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

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Statistical agencies track rental expenditures for use in the national accounts and in consumer price indexes (CPIs). As such, statistical agencies should include late payment fees and nonpayment in rent. In the US context, late payment fees are excluded from the CPI. Ostensibly, nonpayment of rent is included in the US CPI; but its treatment is deficient, and we demonstrate that small variations in nonpayment could lead to large swings in shelter inflation, and might have played a role in the 2009 measured shelter inflation collapse. They didn't: while the national nonpayment incidence is 2-3 percent, in the 1 million plus rent observations in BLS rent microdata from 2000-2016, no nonpayment is recorded. A back-of-the-envelope calculation suggests that, assuming nonpayment undermeasurement continued after 2016, CPI shelter inflation may have been overestimated by about 1 percentage point per month (annualized) in 2020. Late fees and nonpayment are difficult to measure in real time. We offer implementation suggestions that are consistent with CPI procedures.

Keywords: shelter inflation, nonpayment, eviction, COVID collapse, CPI mismeasurement.

JEL Classification: E31, R31.

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1 Introduction

Worldwide, housing typically accounts for 25 percent of total consumption. The *System of National Accounts: 1993* recommends that the measurement of the service flow from owner-occupied housing use a rental equivalence approach; thus movements in market rents are, in many countries, critical inputs into measuring consumption.[1] Many countries also adopt this approach for measuring inflation, including the US. In the US, rent inflation drives about 30 percent of the consumer price index (CPI). The CPI is used widely, such as for indexing Social Security payments and wage payments, and for measuring growth in living standards. Hence, accurate rent inflation measurement is quite important.

According to the CPI 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?"[2] In this paper, we ask: in measuring inflation in rent expenditures, should we measure the sticker price or what households actually pay? Our answer: because expenditures to acquire rental services notably diverge from the sticker price, in a situation in which expenditure variation is not driven by variation in the flow of services, we should measure actual expenditures. This is consistent with CPI practice: 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.

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. Thus both should be included in the CPI.

We study the treatment of late payment fees and nonpayment of rent in the US context and offer our suggestions. At present, late fees are excluded from the CPI. Ostensibly, nonpayment is included in the CPI, though it is treated in a manner that is inconsistent with another BLS procedure (treatment of new tenant discounts), and—as a result of this inconsistency—in a manner that could result in spurious collapses and booms of shelter inflation. But we provide evidence of an undermeasurement problem related to nonpayment of rents. In particular, while external data sources on nonpayments and eviction rates suggest that nonpayment rates are typically on the order of 2-3%, we find that the CPI rent microdata from 2000-2016, with over 1 million observations, contain zero instances of nonpayment. This measurement problem has (historically) prevented any spurious collapses of shelter inflation from materializing. The collapse in rent inflation during the Great Recession was not driven by measured nonpayment. But undermeasured non-

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

[2] The CPI is used for many purposes, and its measurement goal should determine measurement procedures. This paper takes the point of view that is stated in the CPI 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. The cost of living is affected by many things not captured in market transactions, and the cost of achieving a living standard cannot be observed directly, so the CPI only approximates a cost-of-living index. The CPI is sometimes called a conditional cost-of-living index, since the factors that affect the cost of living that aren't in scope are implicitly held constant. The concept of the cost-of-living index guides the CPI measurement objective and is the standard by which any bias in the CPI is defined."

payment may have led to errors in estimated rent inflation. Unfortunately, well-measured nonpayment data over our sample period do not exist, so we cannot estimate the error in rent inflation caused by nonpayment undermeasurement over this period. However, nonpayment data are available since April 2019. A back-of-the-envelope calculation suggests that (given the stated official treatment of rental nonpayment) CPI shelter inflation may have been overestimated by about 1 percentage point per month (annualized) in 2020.

A significant measurement challenge related to both late fees and nonpayment relates to uncertainty: at the time that a rent quote is collected, it may be difficult or even impossible to know whether a missed payment will translate into a late payment or a nonpayment. We provide a solution to this dilemma. 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.

Owing to the difficulty of measuring nonpayment, a statistical agency might decide that it should eschew measuring rent expenditures per se—as this would appear to obviate the need to track nonpayment—and pursue a contractual obligation approach. But we demonstrate that even in this case, 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. The BLS produces three major shelter indexes: rent of primary residence ("Rent"), owner's equivalent rent of primary residence ("OER"), and lodging away from home. Rent and OER are the focus of this study.

The BLS maintains a sample of about 43,000 rental units. The BLS currently rotates its entire sample every six years;[3] thus, any given unit is repriced for six years, whether the tenant has changed or not. However, given the predominance of 12-month rental contracts, concern for respondent burden, and budgetary constraints, the BLS 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.[4] As we explain below, this has profound implications for measuring 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

[3] In the first half of our sample, the BLS retained rental units in its sample for more than six years.

[4] Of course, as is evident in Equation (1), what is needed is an accurate reading of the six-month change in rent. But it is precisely for this reason that the current month's reading must reflect the average payment over a six-month period, rather than simply this month's payment (which may be abnormally small or large). This is a central issue in this paper and we discuss it at length below.

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; for example, rent-controlled units receive 0 weight in the OER index, and the OER index places higher weight on rental units in neighborhoods with high owner expenditure.[5]

During estimation and review, the BLS also computes a unit-level "rent relative" that is used in data review (to ensure that no recording errors enter the index), 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 the OER relative. Extreme rent and OER relatives are always flagged ("flinched") and reviewed, with follow-up interviews with the data collectors so as to prevent errors being introduced into the index.

Another detail is worth noting. 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. 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.[6] As averages are sensitive to extreme observations, such winsorizing removes noise from the rent and OER indexes, without introducing bias.

3 Late payment fees for rent

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.[7] In the real estate context, late payment fees are typically not a substantial source of revenue, 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"[8]) and left to the courts to determine on a case-by-case basis. Still, late payment fees are large

[5]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) argue that the OER weights should reflect structure type as well. Their rationale is that while most owned housing is detached, only about 27 percent of the rental market consists of detached homes, and their work demonstrates that there can be a significant inflation differential based on structure type. For more details on BLS index construction (and how rent and OER indexes differ), see, e.g., Poole and Verbrugge (2010) or the BLS Handbook of Methods.

[6]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.)"*

[7]In his model, under some conditions, landlords will give a rental *discount* to tenants with late payments. This discount would, of course, be measured by a price collector.

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

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)).

The existence of late payment fees means that what renters actually pay, particularly for low-income tenants, often exceeds the sticker price. A failure to take these fees into account implies that we will likely mismeasure changes in expenditures required to maintain a fixed standard of living.

In the US, late payment fees on rents are considered out of scope for the index and are not measured. The rationale for this policy is that these fees are considered finance charges for short-term loans. CPIs track current expenditure; financial assets are considered out of scope. Quoting from the CPI Handbook of Methods:[9] "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 also are out of scope. 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 treat late payment fees as a finance charge or fine, and thus as out of scope for the CPI.

We believe that late payment fees should be included in the CPI because: they are so customary in the rent setting—effectively, part of the ordinary cost of the rent for many households—and thus more akin to sales taxes (which are in scope) than to fines or finance charges; they are an expense connected to an ordinary living expense (rent) rather than a purely financial transaction (credit-card borrowing); and their magnitude is so large (ignoring them represents a notable underestimate of the cost of living for low-income tenants).

How might one appropriately address the (limited) intertemporal dimension of these "late" fees? In the US context, the simplest method would be to track the *current* contractual rent obligation at the time of the price collection, and to adjust this by the amount of the late fee if the tenant incurred a late payment fee *for the most recent rent payment*. Given the timing of rent collection, often this fee would relate to the previous month's rent, rather than the current month's rent. A one-month lag is not ideal for two reasons: recall is imperfect, even for one month ago,[10] and it would often introduce a lag (since it refers to the payment of last month's rent, rather than this month's rent).

In the US context, we nonetheless recommend this method for pragmatic reasons. Consider a tenant of a rental unit in the sample that pays such fees more often than not. At the time that the CPI field staff contact either the tenant or the landlord for the current rent quote, this month's rent may not yet have been paid (so

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

[10] Crone et al. (2010) discuss tenants' "one month recall bias" in the context of their historical survey of improvements in BLS methods. This phenomenon imparted a bias in the CPI that was mostly eliminated when the BLS corrected a bias related to the pricing of vacant units (Rivers and Sommers (1983)) and completely eliminated when the BLS discontinued use of these one-month responses (Armknecht et al. (1995)).

the fee has not yet been assessed), even though the current contractual obligation (the lease terms, which may have recently changed) is known to the tenant. Thus, insisting that the late payment refer to the current month would sometimes require the respondent to enter a projection rather than an actual payment.

Next, we ask: should the late payment fee be "prorated" to put it on a six-month basis? As discussed in the next section, including the late payment fee in this month's rent amounts to an implicit assumption that the late payment fee will be part of the rent until the next price collection. Entering the full amount of the late fee would impart no long-term bias in the index; six months from now, if late payments have ended, the current contract rent will be recorded. But for most tenants, incurring a late payment fee is the exception rather than the rule. For this reason, we argue that the late fee be treated as a transitory (one-month) increase in rent. This, in turn, implies that this month's rent reading should be: the contractual rent obligation at the time of the price collection, plus 1/6 of the late fee if the tenant incurred a late payment fee *for the most recent rent payment*.[11] We explain why, next.

4 Nonpayment incidence: Measurement and implications of nonpayment for shelter indexes

How should nonpayment be measured? And why do we recommend that only 1/6 of the late payment fee enter the rent quote? In the US context, we can obtain some guidance from how the CPI handles a similar and important case: the "first-month's rent free" (FMRF) case. Its treatment is intimately tied to the six-month orientation of the CPI shelter indexes.

Landlords occasionally offer new tenants concessions, a common one being FMRF—in other words, 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. 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 $5r$. The BLS determined that it does not make sense to enter \$0 as the rent, if data collection for that unit happened to land on the first month. Why not? This would be misleading, since—given the six-month orientation of the index—entering a rent of \$0 would effectively imply that the rent is \$0 for the next five months. Hence, 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 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. After the six-month period ends, going forward the BLS would then use the actual rent paid by the tenant.

To underscore the validity of this perspective, we appeal both to economic theory and to pragmatic considerations. In an economic model, the appropriate notion of cost is rarely the payment owed at any given instant. Signing a contract obligates one to a stream of payments over the course of the contract, and

[11] Having said this, late fees are typically small enough so that allowing the entire late fee to enter the rent quote would impart little additional volatility into the index, unless there is a very significant surge in the incidence of late fees.

the sum of those payments (appropriately discounted) is the total cost of that contract. Both the logic of the economics and basic accounting principles would lead one to the conclusion that if one wished to compute the "monthly" cost of this contract, the monthly cost in the first month would not be zero, simply because no payment is due at that moment.

A second rationale for avoiding a $0 rent is pragmatic: using $0 would introduce noise into the index, since averages are very sensitive to outliers. Since it bears on our discussion of nonpayment, we next demonstrate how the use of a "5/6" rule for this case compares to the use of a $0 rule. The "5/6" rule is shown to yield inflation estimates that are less volatile, and more sensible, than using $0.[12]

4.1 Implications of $0 versus 5/6*r*

Consider the following simplified example, depicted in Figure 1a.

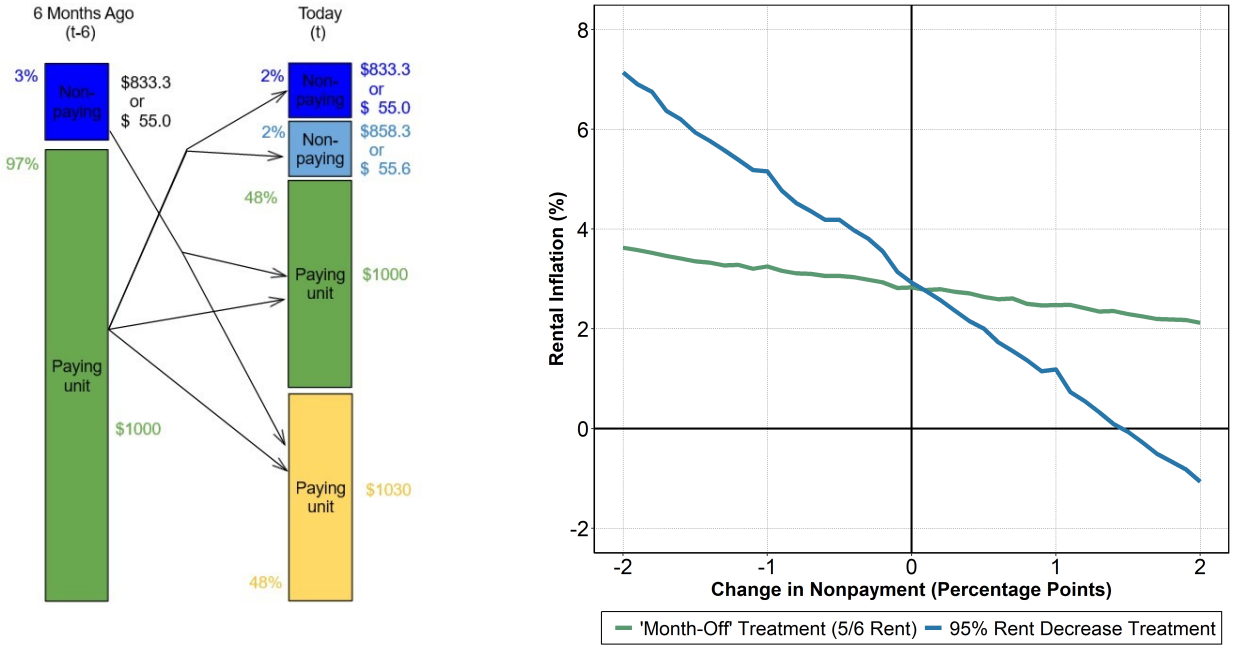
We assume that: all units have equal weight in the rent index; contract rent six months ago was $1000 for all units; when rents adjust, rent increases by 3 percent, to $1030; and rent renewals occur at 12-month intervals, but renewal dates are distributed uniformly over the 12 months. This implies that half of the units will have received contract renewals since the last collection period.

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, the number of units in FMRF status rises from 3 percent of units to 4 percent of units.

[12]Note that the logic of this procedure implies that the BLS should require its data collectors to determine whether the FMRF procedure should be applied whenever they encounter a new tenant. For example, suppose the data collector responsible for obtaining the rent on unit *j* in March (and September) encounters a new tenant in March, and this tenant paid the full rent *r* in March. However, if this tenant received a promotional FMRF two months ago, their current rent should be recorded as (5/6)*r*.



(a) (b)

Figure 1: 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.

If we had been depicting a steady-state situation, Figure 1a would have depicted 3 percent of units in FMRF status today. In this steady state, 3 percent of the units are experiencing a 95 percent rent drop (or a 1/6 drop), but also 3 percent of the units are experiencing a (roughly) 1800% 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.

But now let us consider what happens when there is a 1 percent increase in the number of units experiencing a FMRF promotion. First, we apply the BLS 5/6 rule. Equation (1) then yields an inflation reading of 2.67 percentage points, a notable deceleration (of about 0.4 percentage points), but one that passes the sniff test.[13] Next, we apply "$0 rents" for these units. Equation (1) then yields 1.02 percentage points (from its previous level of ≈ 3 percentage points), a decline of over 2 percentage points—even though only 1 percent more units are getting free rent *for only one month*. The rationale for the 5/6 procedure is clear. Not only does this treatment of a paying $0 for a month correspond more closely to the bottom line of the household budget, it also prevents the index from sharp declines—reducing inflation volatility, and making the inflation measure more useful for households and practitioners, without influencing its long-run movements.

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

4.2 Nonpayment and the implications of \$0 versus 5/6r

Next we consider nonpayment. For simplicity, in this subsection we abstract from uncertainty, and assume that a landlord can observe whether a payment is merely delayed or will never be paid; and we assume that nonpayment always lasts for exactly one month.

Under these assumptions, notice that 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—in other words, the same as an FMRF case.

Thus, we can continue to use Figure 1a; only we now posit that there are no units in FMRF status in either period. Instead of being in FMRF status, the blue rectangles now depict units for which tenants did not pay the rent.

The same math applies: when nonpayment increases by 1 percent, a \$0 rent treatment would result in a dramatic decline in inflation, while a 5/6 treatment would result in a "notable but moderate" deceleration. At the onset of a recession, a 1 percent increase in nonpayment seems quite plausible.

In fact, on a monthly basis, a 1 percent increase might be on the small side. In April 2020, the US Census Bureau initiated a recurring Household Pulse Survey, a 20-minute online survey studying how the coronavirus pandemic was impacting households. One question asked renters about their confidence in their ability to make the next month's rent payment. Among survey respondents, the fraction of renters reporting either "no confidence" or only "slight confidence" in their ability to pay next month's rent has hovered in the 25-33 percent range since August 2020. (We discuss National Multifamily Housing Council (NMHC) nonpayment data below.)

We display the relationship between a change in nonpayment incidence and the resultant change in inflation in Figure 1 b. The relationship is approximately linear. In this figure, the relationship between the change in nonpayment incidence and rental inflation under the \$0 rule assumption is given by the blue line. Notice that if nonpayment increases by about 1.5 percentage points, rent inflation becomes negative (and in like manner, if nonpayment decreases significantly, rent inflation rises sharply). And once nonpayment decreased back to its original level, rent inflation would experience a boom. We would view this collapse (and subsequent boom) in shelter inflation as spurious.

Conversely, the green line depicts the implications of various percentage changes in nonpayment if it were treated according to the 5/6 rule. Viewing this 5/6 method as yielding correct inflation estimates, then the estimated inflation changes implied by a \$0 treatment as a result of a 1.5 percent increase in nonpayment (that lasted six months, and then reverted) would result in 12 months of measurement errors that would be larger than the biggest source of bias identified by the Boskin Commission—see Boskin et al. (1997).

4.3 Current CPI procedures

The current CPI treatment of nonpayment is, effectively, the \$0 treatment. What does the BLS do when the data collector determines that the renter did not pay his rent? 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.[14]

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 exactly the contract rent. Since this rent has not been paid, such an entry corresponds to an *expectation*, rather than any actual payment. Expectations errors could thus enter the index, and probably in a manner that induces short-term bias, since (to explain our results below) landlords must typically overestimate the probability of eventual full payment.[15] The second bullet point indicates that, given the six-month orientation of the index, the BLS is effectively treating any agreed-upon rent concession in the current month as a rent concession that continues unabated for the next five months—even though (as we discuss in more detail below) the logic of the FMRF case applies equally well to this case. Likewise, the third bullet point indicates two important points. First, if the rent is unpaid and the landlord is unsure about the future, then the BLS does *not* record the contract rent but instead records the actual payment; this reveals that its current objective is evidently not to track contract rents, but instead to track actual payments. Second, the BLS effectively assumes that the landlord will accept $0 in rent on this unit for this month and for each of the next five months. As in the case of bullet point two, note that the six-month logic of the FMRF case applies equally well to this case.

What are the implications for shelter inflation measurement?

Rent inflation is notoriously sensitive to unemployment fluctuations (see, e.g., Zaman (2019) and Stock and Watson (2020)). The $0 treatment of nonpayment could be a major channel of this sensitivity.[16] First,

[14] On this point, we (the authors) note that owing to COVID-related uncertainty, this time could be different from the Great Recession, if the nonpayment uncertainty facing a landlord this time is perceived as appreciably different.

[15] We believe that it is quite likely that nonpayment in the survey month will be treated as a delayed payment, in which case this nonpayment will have no influence on the CPI, despite the fact that the landlord may never collect the contract rent.

[16] This is the point of view in Hill (2021) for the current (early 2021) environment, which attempts to estimate the degree of January 2021 rent deceleration due to the $0 treatment of nonpayment. The strong connection between the unemployment rate and shelter inflation rate may ultimately explain why the Phillips curve specified in terms of the median PCE or trimmed mean PCE is well-behaved and does not weaken over the Great Recession (see Ball and Mazumder (2019) and Ashley and Verbrugge (2020)).

we examine whether nonpayment drove the 2009 collapse of shelter inflation. After that, we examine quantitative implications for 2020, a period that is not part of our sample.

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

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, nonpayment of a unit's rent in a given month must be deduced. This is not only because the follow-up that is implicit in the procedures quoted above is difficult and time-consuming work for BLS field staff, but also because the data-collection instruments make recording the necessary details difficult. 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. While any necessary information for accurate index construction is eventually communicated to analysts in the head office, these details are not necessarily recorded in the database.[17]

One type of nonpayment, delayed payment, may be impossible to measure accurately, as such data need not be conveyed in text fields. BLS procedures imply that nonpayment will only be recorded under the second and third bullet points. Payments that are deemed delayed by field staff are not discernible in the rents recorded in the microdata, and hence will have no impact on the CPI. At present, we do not know how prevalent this situation is.

If some rent is forgiven (second bullet point), then the renegotiated rent will enter the index. We do not have a clean way to measure this case; it will simply appear as a reduction in the rent—one which, given the previous section, implicitly refers to a six-month reduction in the rent.

In addition to using $Rent_i(t)$, the collected rent, we construct alternative nonpayment measures based upon $rent_i^*(t)$ and $rent_i^{*,o}(t)$. One advantage to doing so is that, as opposed to collected rents, these are the rent measures that actually enter their respective indexes. This will more clearly indicate the drivers of inflation estimates, our ultimate goal.

There is another challenge to our analysis. 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

[17] While uncertainty remains in the historical data, this does not imply noise in the CPI itself. To ensure data accuracy, the BLS "flinches" all questionable data entries and then analysts in the Washington, D.C. office review them. These entries prompt subsequent discussions with the data collectors.

living in one of the units rent-free.[18] We remove such records, since these do not reflect nonpayment.[19]

We construct three measures to estimate the incidence of nonpayment in month (t). Measure 1 consists of the percentage of valid observations per year that satisfies criterion 1 below, and so on. We distinguish between units in the Rent index and units in the OER index, because these indexes may be of independent interest. The sample of units that receive positive weight in OER is nearly a strict subset of those receiving positive weight in rent, and the OER has a much larger weight in the CPI. 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.[20]

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. We found only one single incidence of zero dollar rent (in measure 3) over the entire 2000-2016 period. As this was not accompanied by $Rent_i(t) = 0$, we are inclined to treat this as an anomalous entry. But our main point holds whether or not there is one single instance or zero instances of zero dollar rent. To emphasize this point, out of over 1 million observations (roughly 43,000 rental units, each priced twice a year), there was not a single instance of nonpayment. It is possible that the collapse in measured shelter inflation in 2009 was actually *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 Implications of accurate nonpayment measurement, in conjunction with the $0 treatment

Next, we attempt to quantify the potential importance of (undermeasured) nonpayment. The incidence of measured nonpayment in the CPI data appears to be strongly at odds with the historical eviction rate data (see Figure 2). Nonpayment is the chief cause of eviction,[21] and the eviction rate ranged between 2.3 percent

[18] The BLS uses information on subsidies and work reductions, along with collected rent, to construct "normalized" rent. This is then subject to further adjustments to produce the measures used in the Rent and OER indexes.

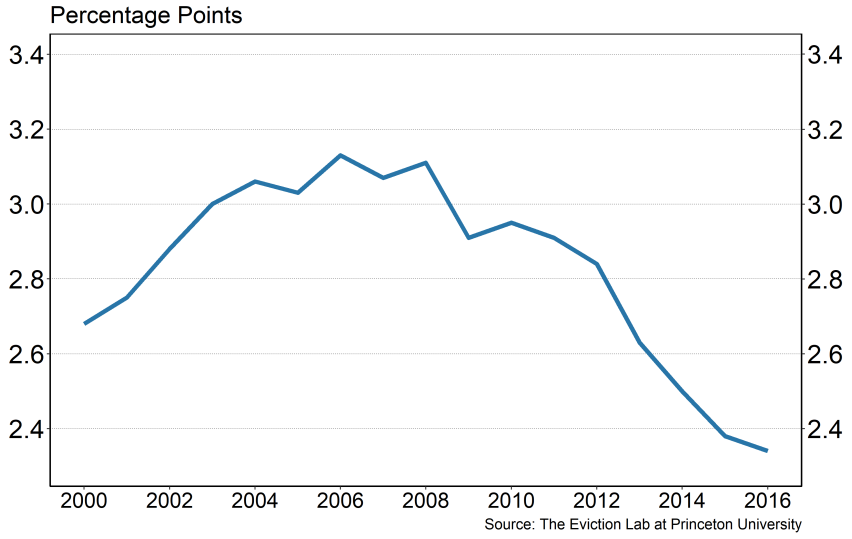
[19] Further data-cleaning steps were necessary. We retained only those units that the BLS considered valid for use in index estimation and that had an interview where all rent-related questions were completed. We also removed all observations with a new tenant.

[20] The BLS microdata contain no flag for "one month free."

[21] See Coulson et al. (2020), who study the relationship between evictions, tenant protections, and rents. Note that an eviction filing may signify more than one month of nonpayment; Robinson and Steil ("forthcoming") 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.

to 3.1 percent of renter households over the 2000-2016 period.[22,23] 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 CPI accuracy. This seems plausible, since eviction rates do not appear to be cyclical. However, it is difficult to draw clear conclusions, since eviction rates are a rather noisy signal of nonpayment, and since the sample is so short and "contaminated" by a surge in homeownership and a housing bubble in the early 2000s.

Figure 2: Eviction Rate



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 on 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

[22]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.

[23]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)).

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.

We can use NMHC data to get a sense of the potential importance of nonpayment for inflation, taking as given that the CPI measurement target currently involves a $0 entry for nonpayment. In particular, we provide a back-of-the-envelope calculation relating to shelter inflation over the past year. Note that nonpayment as measured by the NMHC may be an overestimate. Some of the rent payments recorded as missed will eventually be paid. Of course, NMHC nonpayment may also be an underestimate: the underlying data are derived only from professionally managed apartment complexes, and nonpayment is higher among lower-income renters who are more likely to live in smaller apartments. Furthermore, we do not know how nonpayment in professionally managed apartment complexes compares to, say, nonpayment in mom-and-pop-managed detached rental units. But suppose we make two strong assumptions: first, that the true national nonpayment rate over this period was *half* of the NMHC-measured rate; and second, that even after 2016, no nonpayment is measured. Under the first assumption, NMHC data allow us to compute the 6-month change in actual nonpayment for 12 of the 25 months in this sample. These range from a decrease in nonpayment of 0.1 percentage points to an increase in nonpayment of 1.25 percentage points. Given the $0 nonpayment procedure being in effect, then over the January 2020-January 2021 period, the downward force on annualized Rent and OER inflation rates induced by nonpayment should have been -0.99 percentage points (and over that period, the maximum nonpayment-induced monthly change would have been 2.5 percentage points).[24] If we assume all nonpayment was missed, then this implies that rent and OER shelter inflation may have been overestimated by about 1 percentage point per month (annualized) since January 2020.[25]

4.6 Our recommendations

Treating nonpayment appropriately is challenging for several of the reasons noted above. 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 become a late payment. It is also impossible to determine whether today's missed payment (for the current month) conveys information about another missed payment next month. To maintain timeliness and still measure the current month rent accurately (and thus avoid costly follow-up and inflation revisions), CPI staff would have to enter a forecast of future uncertain events. To our knowledge, CPIs in most countries only measure actual prices (even if these are being used to impute unobserved prices),

[24]Furthermore, if changes in nonpayment had been perfectly measured, then under the $0 treatement, the monthly volatility in nonpayment would have induced considerable volatility in inflation: we estimate that the standard deviation of monthly nonpayment-induced rent changes would have been about 1 percentage point.

[25]Based upon information received from the BLS, Omair Sharif (of Millenium Management) 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.

not forecasts of prices.

Ostensibly, the easiest thing to do would be to ignore nonpayment entirely, and to publicly state that the CPI is pursuing a sticker price (or contractual obligation) approach, so that missed payments are irrelevant. But some nonpayment is, in fact, a reduction in the contractual obligation. In particular, as reflected in bullet point 2 describing the US CPI's approach, ignoring missed payments would ignore any negotiated temporary reduction in the contractual obligation. In such a case, the rent has been lowered on this unit for this month, and this reduction should be reflected in the CPI. In other words, a contractual obligation approach would mandate that this reduction in the contractual obligation be measured.

Thus, nonpayment is a difficult measurement challenge that appears to be unavoidable.

For the case of the US, we again provide a suggestion that takes a pragmatic approach. In keeping with our late payment recommendations, we suggest that the BLS track the *current* contractual rent obligation, and to adjust this using the 5/6 rule (and not the $0 rule) if the tenant failed to pay the rent *last* month. As noted in our discussion about late payment fees, a one-month lag is not ideal due to recall problems—although in the nonpayment case, it is quite possible that recall is much more accurate, in that it is highly likely that both the tenant and the landlord are well aware that last month's rent was unpaid—and this "last month" treatment would introduce a lag. And our procedure will yield the "wrong" answer sometimes. In particular, in some cases, that missed payment will actually be paid, while in other cases, missed payments may extend over many months.[26] Still, we believe that this suggested 5/6 treatment would result in a considerably more accurate reading of the change in rent expenditures than does the current treatment.

Our proposed method is simple and unambiguous, making it easy to explain to field staff and straightforward to implement. 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 nonpayment was previously unmeasured. It enhances the accuracy of those indexes—even if, ex post and with complete information, it is not 100 percent accurate. Finally, it avoids follow-up studies and the necessity of correcting the index for prior months. There is a very tight constraint on correcting errors in the CPI: the BLS has a longstanding policy of not revising its non-seasonally adjusted CPI indexes, unless an egregious error is discovered. Conversely, requiring that the CPI be 100 percent accurate would require repeated extensive follow-up on many rent quotes (which would be prohibitively costly) and would require revising the CPI every month to correct for errors in preceding months.[27]

[26] Without further information, it is impossible to know which error is more likely. The BLS could begin to track this information by asking landlords, six months later (at the next price collection), how things actually turned out.

[27] 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.

5 Conclusion

Shelter occupies a large weight in the CPI, and thus, accuracy in its measurement is crucial. We study late payment fees and nonpayment, and their appropriate treatment in a CPI, given the considerable measurement challenges they present. We investigate how late fees and nonpayment are currently treated in the US context and offer our suggestions.

We argue that a guiding principle for measuring rent expenditures is that one should track the actual expenditures required to remain in a rental unit, rather than track 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. Thus both should be included in the CPI.

In the US context at present, late fees are excluded from the CPI. Ostensibly, nonpayment is included in the CPI, though it is treated in a manner that is inconsistent with other BLS procedures, and—as a result of this inconsistency—in a manner that could result in spurious collapses and booms in shelter inflation. But nonpayment is undermeasured. In particular, while external data sources on nonpayment and eviction rates suggest that nonpayment rates are typically on the order of 2-3 percent, we find that the CPI rent microdata from 2000-2016, with over 1 million observations, contain zero instances of nonpayment. This undermeasurement problem has (historically) prevented any spurious collapses and booms in shelter inflation from materializing.

A significant measurement challenge relates 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. Our solution to this problem is pragmatic: BLS field staff should determine the current contractual rent obligation and also inquire about what happened *the previous* month. If a late fee was paid last month, or if a payment was missed, then the current rent should be adjusted: by 1/6 of the amount of the late fee (if this was incurred), or by using the "5/6" rule (in the case of nonpayment), which amounts to a 1/6 reduction in the contract rent. Because it relates to fees and nonpayment of the previous month, this procedure will introduce a one-month lag into the Rent and OER indexes (though only with respect to late fees and nonpayment), but will enhance their accuracy. In our judgment, this is an acceptable tradeoff.

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