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Constant Quality Rent Indexes for Affordable Housing

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Abstract

This paper develops and applies a method for producing constant quality rent indexes and inflation estimates for different segments of the rental housing stock. In each of the five contrasting metropolitan areas, rent inflation since the late 1980s is found to have varied by market segment. In some metro areas, rental prices have risen most rapidly in the bottom third of the rent distribution, while in other metro areas rental price increases have been greatest in the top third of the rent distribution. The proportion of rent increase attributable to price change, and the estimated annual increase in housing quality, vary by metro area and, within metro areas, by market segment.

The method can also be used to price the same bundle of housing attributes across metro markets. Not surprisingly, rental prices are found to vary substantially across markets. However, the differential depends on the market segment. For example, nationally typical upper market rentals are more expensive in Buffalo than in Phoenix, but typical lower market apartments are less expensive in Buffalo than in Phoenix.

The results have potential implications for policies and programs targeting the lower rent, or “affordable,” segment of the rental market. Reliance on a single rental index for a metro market can produce misleading indications about where rental prices in the affordable market are highest and where they are increasing most rapidly. As for future research, more could be done to estimate these indexes for more areas, to explain why the results differ from metro to metro, and to identify specific housing policies and programs that could be improved through application of rental price indexes for the affordable segment of the housing market.

Introduction

Rents vary widely from market to market and over time. Rents paid depend on both what is being occupied and the price being paid for it. Economists characterize rent as an expenditure that is the product of the quantity of housing consumed ("q") and the price ("p") paid per unit of q. Changes in rent over time can reflect changes in the characteristics of the housing (q) or changes in prices (p). Similarly, differences in rents from one local market to another can indicate differences in either housing characteristics or housing prices or both.

"Quantity" as used by economists is really an amalgamation of all of the size and quality attributes that are valued by consumers and provide housing services. For some research purposes it is treated as a single-dimensional composite, while for others the multidimensionality of housing features is retained.

It is desirable to be able to disaggregate rent into its quantity and price components. Inflation monitoring requires that the same "bundle" of housing attributes represented by q be priced over time. Cross-sectional comparisons of the cost of living in different areas require the same constant-quality set of housing features be priced in each market. The "q" component of rent is useful as an indicator of changes over time in the quantity and quality of housing occupied and of differences across markets in housing conditions.

Disaggregation of rent changes into their p and q components is especially important at the low end of the rental market, sometimes referred to as the "affordable" segment of the market. If rent increases in this segment of the market reflect improved housing quality, the public policy implications are different than if the rent increases are purely inflationary.

The importance of the disaggregation of rent into price and quantity components has been recognized in government statistical programs and in research in government, academia, and private industry. Most prominently, the Consumer Price Index (CPI) has a rental housing component that dates back to 1913. In brief, the CPI measures rent inflation (changes in p) by tracking individual rental housing units and recording changes in their rent, after adjustments for any changes in the quality of housing provided by that unit.

Economists in academia have supplemented the rental price information from the CPI, most often with price indexes developed through a statistical approach known as "hedonic regressions." This approach uses survey data on rental housing units to determine statistically the relationships between specific housing characteristics and the rent paid for that housing. In this literature, the estimated contributions of individual housing attributes to rent are known as the shadow prices of those features. Once these shadow prices are estimated, any combination of housing attributes can be priced. The shadow prices can be estimated for different time periods and across different local markets if comparable survey data are available. Hedonic regressions can therefore be used to estimate the rent for any fixed set of housing attributes, and how that estimated rent varies over time and across markets.

Rental price indexes usually are produced as market averages. That is, only one index is estimated for any geographic market at any point in time. The CPI, for example, measures the average percentage rent increase across all rental units in the geographic market. And most hedonic estimates are for the typical unit, or more precisely, for the market's distribution of housing features.

But there are both theoretical and empirical reasons to believe that a single price index may not be adequate to accurately reflect (1) price changes over time for all quality segments of the rental stock within a geographic area or (2) cross-sectional differences in rents for all segments of the rental stock. Segmentation of the housing market has been a theme in the literature for many years (Sweeney, 1974; Schnare and Struyk, 1976). Consumers' demand for housing is determined by their incomes, demographics, and preferences. All of these determinants vary widely across households. As a result, the amount, quality, and location of housing demanded also vary widely. The housing stock supplied is similarly diverse. As demand for housing in different segments changes, the extent and speed of the supply response in those segments determines what happens to prices. Together, shifting demand across market segments and sluggish supply responses cause price changes to vary across market segments.

The possibility of market segmentation is evident in the national statistics on rent increases. According to the American Housing Survey, between 1991 and 2001, the median gross rent (contract rent plus utilities) nationwide rose 3.2 percent annually. But at the low end of the rental market, represented by the bottom third of the rent distribution, the annualized increase was 3.7 percent while in the top third of the market the typical increase was only 3.1 percent.

These differences in rent inflation by segment may be attributable to improvement in housing conditions or to increases in prices or to some combination. Furthermore, the relative contributions of p and q to the rent change can differ by segment.

Direct empirical evidence in support of segmentation and differences in rental housing prices by quality level comes from at least two sources. One is the Consumer Price Index. In addition to the "rent of primary residence" (RPR) subindex, the CPI also includes an "owners' equivalent rent" (OER) subindex. OER is, loosely, a rent index for the type of housing occupied by homeowners. This housing tends to be bigger and fancier than the typical rental housing unit. Therefore, OER can be viewed as a rent index for high quality housing units.

Over the period since 1988, OER has increased at a rate significantly different from that of RPR, for the nation overall and in a number of major markets.[1] As shown in Table 1, for the U.S. the price increase for high end rentals, as estimated by OER, has been 10 percent above that for rentals overall, as estimated by RPR. The comparison varies substantially from market to market, however, with OER exceeding RPR by 32 percent in Saint Louis, but falling 5 percent short of RPR in four separate markets among these 12 for which CPI estimates are available. For the U.S., the annualized increases corresponding to the cumulative increases in Table 1 are 3.0 percent for RPR and 3.3 percent for OER.

[1] 1988 is chosen as the start point for this comparison because of methodological improvements in the CPI housing components introduced that year.

Table 1:
Percentage increase in rents by CPI measures, 1988-2004

geography	rent of primary residence	owners' equivalent rent	ratio: owner eq / rent
U.S. Total	62.3	68.4	1.10
Metro Areas			
NY	76.1	81.1	1.07
Philadelphia	56.5	61.4	1.09
Boston	77.4	77.3	1.00
Pittsburgh	46.4	63.2	1.36
Chicago	76.7	79.0	1.03
Detroit	49.5	60.3	1.22
St Louis	41.3	54.5	1.32
Cleveland	61.4	58.2	0.95
Minneapolis	59.5	64.7	1.09
Milwaukee	53.1	65.8	1.24
Cincy	48.6	56.8	1.17
Kansas City	58.6	55.8	0.95
Dallas	55.2	54.5	0.99
Houston	84.6	80.0	0.95
Atlanta	49.4	53.1	1.07
Miami	62.0	63.9	1.03
Los Angeles	56.7	61.1	1.08
San Francisco	86.6	82.7	0.95
Seattle	71.6	85.6	1.20
San Diego	76.4	82.1	1.07
Portland	66.1	81.1	1.23
Honolulu	48.7	52.0	1.07
Anchorage	71.3	70.8	0.99
Denver	78.8	80.6	1.02

Source: author's calculations of CPI data.

Additional evidence on price differences by segment comes from Thibodeau (1992; 1995), who produced hedonic price and inflation estimates for low quality rental housing. Using data from the AHS metropolitan area surveys from 1974 through 1983, Thibodeau (1992) defined substandard rental housing as those units reporting one or more from a set of eight serious physical deficiencies related to facilities, heating, plumbing, or electricity. These substandard units were then assigned hedonic rents based on their full set of characteristics and the shadow prices assigned to those characteristics in the hedonic model estimated for all rental units in that market. Based on these estimates, Thibodeau concluded that the discount at which substandard housing is priced relative to standard housing varies from market to market and that, within markets, rents of substandard and other rental housing have increased at varying rates.

This previous work demonstrates that market segmentation results in different inflation rates and in cross-section differences in rents for different segments of the rental housing market. But the estimates produced by this prior research are not sufficient for our purposes. The CPI owners' equivalent rent index is a de facto high segment rent index and says nothing about possible segmentation at the low end. Furthermore, the CPI rent and owners' equivalent rent indexes cannot be compared across geographic markets because the indexes are specific to the mix of housing characteristics in the market areas for which the indexes are calculated. The Thibodeau estimates are for a specific low-quality housing bundle, which may or may not be representative of all units in that segment of the market. And those estimates are now at least 13 years out of date.

The purpose of this research is to present and apply a method developing rental price indexes that builds on this previous research by providing time series and cross section indexes representative of the mix of units in the high, middle, and low segments of the rental housing market.

The Approach

The principal innovation in the approach here is to use rent to identify the quantity/quality segments of the rental market and then to use hedonic regressions to price the fixed sets of housing attributes found in those rent ranges at different points in time or across different local markets.

The advantage of this approach is that it can produce estimates representative of any quality segment of the market. It is more general and flexible than methods that price the typical unit or housing units of arbitrarily selected profiles. That is, the method used here produces a rent not for a typical unit but for a typical mix of units. That mix can be defined as of any time and any place.

The approach can be illustrated with an example of how it can generate constant quality rent indexes and inflation estimates for three quality segments of a metro area's rental market.

Step 1. Use all occupied, rent-paying housing units in the metro area to estimate a hedonic equation for time period t, generating a vector of estimated shadow prices $\mathbf{P_t}$ for a set of housing and location attributes represented by vector **Q_t**. This hedonic regression will generate a predicted rent ^ **R_t** (^ indicates predicted) for each of the units in the regression sample.

Step 2. Repeat, for time period t+1 the same specification as the hedonic equation estimated for t in step 1. Estimate on all the occupied rent-paying units in the metro market in t+1. These units have attributes represented by **Q_{t+1}**. This estimation will generate an estimated price vector **P_{t+1}** and for each unit a predicted rent ^ **R_{t+1}** .

Step 3. Take the housing units in the bottom third of the rent distribution (actual rent, not predicted) in t, and calculate the median value of ^**R_t** in this segment as well as the segment's mix of characteristics as represented by **Q_t**.

Step 4: Price the bottom third's mix of characteristics Qt using the shadow price vector **P_{t+1}** estimated in step 2. Label the resulting estimates ^**$R_{Qt,Pt+1}$**

Step 5: Calculate the constant quality rent increase for units in the bottom third of the rent distribution as the median of ^**$R_{Qt,Pt+1}$** minus the median of ^ **R_t** . [2]

Step 6: Repeat steps 3, 4, and 5 for units in the middle third of the actual rent distribution in t, and then for units in the top third of the rent distribution.

Measures of inflation need to select the bundle **Q** being priced. The three indexes developed above are based on the bundle Q observed in the low, middle, and upper thirds of the rent distribution. Those characteristics are as of time period **t**, the beginning of the interval over which the inflation measures are calculated. Price indexes such as these that fix the characteristics at their beginning values are called Laspeyres price indexes.

An alternative family of price indexes, called Paasche indexes, defines the bundle of attributes as of the end of the observation period. In our application, that means defining the Q mixes for the three segments of the market based on the characteristics of housing in the rent groups defined in t+1. Because the characteristics of housing in the low, middle, and upper quality ranges will shift over time, Laspeyres and Paasche index values generally will differ. The appropriate choice between these two indexes depends on the application.

A final price index, the Fischer Ideal index, balances these two alternatives and is constructed as the geometric mean of the Laspeyres and Paasche, that is, as the square root of their product. The results later in this paper report values for all three index definitions.

[2] The median observation in the bottom third of the rent distribution is the observation nearest the 17th percentile of the full distribution. Calculating the constant quality rent increase as the difference in intra-segment medians, as opposed to means, reduces the influence of the intra-segment distribution of predicted rents.

Data

The data used in the estimation come from the American Housing Survey (AHS). It is the best source of detailed housing data on representative samples of the housing stock for the U.S. overall and for individual metro areas that are surveyed separately. For these first estimates, five markets were selected that differ in size, growth, incomes, and land use: Boston, Buffalo, Dallas, Milwaukee, and Phoenix. Each of these metro areas was surveyed in either 1988 or 1989, and then again in 2002 (except Boston, which was most recently re-surveyed in 1998). The analysis was conducted over this period to provide an observation interval long enough to reveal longer run market performance, while avoiding non-comparabilities encountered in using AHS data for years prior to the mid-1980s. The geographic boundaries of these five metro areas were unchanged in the AHS over this period, unlike many other AHS metros.

Throughout this analysis, the rent variable analyzed is monthly gross rent, which is defined as what the resident pays the property owner/manager plus any additional payments the resident makes for utilities. The analysis excludes vacant rental units, vacation properties, and units occupied by renters who do not pay cash rent. In each metro area, approximately 1100 to 1500 sample observations were used in the estimation.

Rent growth in these markets since the late 1980s is summarized in Table 2. Two facts about rent growth can be drawn from the table. First, as is well known, rent inflation varies substantially from market to market. As described in the note in Table 2, the increase in median rent in the market is represented by the percentages in the "middle third" column of the table. Across these five metro areas, the annualized increase ranges from a low of 2.3 percent for Boston to a high of 3.6 percent for Dallas. This difference may not seem large, but compounded over a 10-year period totals 43 percent in Dallas but only 26 percent in Boston. Incidentally, these AHS-based estimates of gross rent increases by market are similar to those calculated by comparing the gross rents reported in decennial Censuses of 1990 and 2000.

The second fact apparent from the figures in Table 2 is that rent inflation within each metro area has differed by market segment. These differences mark shifting rent distributions in these markets. The shifts, furthermore, depended on the market. In three of the five in Table 2, the increase in the top third of the market exceeded that in the bottom third, while in the other two markets rent increases were greatest in the bottom third. As before, these annualized differences may not seem large, but compounded over a 10-year period, they are substantial. In Dallas, for example, the 3.8 percent annual increase in the bottom third compounds over 10 years to 46 percent, but the top third increase of 3.2 is only 38 percent over 10 years.

As describe earlier, the interpretation of these gross rent increases is ambiguous. They need to be disaggregated into their p and q components.

Table 2:
Annualized Increase in Gross Rent, 1988-89 to 1998-2002, by Position in Local Rent Distribution

Metro Area	bottom third	middle third	top third
Boston	2.9%	2.3%	2.6%
Buffalo	3.0%	3.2%	3.3%
Dallas	3.8%	3.6%	3.2%
Milwaukee	2.6%	2.7%	2.9%
Phoenix	2.8%	3.0%	3.2%

source: author's tabulations of data from the AHS.
note: increases are for the median rent in the listed third of the distribution, so the bottom third is represented by the 17th percentile rent, the middle is the 50th percentile, and the top is the 83rd percentile rent.
Beginning date is 1988 for Buffalo and Milwaukee and 1989 for the others.
Ending date is 1998 for Boston and 2002 for the others.

Hedonic Model Specifications

The hedonic models specified and estimated here follow closely the specifications and results of previous research. The regression specification takes the natural log of gross rent to be an additive function of the following attributes:

> number of bedrooms, number of bathrooms, structure type (6 categories), decade of construction, central air conditioning, dishwasher, washer/dryer, substandard physical condition, porch, fireplace, type of heating fuel, garage parking, and geographic "zone."

The zone variable is a geographic identifier in the AHS metro files that defines and identifies, within each metro area, contiguous areas of at least 100,000 population. Preliminary tests indicated that the zone variables explain more of the variance in rent than do a set of specific neighborhood attributes and assessments relating to safety, services, and amenities as reported by AHS respondents. Furthermore, the specific assessments did not add to the explanatory power of models that already included the zone variable. For these reasons the final models were estimated with the zone variables among the predictors but without other neighborhood characteristics.

All the variables are entered as categoricals, to allow non-linear effects on rent to be captured. The model is estimated separately, for those rental units occupied by rent-paying renters, for each of these five metro areas as of both the first observation date and the last date.

Results from the estimation of these hedonic equations were generally consistent with those of previous analyses in terms of the effects of individual attributes on rent and in terms of the overall explanatory power of the equations. As measured by the adjusted R-square statistic, the models "explain" about 25 percent to 40 percent of the variance in the log of rent, depending on the metro area and year.

I experimented with alternative specifications before selecting the one described above. In addition to testing alternative sets of independent variables, alternative dependent variables were investigated, including contract rent and an arithmetic (that is, non-log) version of gross rent. For various reasons, the specification above was deemed superior. The model was estimated on unweighted sample observations using ordinary least squares. Estimation using the sample weights, and substitution of "robust" estimation techniques for ordinary least squares, yielded results similar to those reported here.

Inflation Estimates by Quality Segment

The hedonic estimates generate a predicted rent for every rental housing unit in the AHS sample based on the characteristics included in the regression model and on the relationships of those characteristics to gross rent in that metro area. Changes in that predicted rent are then used to produce rent inflation estimates following the Laspeyres, Paasche, and Fisher specifications presented earlier.

Rent increase in excess of price index increase is either quality increase attributable to included or excluded housing characteristics, or to price changes of the excluded characteristics.

The estimates of rental price increases appear in Table 3. In each metro area, the Laspeyres and Paasche inflation estimates differ, indicating some shift over time in the housing attributes in each segment of the market. In most instances the difference in inflation estimates between these two measures is moderate. For simplicity, the discussion and estimates presented subsequently will focus on the Fisher index, which again is the geometric mean of the Laspeyres and Paasche indexes (calculated as the square root of their product).

Table 3:
Annualized Increase in Constant-Quality Rent, 1988-89 to 1998-2002, by Position in Local Rent Distribution and Index Type

Metro Area		market segment		
		bottom third	middle third	top third
Boston				
	Laspeyres	2.3%	1.7%	1.9%
	Paasche	1.6%	1.8%	2.1%
	Fisher	1.9%	1.7%	2.0%
Buffalo				
	Laspeyres	2.4%	2.3%	2.4%
	Paasche	2.5%	2.4%	2.9%
	Fisher	2.5%	2.4%	2.7%
Dallas				
	Laspeyres	3.3%	3.4%	2.8%
	Paasche	2.8%	3.0%	3.0%
	Fisher	3.1%	3.2%	2.9%
Milwaukee				
	Laspeyres	2.1%	1.7%	2.1%
	Paasche	2.2%	2.0%	2.4%
	Fisher	2.2%	1.9%	2.3%
Phoenix				
	Laspeyres	2.4%	2.7%	2.4%
	Paasche	2.0%	2.0%	2.4%
	Fisher	2.2%	2.3%	2.4%

source: author's tabulations of AHS data.
note: Beginning date is 1988 for Buffalo and Milwaukee and 1989 for the others.
Ending date is 1998 for Boston and 2002 for the others.

The Fisher estimates in Table 3 indicate that rental prices have been increasing at similar rates in each of the three segments within a metro area. The differences that do exist are mixed; in some markets inflation is greatest at the low end, while in others at the high end. The Table 3 estimates can be compared to the CPI estimates in Table 1 for three markets, although the geographic coverage and time periods are not identical. In Boston, both CPI rent measures in Table 1 rose at a 3.6 percent annually, somewhat above the Table 3 estimates. In Dallas, both CPI measures rose at a 2.7 percent rate, and in Milwaukee CPI rent increased 2.7 percent annually and owner's equivalent rent rose at a 3.2 percent rate.

The figures in Tables 2 and 3 can be combined to estimate the proportion of the rent increase attributable to price. Shown in Table 4, these figures suggest that most of the rent increase in each segment of each market has been attributable to inflation rather than to quality improvements.[3]

Table 4:
Proportion of Increase in Gross Rent, 1988-89 to 2002, Attributable to Increase in Price Index, by Position in Local Rent Distribution

Metro Area	bottom third	middle third	top third
Boston	77.8%	87.4%	67.9%
Buffalo	78.2%	70.4%	76.6%
Dallas	76.8%	85.2%	88.0%
Milwaukee	81.9%	64.5%	74.0%
Phoenix	79.7%	80.2%	77.0%

source: author's tabulations of data from the AHS.
note: price index contribution is from the Fisher index estimate

As mentioned earlier, in theory the part of the rent increase not attributable to price should be attributable to quantity/quality, but in practice things are more complicated. Part, and perhaps all, of the change in rent not attributable to the price index is attributable to changes in housing attributes – both those included in the model and those not included. But part of the rent increase could also be attributable to increases in the prices of excluded attributes. For example, slate roofs are not an attribute in the hedonic model. If these roofs have a positive valuation (shadow price), then increases in rent over time could be reflecting increasing prevalence of slate roofs, increasing valuations of slate roofs, or both.

With this caution, Table 5 presents estimates of annual increases in housing "quality" by market and segment. These are calculated simply as the annual rent increase in Table 2 less the annual Fisher price increase in Table 3. Because of the uncertainty in interpretation, "quality"

[3] The estimates in Table 4 are derived from the total increases in rents and price indexes over the observation period, and because of compounding these estimates will not equal the ratio of the entries in Table 3 divided by the corresponding entries of Table 2

remains in quotation marks here. The results are another mixed bag. The overall rate of quality improvement varies across markets, but there is no consistent pattern. Milwaukee, for example, is below average in quality improvement in the low segment, but above average in the middle or upper segment.

Table 5:
Annualized Increase in Housing "Quality," 1988-89 to 1998-2002, by Position in Local Rent Distribution

Metro Area	bottom third	middle third	top third
Boston	1.0%	0.6%	0.7%
Buffalo	0.6%	0.8%	0.6%
Dallas	0.7%	0.4%	0.3%
Milwaukee	0.4%	0.9%	0.7%
Phoenix	0.7%	0.7%	0.8%

source: author's tabulations of data from the AHS.
note: estimates are calculated as rent increases from Table 2 less price increases in Table 3. "Quality" increases are attibutable to housing attributes included and not included in the hedonic model and to price increases for non-included attributes.

Cross-market Rent Comparisons

The same technique used above to estimate rent inflation for segments within a metro market can be used to estimate differences in rental prices across markets at a point in time. One difference is that there must be a selection of a bundle of attributes to price across markets. The previous analysis was specific to the housing in the designated metro market.

Table 6 presents results from pricing the same housing bundles in different markets. The rents are the predicted values from combining the hedonic regression coefficients from the specified metro with the characteristics of housing units in the three thirds of the rent distribution, as estimated from the 2001 national AHS.[4] The specification of the hedonic regressions is the same as described previously, except that the geographic "zone" variable is excluded because it has no counterpart in the national data.

Table 6:
Predicted Rents from Pricing the Same Bundles Across Markets by Position in the National Rent Distribution

Metro Area		market segment (national stock) bottom third	middle third	top third
Boston (in 1998)				
	rent	$573	$663	$768
	relative to middle	-13.6%		15.8%
Buffalo (2002)				
	rent	$419	$482	$603
	relative to middle	-13.2%		25.0%
Dallas (2002)				
	rent	$486	$532	$632
	relative to middle	-8.5%		18.9%
Milwaukee (2002)				
	rent	$477	$540	$658
	relative to middle	-11.6%		21.9%
Phoenix (2002)				
	rent	$429	$468	$570
	relative to middle	-8.4%		21.7%

source: author's tabulations of AHS data. Rents shown are the median predicted values for units within the specified market segment.

Not surprisingly, the predicted rents for each segment vary across metro markets. But the premium and discount on upper and lower market rentals, relative to the middle market, varies substantially from metro to metro, as indicated by the percentages shown in the table. Another way of viewing these estimates is to compare rents for the same bundle across markets. Judging from the middle segment, Phoenix is the least expensive market. Buffalo, for example,

[4] Because rents vary greatly from metro to metro, the units selected into the market thirds were based on their position in their local metro rent distribution rather than the national rent distribution. The national AHS sample includes 20 metro areas with more than 100 rental housing units, and units in these metros were used to define the profile of rental housing in the low, middle, and top thirds of the market nationally.

has a median rent 3 percent higher (compare $482 and $468). But for a high quality bundle, Buffalo is 6 percent more expensive than Phoenix, while for a low quality bundle Buffalo is 2 percent less expensive than Phoenix.

The Table 6 estimates of price discounts and premia in the lower and upper thirds bear little resemblance, in size or in rankings of these metros, to the estimates reported by Thibodeau (1992; 1995). This dissimilarity is not surprising, given the differences in definitions of market segments and in the time periods for which the estimates were generated.

Effects of Neighborhood Characteristics on Rents

Location clearly influences rents. That is apparent from the large differences across metro markets in Table 6 and, within markets, in the effect of the "zone" variable in the hedonic regressions described earlier.

In looking at rent differences by neighborhood within a metro, harder to say what specific neighborhood features do influence rents. In theory, accessibility, safety, and amenities are three sets of features for which consumers are willing to pay and for which supply is limited, so there should be positive prices associated with these attributes.

Empirical evidence of these prices is, however, elusive. The AHS includes numerous variables describing neighborhood features and respondents assessments of them. But testing of alternative hedonic specifications showed that many of these attributes have no independent effect on rents. Furthermore, these specific features and evaluations as a group had less rent-explaining power than the simple zone identifier and added no explanatory power beyond that associated with the zone.

Why might simple identification of a location do better than a set of features of that location in predicting rents? One possibility is that features important to location valuations are omitted from the AHS variable set, although the list does appear comprehensive. Another possibility is that respondents' assessments of the availability and adequacy of neighborhood services and features says more about respondents' psyches than about objectively measured differences in these neighborhood characteristics from place to place. This issue is not resolved here, nor have I investigated why intra-metro location, as indicated by the zone variable, has more influence on rents in some metro markets than in others.

These empirical results and remaining questions highlight the difficulty of defining the neighborhood dimension of "… a decent home and a suitable living environment for every American family..." established by Congress as a national goal in the Housing Act of 1949 (Koebel and Renneckar, 2003). It has proven somewhat easier to define the housing unit component of a decent home, with safe and sanitary conditions and unit size requirements operationalized in the minimum housing requirements applied in HUD's Section 8 housing assistance program.

National Benchmarks

Housing markets are segmented geographically, with both demand and supply conditions varying from place to place. Metro area boundaries are one reasonable way of delimiting housing markets. For that reason the analysis here has focused on metro-specific results. In addition, from a practical standpoint, the American Housing Survey includes the local area "zone" variable only in the metro area data files, and not in the national AHS.

Nonetheless, national price estimates provide a baseline against which the results for individual metro areas can be interpreted. For that reason I have repeated the metro area analysis with the national AHS data, estimating the same hedonic regression model, with the exception of the geographic identifiers. Instead of the zone variable, in the national analysis I used region (4 categories), city/suburb location (2 categories), and the interaction of these two variables (8 categories). The model was estimated on the national AHS files for 1991 and 2001, with approximately 11,000 sample observations used in the estimation in each year. For comparability with the metro results, the national AHS analysis was restricted to housing units in metro areas. These units account for most (85 percent) of the national stock of rental housing. The adjusted R-square statistic was 0.29 for the 1991 estimation and 0.21 for 2001, somewhat lower than those for the metro area estimations described earlier.

Table 7 presents a summary of the results from this national estimation. Overall, the results show the importance of analyzing metro markets individually. Even though the percentages in Table 7 are of the same order of magnitude as their counterparts in the earlier tables, the diversity across metros is lost in these national aggregates. Notably, the estimated increases in rental prices are very similar across the three national segments. Also of interest is the contrast with the CP estimates of Table 1, which showed rental prices to have increased most rapidly in the top part of the market.

Conclusions and Next Steps

The analysis has shown that one rental price index for a metro market may not be adequate. Reliance on a single index can produce misleading indications about where rental prices are highest and where they are increasing most rapidly. For the rental housing typically occupied by lower income households, loosely defined as "affordable" housing, this potential mismeasurement can have unintended consequences for housing program designs and benefit allocations.

This analysis could be extended in several ways. First, price indexes could be estimated from the AHS for many more metros than the five analyzed here. In addition, data from the 1990 and 2000 Censuses could be used to estimate indexes for each metro area in the country, although the analysis would be hampered by the lack of any local area identifiers similar to the "zone" variables available in the metro AHS files. In the future the American Community Survey may be superior to either the AHS or the Census as a source of data for constructing these rental indexes.

Table 7: National Results for 1991 through 2001

	National Rent Distribution bottom third	middle third	top third
Annualized Increase in Gross Rent, by Position in the National Rent Distribution	3.5%	3.1%	3.1%
Annualized Increase in Constant-Quality Rent, by Position in National Rent Distribution and Index Type			
Laspeyres	2.7%	2.6%	2.6%
Paasche	2.5%	2.5%	2.4%
Fisher	2.6%	2.6%	2.5%
Proportion of Increase in Gross Rent Attributable to Increase in Price Index, by Position in National Rent Distribution	70.8%	81.2%	78.5%
Annualized Increase in Housing "Quality" by Position in the National Rent Distribution	0.9%	0.5%	0.6%

source: author's tabulations from the 1991 and 2001 national AHS files.
note: see Tables 2 - 5 for definitions; estimates are for metro housing only.

Second, the reasons for differences across markets could be investigated. Why in some markets are rental prices increasing most rapidly at the top of the market, and in others at the bottom? Are differences in housing demand the main drivers, or are differences in supply conditions largely responsible?

Third, what are the specific implications of the findings for affordable housing programs and policies? Are the differences in prices across segments and markets large enough to matter for some practical purposes but not for others? Do the results point to possible improvements in the Fair Market Rents as currently estimated and used by HUD?

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