 percentage points, a notable deceleration from 3.1 percentage points, but one that passes the sniff test.[14] But when we apply "\$0 rents" for these units, Equation (1) then yields inflation at 1.0 percentage point (from its previous level of 3.1 percentage points), a decline of over 2 percentage points—even though only a mere 1 percent more units are getting free rent *for only one month*.

The next month, the same math applies, since what matters is the nonpayment rate today versus 6 months ago. Assuming that nonpayment remains at 4 percent indefinitely, rent growth will remain at the same level until the following January.

[14] A spreadsheet with these and other computations is available from the authors upon request.

The rationale for the 5/6 procedure is clear. Not only does this treatment of paying $0 for a month correspond more closely to the bottom line of the household's budget, it also prevents the index from sharp declines—reducing inflation volatility and generating more sensible inflation estimates, without influencing its long-run movements.

4.3 Nonpayment versus FMRF

Next we consider nonpayment; this can be depicted in the same diagram, where blue bars now indicate nonpayment. For simplicity, we abstract from uncertainty (landlords observe nonpayment perfectly), and assume that nonpayment lasts only one month. Under these assumptions, the flow of payments accruing to the landlord is *exactly the same* as if the landlord had offered this tenant a month's free rent.

And the exact same math applies: when nonpayment increases by 1 percent, a $0 rent treatment—the current treatment—would result in a dramatic decline in inflation, while a 5/6 treatment would result in a "notable but moderate" deceleration. On a monthly basis, as we discuss below, a 1 percent increase in nonpayment at the onset of a recession is probably an underestimate.

In Figure 1b, we display the relationship between a change in the incidence of nonpayment (displaying this from -2 percent to 2 percent) and the resultant change in rental inflation. The relationship is approximately linear. The blue line represents the relationship under a $0 treatment. Notice that if nonpayment increases by about 1.5 percentage points, rent inflation falls by a full 3 percentage points—and would stay there, as explained above, for the next six months. And later, once nonpayment reverted back to its original level, the opposite would happen: rent inflation would experience a boom, rising above its steady-state level by 3 percentage points. The $0 rent treatment results in tremendous sensitivity to variations in nonpayment, and we would view such a collapse (and subsequent boom) in shelter inflation as totally unjustified.

Conversely, the green line depicts the relationship under the 5/6 rule, the rule that matches the (essentially identical) FMRF case, and that we view as a more appropriate method. If we view the 5/6 method as correct in this case, then the $0 method results in severe measurement errors. For instance, a 1.5 percent increase in nonpayment that lasted exactly six months (then reverted) would result in 12 months of measurement errors that would exceed the largest source of bias identified by the Boskin Commission; see Boskin et al. (1997). In short, this issue is very consequential indeed.

To sum up, given its current treatment, nonpayment is (ostensibly) a source of extreme instability in the

CPI shelter indexes. Historically, has nonpayment been a major source of rent inflation volatility?

4.4 Did nonpayment drive the 2009 collapse of shelter inflation? Measuring nonpayment in CPI rent microdata

Rent inflation is notoriously sensitive to unemployment fluctuations (see, e.g., Zaman (2019) and Stock and Watson (2020)). Perhaps the $0 treatment of nonpayment constitutes the major channel of this sensitivity.[15] We thus examine whether nonpayment drove the 2009 collapse of shelter inflation. We then examine the quantitative implications of the $0 rent method on the CPI for 2020, a period that is not part of our sample.

Shelter inflation collapsed in mid-2009: after running near 3 percentage points (annualized) for over a decade, it then fell to the -0.8 percentage points range, almost 4 percentage points below its typical level. Given shelter's large weight, its numerous negative monthly readings between June 2009 - March 2010 weighed heavily on overall inflation, pulling it down by about a full percentage point. Was this collapse in shelter inflation driven by declining rents per se, or did rising nonpayment play a significant (or even dominant) role? To answer this question, we measured the incidence of nonpayment in the confidential BLS rent microdata, from 2000-2016.

Measuring nonpayment using the historical CPI rent microdata is not simple. In these data, there is no nonpayment flag, nor an FMRF flag. The only way for a price collector to record details about unusual rent entries (such as $0) is to type it out in a text field; such reporting is accordingly spotty and irregular. Payments that field staff deem delayed are not discernible at all, and so we deduce nonpayment, as we explain next.

We construct alternative nonpayment measures using three variables: collected rent ($Rent_i(t)$), and the adjusted rents that actually enter the indexes ($rent_i^*(t)$ and $rent_i^{*,o}$).[16] A challenge to our analysis is that a collected rent recorded at $0 is not uncommon, but usually reflects a "work reduction," e.g., when part of an apartment maintenance worker's compensation package is living in one of the units rent-free. We remove such records, since these do not reflect nonpayment.[17]

[15] This was the point of view in Hill (2021) in the early 2021 environment, a study which attempted to estimate the degree of January 2021 rent deceleration due to the $0 treatment of nonpayment. But this author had no way of knowing that nonpayment was so severely mismeasured by the BLS.

[16] Some rental units, such as rent-controlled units, are not part of the OER sample. Also, OER has a higher weight in the CPI.

[17] Further data-cleaning steps were necessary. We retained only those units that the BLS considered valid for use

We construct three alternative measures to estimate the incidence of nonpayment in month (t). Measure 1 consists of the percentage of valid observations that satisfies criterion 1 below, and so on. Measure 1 is the most direct measure. Measures 2 and 3 capitalize on the fact that, given BLS procedures, a zero-dollar rent will roughly translate into a 95 percent drop in the adjusted rent measure that is actually used in index estimation.

1. $Rent_i(t) = 0$ and there are no work reductions and/or subsidies.

2. $RR_i^*(t) <= 0.15$ and $RR_i^*(t+6)$ is > 10. (A unit that went unpaid this month will induce a rent relative well above 10 six months from now, if rent is paid.)

3. $RR_i^{*,O}(t) < 0.15$ and $RR_i^{*,O}(t+6)$ is > 10.

Did nonpayment play a role in the shelter inflation collapse during the Great Recession?

No. Over the 2000-2016 period, out of over 1 million observations (roughly 43,000 rental units, each priced twice a year), we found only one single instance of zero dollar rent (in measure 3). As this was not accompanied by $Rent_i(t) = 0$, we are inclined to treat this as an anomalous entry. Hence, the measured collapse in shelter inflation in 2009 was probably *too small*, as Ambrose et al. (2015) have argued.

What is the source of the mismeasurement? We suspect that most nonpayment is reported as "delayed" payment.

4.5 Incidence of nonpayment and quantitative implications

Here, we attempt to quantify the potential importance of (undermeasured) nonpayment. Unfortunately, external evidence on nonpayment is spotty; we know of no time series spanning the 2000-2016 period that measures nonpayment. But direct and indirect evidence suggests that nonpayment over this period was surely well above the zero percent measured nonpayment in the CPI data. Ambrose and Diop (2014) found that the average lease default rate —defined as "the first occurrence of a missed rent payment" —was 5.7 percent over the 2001-2006 period, with wide variation over MSAs. And historical eviction rate data (see Figure 2) also provide indirect evidence of significant nonpayment.

in index estimation and that had an interview where all rent-related questions were completed. We also removed all observations with a new tenant.

Nonpayment is the chief cause of eviction,[18] and the eviction rate ranged between 2.3 percent and 3.1 percent of renter households over the 2000-2016 period.[19,20] Such eviction rates are difficult to square with the absence of any cases of nonpayment in the BLS microdata, suggesting a measurement problem. Having said that, if nonpayment remains relatively stable, its mismeasurement is unlikely to threaten the accuracy of the CPI. This seems plausible, since eviction rates do not appear to be cyclical.

[Figure 2 here]

Until recently, nonpayment data were difficult to obtain for the US. Despite an abundance of studies on eviction that discuss nonpayment as its chief cause, there is a paucity of research investigating rent nonpayment itself (unlike the case for mortgage nonpayment; see, e.g., Gerardi et al. (2017)). Lacking a time series of nonpayment over our sample period, it is difficult to provide a meaningful investigation of the quantitative implications of undermeasured nonpayment in the CPI. However, for the more recent period, estimates on nonpayment rates do exist. Starting in early 2020, the National Multifamily Housing Council (NMHC) developed a Rent Payment Tracker, and the NMHC now provides nonpayment data back to April 2019 (with a break in the data in February and March of 2020).

The data underlying the NMHC payment tracker are provided by five property management software providers—Entrata, MRI Software, RealPage, ResMan, and Yardi—and, in total, cover approximately half of the national market of apartment units in buildings with five or more units. Nonpayment in these data is defined to be a rental payment owed for a given month that is unpaid by the end of that month. Over the April 2019-January 2021 period, nonpayment rates increased, rising from a low of 2.3 percent (April 2019) to a high of 6.8 percent (January 2021). Monthly six-month changes ranged from -0.20 percent to +2.5 percent; the average six-month increase is about 1 percent.

[18] See Coulson et al. (2020), who study the relationship between evictions, tenant protections, and rents. Other causes include lease violations, property damage, tenant behavior, and illegal activity. Note that an eviction filing may signify more than one month of nonpayment; Robinson and Steil (2021) report that in their Boston data from 2014-2017, the median amount owed at the time of a nonpayment eviction filing is slightly less than three months of the median gross rent.

[19] This research uses data from the Eviction Lab at Princeton University, a project directed by Matthew Desmond and designed by Ashley Gromis, Lavar Edmonds, James Hendrickson, Katie Krywokulski, Lillian Leung, and Adam Porton. The Eviction Lab is funded by the JPB, Gates, and Ford Foundations as well as the Chan Zuckerberg Initiative. More information can be found at evictionlab.org. For national eviction data, see https://evictionlab.org/national-estimates/. Note that eviction "judgments" are labeled as "evictions" in these data, but such judgments sometimes result in interventions (such as payment plans) that allow renters to remain in their homes.

[20] Eviction filings are not necessarily an upper bound on instances of nonpayment. Informal evictions, in which landlords displace their tenants outside of the court system, appear to be even more common than evictions (see, e.g., Desmond et al. (2015)).

Given the current CPI measurement target of $0 for nonpayment, we can use NMHC data to get a sense of the potential importance of nonpayment over January 2020-January 2021. NMHC nonpayment estimates might be too high, since some missed rent payments will eventually be paid. But more likely, NMHC nonpayment estimates might be too low. The NMHC's underlying data come from professionally managed apartment complexes, and nonpayment is higher among lower-income renters, who are more likely to live in smaller complexes. Similarly, we know little about nonpayment in mom-and-pop-managed detached rental units; but the Understanding America Survey (see Engelhardt and Eriksen (2020)), which covers all rental units, estimates that the national nonpayment rate from 2020Q2 to 2021Q1 was 8.6 percent.

But suppose we make two strong assumptions: first, that the true national nonpayment rate over this period was just *half* of the NMHC-measured rate; and second, that, as in our data, no nonpayment is measured in the CPI after 2016.[21] Then over the January 2020-January 2021 period, given the $0 nonpayment procedure, the downward force on annualized Rent and OER inflation would have averaged -0.99 percentage points per month (and the maximum nonpayment-induced monthly change, induced by a nonpayment increase of 1.25 percentage points, would have been 2.5 percentage points). Further, the monthly standard deviation induced by nonpayment would have been about 1 percentage point. As we assume that all nonpayment was missed, this implies that rent and OER shelter inflation may have been overestimated by about 1 percentage point per month (annualized) between January 2020 and January 2021.[22] Since rent drives 32 percent of the CPI, this implies that headline CPI would have run 0.3 percentage points (annualized) above its measurement target each month over this period. (Similarly, during the period when nonpayment returns to normal levels, nonpayment undermeasurement would drive rent and shelter inflation well *below* its measurement target.)

5 Improving nonpayment and late fee measurement

Late fees and nonpayment present separate measurement challenges. However, the most problematic issue is related to uncertainty, at the time of the interview, about the outcome in the current month. Hence, our

[21] If we instead assume that the NMHC-measured rate is accurate, all of the estimates in this paragraph would double.

[22] Based upon information received from the BLS, Omair Sharif (of Inflation Insights) reports that nonpayment quotes in the BLS microdata averaged four per month from April 2020 to December 2020 (July and October are missing), with a maximum of six (private communication). This does not materially alter our conclusion.

recommendations for improving the treatment of late fees and nonpayment are closely related.

At the time that a rent is collected, it is generally impossible to determine whether the missed rent payment (a nonpayment) for that month will eventually result in a late fee, or eventually become a late payment. To maintain full timeliness and still obtain an unbiased measure of the current month's rent accurately, CPI staff would have to enter an unbiased forecast of future uncertain events. CPIs intend to measure actual prices (even if said prices are used to impute unobserved prices) and ordinarily eschew forecasts—although, as noted above, the CPI currently *does* include forecasts.

One might think that the CPI could "duck" the nonpayment problem by stating that it is pursuing a "sticker price" or contractual obligation approach, and treat nonpayment like shoplifting. But this is not a solution: some nonpayment is, in fact, a reduction in the contractual obligation. Thus, this alternative approach would still require measuring nonpayment. Moreover, a sticker price approach would depart from the stated goal of measuring the (actual) expenditure needed to maintain a given standard of living.

Our recommendation is pragmatic. We suggest that the BLS adjust rents by nonpayment or late fees using the 5/6 rule (not the $0 rule), but collect said nonpayment and late fee information from the *previous* month.

This procedure would introduce a one-month lag in measured late fees and nonpayment. We acknowledge that this recommendation is imperfect for several reasons. First, it would introduce a one-month lag in fees and nonpayment. Second, recall is likely to be imperfect, even for one month ago.[23] However, in the case of nonpayment at least, recall problems are probably limited, since nonpayment can have severe consequences. Third, the procedure assumes that late fees and nonpayment incurred last month are not repeated, and misses late fees and nonpayment incurred in earlier months.

But on the plus side, our proposed method is simple and unambiguous, making it easy to explain to field staff and straightforward to implement. It removes the current use of forecasts of future payment. In theory (i.e., on paper), it reduces the sensitivity of the CPI shelter indexes to nonpayment in an appropriate manner—even though, in practice, switching to this approach will increase the sensitivity of the CPI shelter indexes to nonpayment, because it provides a way to actually measure nonpayment. And on net, our proposal would considerably increase the accuracy of the CPI, while maintaining the long-standing BLS policy of

[23] Crone et al. (2010) discuss tenants' "one month recall bias" in the context of their historical survey of improvements in BLS methods.

not needing to revise non-seasonally-adjusted CPI indexes, and not requiring any additional estimation.[24]

6 Conclusion

For many purposes, it is important that rent expenditures be accurately measured. The BLS is the statistical agency in the US that is tasked with measuring rents and producing a CPI. And given their importance in overall household expenditure, accurately measuring rent expenditures is crucial. We study late payment fees and nonpayment, and their appropriate treatment in a CPI in particular, given the considerable measurement challenges associated with them. We critically assess how late fees and nonpayment are currently treated in the US context, and offer our suggestions.

A guiding principle for measuring rent expenditures is that one should track the actual expenditures required to remain in a rental unit, rather than tracking the sticker price. Both late payment fees and nonpayment of rent are of nonnegligible magnitude and directly tied to the actual expenditures required to obtain the flow of rental services. Moreover, actual renter expenditures translate into the actual payment stream for landlords, and thus correspond to owners' equivalent rent, which is the opportunity cost facing homeowners. Thus both late fees and nonpayment should be measured and included in the CPI.

In the US context at present, late fees are excluded from the CPI. But the justification for their exclusion is questionable. Moreover, excluding late fees yields an inaccurate picture of the actual expenditures that renters, particularly poor renters, habitually undertake to obtain rental services in the market.

Ostensibly, nonpayment is included in the CPI. On paper, nonpayment is supposed to be entered as a \$0 rent. This \$0 rent treatment departs from CPI practice for a nearly identical case, a large rent discount in a given month, and renders the CPI extremely sensitive to small variations in nonpayment rates. Historically, this extreme senstivity has not led to spurious collapses and booms in rental inflation, but only because nonpayment has been severely undermeasured. In particular, we find *zero* instances of nonpayment in 16 years of CPI rent microdata (from 2000-2016), even though external data sources on nonpayment and eviction rates suggest that nonpayment rates typically exceed 2-3 percent per year. This undermeasurement problem has (historically) prevented any spurious collapses and booms in shelter inflation from materializing. Taking

[24] Diewert and Fox (2020) examine the treatment of a rent holiday for measuring consumption in the national accounts and for constructing a cost of living index. For both purposes, they argue that reservation prices rather than zero prices should be used, and discuss how these might be estimated.

the current official CPI treatment of nonpayment as given, we calculate that CPI shelter inflation may have been overestimated by about 1 percentage point per month (annualized) in 2020, and (depending upon the estimated nonpayment rate) possibly much more. This type of miss is far too large to ignore, and statistical agencies typically go to great lengths to address far smaller problems; see Lebow and Rudd (2003) and Moulton (2018).

A significant measurement challenge is related to the uncertainty, at the time a rent quote is collected, as to whether a missed payment will translate into a late payment (with a late fee) or a nonpayment. We discuss how late payment fees and nonpayment should be measured in the US context, i.e., how the BLS could implement changes to incorporate these features appropriately while not departing from its current rent inflation measurement framework. The solution is simple: collect late payment fee and nonpayment information from the previous month. This, in conjunction with treating nonpayment in the same way that a “first month’s rent free" case is currently treated, would greatly enhance the accuracy of the shelter indexes in the CPI.

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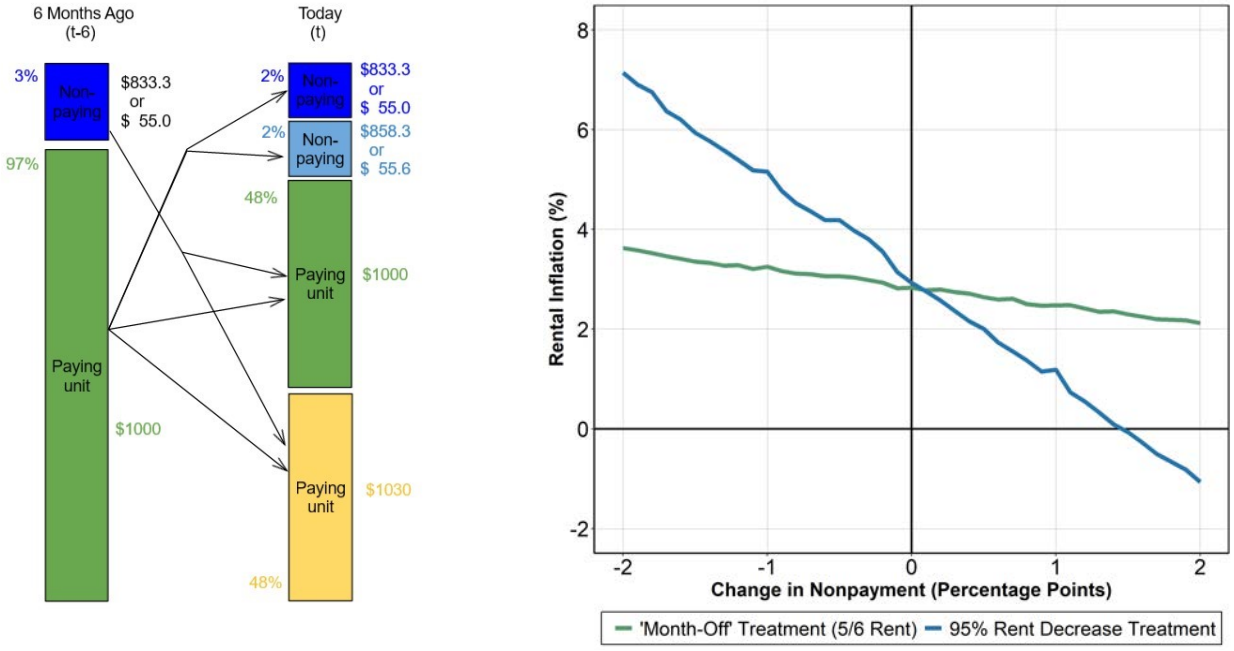
Figure 1: Effect of $0 Rent versus 5/6 Treatment



(a) (b)

Figure 1(a) depicts a sample of rental houses at time $t-6$ and when they are next repriced, at time t. In each time period, the houses are reordered in increasing rent. Arrows depict flows from one rent category in time $t-6$, to other rent categories in time t. The units depicted by the blue rectangles are nonpaying units, and we explore a "$0" rent treatment (95 percent rent decrease) or a "5/6" ("month-off") rent treatment for these units. Figure 1(b) depicts the relationship between a percentage change in nonpayment and the implied percentage change in rent inflation, given either a "$0" treatment (95 percent rent decrease) or a "5/6" ("month-off") rent treatment.

Figure 2: Eviction Rate

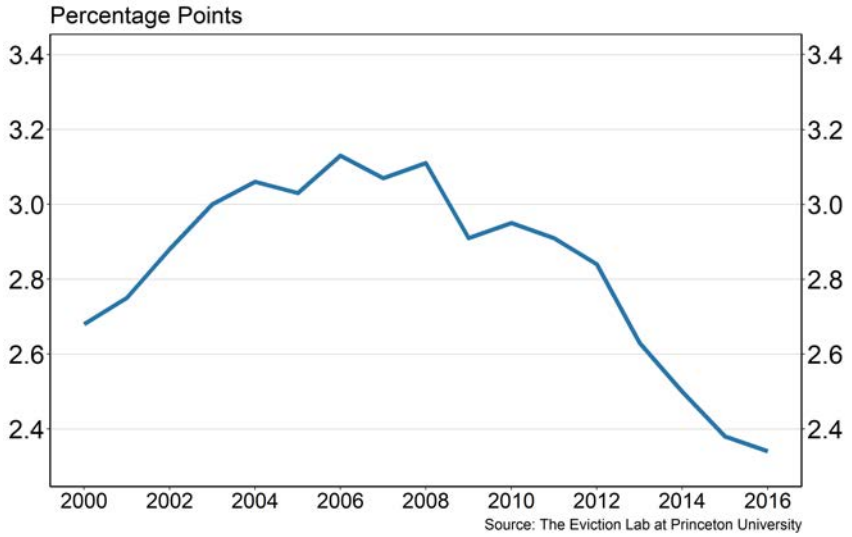


Figure 2 depicts the percentage of renter-occupied households that experienced an eviction in a given year. In these data, an eviction is defined as an eviction judgment issued to a renting home. For more information, please see the Eviction Lab at Princeton University.