



**U.S. Department of Housing and Urban Development**  
Office of Policy Development and Research



# **American Housing Survey**

## **Rental Market Dynamics: 2005 - 2007**

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# **American Housing Survey**

## **Rental Market Dynamics: 2005-2007**

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U.S. Department of Housing and Urban Development  
Office of Policy Development and Research

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# Rental Market Dynamics: 2005-2007

## Overview

This paper answers two questions:

- Did the number of rental units affordable to lower income households grow or decline between 2005 and 2007?

and

- What factors caused the number of affordable rental units to grow or decline during this period?

The first section provides background on these issues and deals with methodological and data concerns. The American Housing Survey (AHS) provides the data but the analysis employs different weights than the regular AHS weights. For this reason, the first issue is whether the regular AHS weights and the weights used in this analysis tell the same story about changes in rental housing between 2005 and 2007. Table 1 compares the stories and concludes that they are similar enough to continue with the analysis. Tables 2 and 3 paint a precise picture, by affordability category, of what happened between 2005 and 2007 to the rental units available in 2005. This picture answers the posed questions only partially, because Tables 2 and 3 provide information on only those 2007 rental units that were also rental units in 2005; they contain no information on newly constructed rental units or units that are rental in 2007 but were not rental in 2005. Tables 5 and 6 contain information on new construction and the movement of units from non-rental status in 2005 to rental status in 2007. They paint a precise picture, by affordability category, of where the units available for rent in 2007 came from in terms of their status in 2005. However, this picture also answers the posed questions only partially because it depicts only part of the 2005 rental stock; it does not provide information on units that were rental in 2005 but ceased to be part of the rental stock in 2007.

This paper then combines the two pictures even though the weights used in the separate pictures are not consistent. Tables 8 and 9 present two different combinations of the earlier analyses and explain how the combinations were constructed. Table 11 gathers information from Tables 8 and 9 to answer the two questions. Because weights are not fully consistent, Table 11 cannot measure precisely the increase or decrease in affordable units or how much of the increase or decrease is due to factors such as the movement of units from one affordability category to another. However, there is enough consistency in the two analyses to draw reasonable conclusions about the direction and magnitude of changes in the number of units in most of the affordability categories, the relative contribution to these changes of the movement of units across affordability categories, and the gain or loss of units from the rental stock.

## **Background and Methodology**

Rental market dynamics focuses on the supply of rental housing and how that supply changes over time. Rental dynamics analysis has many of the features of components of inventory change (CINCH) analysis, which seeks to explain how units change characteristics, e.g., high rent or low rent, or change status, e.g., in the stock or out of the stock. Like CINCH, rental dynamics traces where units come from and where they go to, but with an emphasis on low rent units. This paper is part of a larger research project that includes several research studies using the AHS. One of these studies, *Components of Inventory Change: 2005-2007*, undertook a CINCH analysis using the 2005 and 2007 national AHS surveys.<sup>1</sup> This paper is another of the research studies; the earlier companion piece made the work of this paper easier.

A key step in rental dynamics analysis is separating the rental stock into classes or strata based on how affordable they are. This paper uses eight categories:

- non-market – either no cash rent or a subsidized rent,
- extremely low rent (affordable to renters with incomes less than or equal to 30 percent of local area median income),
- very low rent (affordable to renters with incomes greater than 30 percent but less than or equal to 50 percent of local area median income),
- low rent (affordable to renters with incomes greater than 50 percent but less than or equal to 60 percent of local area median income),
- moderate rent (affordable to renters with incomes greater than 60 percent but less than or equal to 80 percent of local area median income),
- high rent (affordable to renters with incomes greater than 80 percent but less than or equal to 100 percent of local area median income),
- very high rent (affordable to renters with incomes greater than 100 percent but less than or equal to 120 percent of local area median income), and
- extremely high rent (affordable to renters with incomes greater than 120 percent of local area median income).

For each category, “affordable” is defined as a gross rent-to-income ratio of 30 percent or less for the higher of the incomes that define the boundaries for that category.<sup>2</sup> The categories are defined relative to area median income, and therefore the boundaries of the categories will change as area median income changes. For example, if area median income increases between 2005 and 2007, then the upper boundaries of each category will also increase between 2005 and 2007.<sup>3</sup>

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<sup>1</sup> *Components of Inventory Change: 2005-2007*, Frederick J. Eggers and Fouad Moumen, a report prepared for the Department of Housing and Urban Development by Econometrica, Inc., April 2009. This report is available at <http://www.huduser.org/datasets/cinch.html>.

<sup>2</sup> Gross rent is rent plus utilities.

<sup>3</sup> This means that rental costs and affordability do not always move in the same direction. For example, if the costs of renting a unit are \$610 in 2005 and \$640 in 2007, while the upper boundary of the low-income category changes from \$600 to \$650 between 2005 and 2007, then the unit that was classified as moderate income in 2005 will be classified as low income in 2007 despite higher rental costs.

The AHS provided the data used in this analysis. The AHS is well suited for this purpose. It is a large, nationally representative sample of the housing stock. The AHS gathers information on the same housing units at 2-year intervals. Following the same unit over time allows the analysis to track changes in how units serve the housing market.

This paper also used two related data sets that greatly facilitated the analysis:

- Housing Affordability Data System (HADS)<sup>4</sup>
- 2005-2007 CINCH variables and weights.<sup>5</sup>

HADS is a housing-unit-level data set that measures the affordability of housing units and the housing cost burdens of households relative to area median incomes, poverty level incomes, and HUD Fair Market Rents. HADS contains two important variables not available in the regular AHS data set. The first is OWNRENT, which classifies units as either owned or rented.<sup>6</sup> It differs from the AHS variable TENURE in two respects. First, OWNRENT has two states: owned or rented. TENURE has three states: owned, rent for cash, or rented for no cash rent. More importantly, OWNRENT applies to all occupied or vacant units, whereas TENURE does not apply to vacant units.<sup>7,8</sup> HADS also contains variables that classify all units by the cost of the unit relative to adjusted median income in the locality where the unit is located. From this set of variables, this paper uses COST08RELAMICAT in 2005 and 2007, which put the unit into one of seven categories based on the ratio of total monthly housing costs to monthly adjusted median income for the locality.<sup>9</sup> Except for the non-market classification, these seven categories match the eight categories used in this paper.

The CINCH variables and weights data set was a product of the companion research report. For all AHS units, the data set contains (1) a set of forward-looking CINCH weights (FLCINCHWT) that allow one to track from 2005 to 2007 those units that were part of the 2005 housing stock, and (2) a set of backward-looking CINCH weights (BLCINCHWT) that allow one to track from 2007 to 2005 those units that were part of the 2007 housing stock. This paper uses these weights for the rental dynamics analysis.

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<sup>4</sup> HADS is a data system developed by the Office of Policy Development and Research, U.S. Department of Housing and Urban Development. The HADS files and documentation are online, at <http://www.huduser.org/datasets/hads/hads.html>. When this analysis was performed, the 2007 HADS data had not yet been released. The authors compiled the HADS data using SAS code provided by HUD.

<sup>5</sup> The data set and documentation are available at <http://www.huduser.org/datasets/cinch.html>.

<sup>6</sup> Here and elsewhere in this paper, words printed with all capital letters are the names of variables in different data sets. Exceptions include abbreviations such as AHS, CINCH, and HADS.

<sup>7</sup> OWNRENT counts vacant units with VACANCY values of 1, 2, or 4 as rental, and those with VACANCY values of 3 or 5 as owned. No-cash-rent units are classified as rental.

<sup>8</sup> TENURE also does not apply to units whose occupants usually reside somewhere else, or units that were not interviewed because they were temporarily or permanently out of the housing stock. OWNRENT does not apply to these units as well.

<sup>9</sup> The set of variables with “COSTXXRELAMICAT” apply to both owner-occupied and rental units. The XX refers to the interest rate applied to a hypothetical mortgage on owner-occupied properties. HADS databases usually provide four alternative COSTXXRELAMICAT variables based on four different values for the interest rate on the hypothetical mortgage.



The CINCH variables and weights data set also contains other variables that are important for the rental dynamics analysis and that are not found in the regular AHS data set. FLSTATUS indicates whether a 2005 housing unit was also in the 2007 housing stock or whether it had been lost to the stock for one of six reasons. BLSTATUS indicates whether a 2007 housing unit was also in the 2005 housing stock or whether it had been added to the stock for one of six reasons. The CINCH data set includes four additional variables that were constructed from OWNRENT and COST08RELAMICAT in HADS. These variables (FLRENT, BLRENT, FLAFFORD, and BLAFFORD) classify rental units into one of the eight categories used in this paper in 2005 and 2007 respectively.

### ***Affordability Changes in the Rental Stock***

Before presenting the results using CINCH weights, this paper investigates whether the CINCH weights and the AHS weights depict similar changes in the rental stock between 2005 and 2007. This paper will use the CINCH weights discussed in the Background and Methodology section to analyze changes in the affordability of the rental stock. This paper uses the CINCH weights instead of the regular AHS weights because the analysis in this paper uses mainly units that were interviewed in both years. Excluding units that were not interviewed requires adjustments to the regular AHS weights. The companion CINCH report compared CINCH estimates to published AHS totals. Almost all of the CINCH estimates are within 5 percent of the AHS published totals, and many are very close to the AHS estimates.<sup>10</sup> There are some important exceptions relevant to the topic of this paper. The CINCH weights underestimate the number of rental units with no cash rents by 9.9 percent in 2005 and 6.9 percent in 2007, and overestimate the number of rental units with monthly housing costs less than \$350 by 5.2 percent in 2005.

Using regular AHS weights and the affordability classifications produced by HADS, Table 1 counts the number of occupied or vacant rental units in 2005 and 2007 and classifies them into one of eight affordability categories. The regular AHS weights provide a benchmark for the rental dynamics analysis. According to the regular AHS weights, the rental stock—including both occupied and vacant units—increased by 1,405,000 units between 2005 and 2007, which is a 3.7 percent increase.<sup>11</sup>

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<sup>10</sup> There were three areas where the CINCH weights appeared to vary systematically from the regular AHS weights. The CINCH weights overestimate the number of units outside of metropolitan areas by 16 percent in 2005 and 12 percent in 2007; overestimate units with a householder over age 65 by 7-9 percent in 2005 and 6-8 percent in 2007; and underestimate Blacks by about 8 percent in both years.

<sup>11</sup> Throughout the paper, sums and differences of counts or percentages may not equal the reported sums and differences or percentages because of rounding.

**Table 1: Rental Units by Affordability Class, 2005-2007, using regular AHS weights and HADS designations (all counts in thousands)**

Rent Groups	Rental in 2005	Rental in 2007	Change	Percent Change
Non-market	8,363,000	8,186,000	-177,000	-2.1%
Extremely Low Rent	2,262,000	2,201,000	-61,000	-2.7%
Very Low Rent	10,566,000	9,429,000	-1,137,000	-10.8%
Low Rent	5,914,000	6,309,000	395,000	6.7%
Moderate Rent	6,526,000	7,608,000	1,082,000	16.6%
High Rent	1,916,000	2,367,000	451,000	23.6%
Very High Rent	899,000	1,385,000	486,000	54.0%
Extremely High Rent	1,473,000	1,840,000	366,000	24.9%
<b>Total</b>	<b>37,919,000</b>	<b>39,324,000</b>	<b>1,405,000</b>	<b>3.7%</b>

Table 2 counts the number of occupied or vacant rental units in 2005 and 2007 and classifies them into one of eight affordability categories based on the CINCH weights. The rental dynamics analysis in the remainder of this paper will focus on the changes identified in Table 2. According to the CINCH weights, the rental stock—including both occupied and vacant units—increased by 1,265,000 units between 2005 and 2007, a 3.3 percent increase. These changes are smaller than those recorded by the regular AHS weights.<sup>12</sup>

**Table 2: Rental Units by Affordability Class, 2005-2007, using CINCH weights and HADS designations (all counts in thousands)**

Rent Groups	Rental in 2005 from Forward-Looking Analysis	Rental in 2007 from Backward-Looking Analysis	Change	Percent Change
Non-market	8,640,000	8,507,000	-133,000	-1.5%
Extremely Low Rent	2,312,000	2,278,000	-35,000	-1.5%
Very Low Rent	10,770,000	9,412,000	-1,358,000	-12.6%
Low Rent	5,878,000	6,335,000	457,000	7.8%
Moderate Rent	6,608,000	7,694,000	1,086,000	16.4%
High Rent	2,003,000	2,419,000	416,000	20.8%
Very High Rent	934,000	1,423,000	489,000	52.4%
Extremely High Rent	1,530,000	1,873,000	343,000	22.4%
<b>Total</b>	<b>38,675,000</b>	<b>39,941,000</b>	<b>1,265,000</b>	<b>3.3%</b>

The CINCH weights also count more rental units: 38,675,000 in 2005 compared to 37,919,000 from the AHS weights, and 39,941,000 in 2007 compared to 39,324,000. The differences in total counts are small. Relative to the regular AHS weights, the CINCH weights count 2.0 percent more units in 2005 and 1.6 percent more units in 2007. The CINCH weights are crafted to produce estimates of the occupied rental stock that equal published Census Bureau estimates, and to produce estimates of total vacant units that equal published Census Bureau estimates. The

<sup>12</sup> The published AHS reports show an increase of 1,250,000 rental units, including units vacant for rent, between 2005 and 2007 (3.3 percent). The estimates produced from the public use file (PUF) are somewhat larger than those found in the published reports – 0.7 percent for 2005 and 1.1 percent for 2007.

observed differences appear to result from the CINCH weights overestimating vacant rental units and underestimating vacant owner units compared to the regular AHS weights.

The pattern of changes recorded in Table 2 parallels the changes in Table 1 closely, including the following:

- Both tables record a large absolute and percentage decrease in very low rent units.
- Both tables record modest absolute and percentage declines in non-market units and extremely low rent units.
- Both tables record large absolute and percentage increases in moderate rent units.
- Both tables record large absolute and percentage increases among high rent units, very high rent, and extremely high rent units.

Overall, the AHS and CINCH weights paint very similar pictures of the changes in the rental stock between 2005 and 2007.

### ***Rental Dynamics Tables***

An ideal rental dynamics analysis would provide an exact accounting of the following form for each of the eight rental affordability categories:

$$\begin{aligned} 2007 \text{ rental stock in category } x &= 2005 \text{ rental stock in category } x \\ &\quad - 2005 \text{ rental units in category } x \text{ that moved to another} \\ &\quad \text{category} \\ &\quad - 2005 \text{ rental units in category } x \text{ that become owner-} \\ &\quad \text{occupied or seasonal in 2007} \\ &\quad - 2005 \text{ rental units in category } x \text{ that are lost to the stock by} \\ &\quad 2007 \\ &\quad + 2005 \text{ rental units not in } x \text{ that moved into category } x \\ &\quad + 2005 \text{ owner-occupied or seasonal units that become} \\ &\quad \text{rental units in category } x \text{ in 2007} \\ &\quad + \text{ newly constructed rental units in category } x \\ &\quad + \text{ other additions to the rental stock in category } x. \end{aligned}$$

This accounting is an expanded form of the standard CINCH problem. Experience in CINCH analysis has shown that it is difficult to create a set of weights that accomplishes such an accounting.<sup>13</sup> The solution in CINCH has been to split the problem in two separate questions: forward-looking CINCH analysis takes the 2005 housing stock and explains what happens to those units by 2007, while backward-looking CINCH analysis takes the 2007 housing stock and explains where those units came from in terms of the 2005 housing stock. This paper will follow the same approach.

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<sup>13</sup> See *Weighting Strategy for 2005-2007 CINCH Analysis*, available at <http://www.huduser.org/datasets/cinch.html>.

## Forward-Looking Rental Dynamics

Table 3 tracks how 38,444,000 rental units in the 2005 housing stock relate to the 2007 housing stock.<sup>14</sup> Columns B through L explain where the 2005 rental units fit into the 2007 housing stock.

- If the units are still rental in 2007, they will be counted in columns B through I, depending upon how affordable they are in 2007.
- If the units have become owner-occupied, they will be counted in column J.
- Seasonal units, units that are not the primary residence of their occupants, units used for migratory workers, and units that are vacant but not for rent or sale are counted in column K.
- Column L counts 2005 units that are not in the 2007 housing stock; these can be either temporary or permanent losses to the stock.

The sum of columns B through L equals column A, except for rounding.

Table 4 presents the same information as Table 3, but columns B through L are now percentages of column A. Columns B through L sum to 100 percent in each row.

Non-market rental units show much greater stability than units in the other seven affordability categories. Over 50 percent of the 2005 non-market units are non-market in 2007 as well. Units renting for cash show greater movement across categories. Among units that were extremely low rent in 2005, only 21.6 percent were extremely low rent in 2007, and 40.7 percent of the units that were extremely high rent in 2005 are still extremely high rent in 2007.

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<sup>14</sup> This count differs from the 38,676,000 reported in Table 2 because it excludes 232,000 for which we have no information on their status in 2007.

**Table 3: Forward-Looking Rental Dynamics Analysis, Counts: 2005-2007 (all numbers in thousands)**

Affordability Categories	A Total in 2005	B Non-Market in 2007	C Extremely Low Rent in 2007	D Very Low Rent in 2007	E Low Rent in 2007	F Moderate Rent in 2007	G High Rent in 2007	H Very High Rent in 2007	I Extremely High Rent in 2007	J Owner Occupied in 2007	K Seasonal or Related Vacant in 2007	L Lost to Stock in 2007
<b>Non-market</b>	8,606	4,432	266	825	606	741	205	117	124	804	328	159
<b>Extremely Low Rent</b>	2,297	266	496	538	171	147	46	31	67	259	168	108
<b>Very Low Rent</b>	10,728	885	443	5,001	1,886	704	127	72	104	739	443	325
<b>Low Rent</b>	5,843	503	216	917	1,904	1,400	119	41	75	387	174	107
<b>Moderate Rent</b>	6,556	529	228	423	700	2,884	676	172	146	503	175	120
<b>High Rent</b>	1,983	134	69	121	55	368	520	255	76	255	102	28
<b>Very High Rent</b>	923	74	30	65	39	108	55	257	139	99	40	17
<b>Extremely High Rent</b>	1,508	111	56	138	55	113	39	101	613	155	79	47
<b>Total</b>	38,444	6,934	1,804	8,028	5,415	6,465	1,787	1,046	1,343	3,201	1,509	910

**Table 4: Forward-Looking Rental Dynamics Analysis, Row Percentages: 2005-2007**

Affordability Categories	A Total in 2005 (thousands)	B Non-Market in 2007	C Extremely Low Rent in 2007	D Very Low Rent in 2007	E Low Rent in 2007	F Moderate Rent in 2007	G High Rent in 2007	H Very High Rent in 2007	I Extremely High Rent in 2007	J Owner Occupied in 2007	K Seasonal or Related Vacant in 2007	L Lost to Stock in 2007
<b>Non-market</b>	8,606	51.5%	3.1%	9.6%	7.0%	8.6%	2.4%	1.4%	1.4%	9.3%	3.8%	1.8%
<b>Extremely Low Rent</b>	2,297	11.6%	21.6%	23.4%	7.4%	6.4%	2.0%	1.4%	2.9%	11.3%	7.3%	4.7%
<b>Very Low Rent</b>	10,728	8.2%	4.1%	46.6%	17.6%	6.6%	1.2%	0.7%	1.0%	6.9%	4.1%	3.0%
<b>Low Rent</b>	5,843	8.6%	3.7%	15.7%	32.6%	24.0%	2.0%	0.7%	1.3%	6.6%	3.0%	1.8%
<b>Moderate Rent</b>	6,556	8.1%	3.5%	6.5%	10.7%	44.0%	10.3%	2.6%	2.2%	7.7%	2.7%	1.8%
<b>High Rent</b>	1,983	6.8%	3.5%	6.1%	2.8%	18.5%	26.2%	12.9%	3.8%	12.9%	5.1%	1.4%
<b>Very High Rent</b>	923	8.0%	3.2%	7.0%	4.2%	11.7%	6.0%	27.8%	15.1%	10.7%	4.4%	1.9%
<b>Extremely High Rent</b>	1,508	7.4%	3.7%	9.2%	3.7%	7.5%	2.6%	6.7%	40.7%	10.3%	5.2%	3.1%
<b>Total</b>	38,444	18.0%	4.7%	20.9%	14.1%	16.8%	4.6%	2.7%	3.5%	8.3%	3.9%	2.4%

The numbers in Tables 3 and 4 suggest that some rental units move far from their initial category. For example, 9.2 percent of the units that were extremely high rent in 2005 became very low rent in 2007. Although sizeable movements both up and down are possible, the tables probably overestimate the range of movement. The HADS variables used in this paper rely on AHS variables that are subject to allocation, a process by which the Census Bureau assigns values to variables if respondents fail to answer questions. Previous analysis has shown that using data without allocations produces less movement out of an affordability category and fewer changes of more than one category.<sup>15</sup>

Table 5 summarizes what happened to the 2005 rental units by affordability category.

**Table 5: Summary of Forward-Looking Rental Dynamics**

Affordability Categories	2005 Rental Units (thousands)	To More Affordable Categories in 2007	In Same Affordability Category in Both Years	To Less Affordable Categories in 2007	2005 Rental Units Non-Rental in 2007
<b>Non-market</b>	8,606	NA	51.5%	33.5%	15.0%
<b>Extremely Low Rent</b>	2,297	11.6%	21.6%	43.5%	23.3%
<b>Very Low Rent</b>	10,728	12.4%	46.6%	27.0%	14.0%
<b>Low Rent</b>	5,843	28.0%	32.6%	28.0%	11.4%
<b>Moderate Rent</b>	6,556	28.7%	44.0%	15.2%	12.2%
<b>High Rent</b>	1,983	37.7%	26.2%	16.7%	19.4%
<b>Very High Rent</b>	923	40.2%	27.8%	15.1%	16.9%
<b>Extremely High Rent</b>	1,508	40.7%	40.7%	NA	18.6%
<b>Total</b>	38,444	17.8%	41.9%	25.7%	14.6%

Overall, more rental units moved to less affordable categories than moved to more affordable categories—25.7 percent versus 17.8 percent. The pattern by affordable categories is distinctive. The focus here is on the middle six categories, because units in the non-market and extremely high rent categories can change affordability categories in only one direction. Among the three highest rent categories of these six middle categories, a higher proportion of units became more affordable than less affordable. This is the classic filtering model—that is, as units age there is a tendency for their rents to decline in relative terms. Among very low rent and extremely low rent units, a higher proportion became less affordable than became more affordable. Over 40 percent of the extremely low rent units became less affordable. This may be the consequence of efforts to upgrade older, less desirable units to make them more competitive, or to respond to gentrifying activity in older neighborhoods. In viewing all of these trends, it is important to remember that the allocation process does create the appearance of more movement among affordable categories than is probably taking place.

Of the 38,444,000 rental units in 2005, 5,620,000 (or 14.6 percent) were no longer in the rental stock in 2007. More than half of these losses were due to changes in tenure, with 3,201,000 rental units becoming owner-occupied in 2007. Another 1,509,000 units became seasonal units, units occupied by persons with usual residence elsewhere, or units used for migratory workers.

<sup>15</sup> See page 10 of *Rental Market Dynamics: Is Affordable Housing for the Poor an Endangered Species?* found at <http://www.huduser.org/datasets/ahs/ahsReports.html#2>.

Finally, 910,000 rental units were no longer in the housing stock in 2007. Some of these losses were permanent, that is, the units were demolished or destroyed; some losses were potentially reversible, for example, units being used for nonresidential purposes.

Movement into owner-occupancy occurred for 8.3 percent of all rental units. The percentage of movement into owner occupancy across the categories ranged from a high of 12.9 percent for high rent units to a low of 6.6 percent for low rent units. While units in the highest rent categories were more likely to become owner-occupied, there was substantial movement in this direction among extremely low rent units, with 11.3 percent becoming owner-occupied. Among 2005 rental units, 3.9 percent were seasonal or related vacant in 2007. Extremely low rent units displayed the highest rate of movement into this status (7.3 percent). Of the 2005 rental units, 2.4 percent was lost to the housing stock by 2007; this compares to a 1.9 percent loss rate for rental units between 2003 and 2005. Extremely low rent units had the highest loss rate (4.7 percent); very low rent units and extremely high rent units were the only other categories to have an above average loss rate (3.0 percent and 3.1 percent respectively).

## **Backward-Looking Rental Dynamics**

Table 6 tracks how the 39,756,000 rental units in the 2007 housing stock relate to the 2005 housing stock.<sup>16</sup> Columns B through M explain where the 2007 rental units fit into the 2005 housing stock.

- If the units were also rental in 2005, they will be counted in columns B through I, depending upon how affordable they were in 2005.
- If the units were owner-occupied, they will be counted in column J.
- Seasonal units, units that were not the primary residence of their occupants, units used for migratory workers, and units that were vacant but not for rent or sale are counted in column K.
- Column L counts units that were newly constructed between 2005 and 2007.
- Column M counts units that were temporary losses to the housing stock in 2005 or were added for other reasons.

The sum of columns B through M equals column A, except for rounding.

Table 7 presents the same information as Table 6, but columns B through M are now percentages of column A. Columns B through M sum to 100 percent in each row.

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<sup>16</sup> This count differs from the 39,941,000 reported in Table 2 because it excludes 184,000 for which we have no information on their status in 2007.

**Table 6: Backward-Looking Rental Dynamics Analysis, Counts: 2005-2007 (all numbers in thousands)**

Affordability Categories	A Total in 2007	B Non- Market in 2005	C Extremely Low Rent in 2005	D Very Low Rent in 2005	E Low Rent in 2005	F Moderate Rent in 2005	G High Rent in 2005	H Very High Rent in 2005	I Extremely High Rent in 2005	J Owner Occupied in 2005	K Seasonal or Related Vacant in 2005	L New Construc- -tion	M Other Addition
<b>Non-market</b>	8,488	4,570	278	947	543	566	143	79	122	756	218	119	148
<b>Extremely Low Rent</b>	2,254	252	501	425	209	224	65	28	58	267	144	35	46
<b>Very Low Rent</b>	9,339	809	557	5,175	953	442	130	69	142	679	238	38	106
<b>Low Rent</b>	6,325	601	174	1,915	1,991	728	55	40	57	470	184	48	63
<b>Moderate Rent</b>	7,667	731	150	712	1,439	2,969	388	115	118	651	185	141	67
<b>High Rent</b>	2,399	199	47	127	112	676	552	59	41	394	66	99	26
<b>Very High Rent</b>	1,418	115	30	69	42	177	260	265	104	202	36	90	27
<b>Extremely High Rent</b>	1,866	122	66	101	74	145	76	148	631	274	109	82	39
<b>Total</b>	39,756	7,398	1,804	9,471	5,362	5,926	1,669	804	1,275	3,694	1,180	652	523

**Table 7: Backward-Looking Rental Dynamics Analysis, Row Percentages: 2005-2007**

Affordability Categories	A Total in 2007 (thousands)	B Non- Market in 2005	C Extremely Low Rent in 2005	D Very Low Rent in 2005	E Low Rent in 2005	F Moderate Rent in 2005	G High Rent in 2005	H Very High Rent in 2005	I Extremely High Rent in 2005	J Owner Occupied in 2005	K Seasonal or Related Vacant in 2005	L New Construc- -tion	M Other Addition
<b>Non-market</b>	8,488	53.8%	3.3%	11.2%	6.4%	6.7%	1.7%	0.9%	1.4%	8.9%	2.6%	1.4%	1.7%
<b>Extremely Low Rent</b>	2,254	11.2%	22.2%	18.9%	9.3%	9.9%	2.9%	1.3%	2.6%	11.9%	6.4%	1.5%	2.1%
<b>Very Low Rent</b>	9,339	8.7%	6.0%	55.4%	10.2%	4.7%	1.4%	0.7%	1.5%	7.3%	2.5%	0.4%	1.1%
<b>Low Rent</b>	6,325	9.5%	2.8%	30.3%	31.5%	11.5%	0.9%	0.6%	0.9%	7.4%	2.9%	0.8%	1.0%
<b>Moderate Rent</b>	7,667	9.5%	2.0%	9.3%	18.8%	38.7%	5.1%	1.5%	1.5%	8.5%	2.4%	1.8%	0.9%
<b>High Rent</b>	2,399	8.3%	2.0%	5.3%	4.7%	28.2%	23.0%	2.5%	1.7%	16.4%	2.8%	4.1%	1.1%
<b>Very High Rent</b>	1,418	8.1%	2.1%	4.9%	2.9%	12.5%	18.3%	18.7%	7.3%	14.3%	2.6%	6.4%	1.9%
<b>Extremely High Rent</b>	1,866	6.5%	3.5%	5.4%	4.0%	7.8%	4.1%	7.9%	33.8%	14.7%	5.8%	4.4%	2.1%
<b>Total</b>	39,756	18.6%	4.5%	23.8%	13.5%	14.9%	4.2%	2.0%	3.2%	9.3%	3.0%	1.6%	1.3%



As was the case in the forward-looking analysis, non-market rental units show great stability; of the 2007 non-market units, 53.8 percent were non-market in 2005 as well. Very low rent units were also very stable, with 55.4 percent of the 2007 very low rent units being very low rent in 2005. Among units in the other affordability categories, the proportion of units from a 2007 category that were in the same category in 2005 ranged from 18.7 percent (very high rent) to 38.7 percent (moderate rent).

Table 8 summarizes where the 2007 rental units came from by affordability category.

**Table 8: Summary of Backward-Looking Rental Dynamics**

Affordability Categories	2007 Rental Units (thousands)	From Less Affordable Category in 2005	In Same Affordability Category in Both Years	From More Affordable Category in 2005	2007 Rental Units Non-Rental in 2005
<b>Non-market</b>	8,488	31.5%	53.8%	NA	14.6%
<b>Extremely Low Rent</b>	2,254	44.8%	22.2%	11.2%	21.9%
<b>Very Low Rent</b>	9,339	18.6%	55.4%	14.6%	11.4%
<b>Low Rent</b>	6,325	13.9%	31.5%	42.5%	12.1%
<b>Moderate Rent</b>	7,667	8.1%	38.7%	39.6%	13.6%
<b>High Rent</b>	2,399	4.2%	23.0%	48.4%	24.4%
<b>Very High Rent</b>	1,418	7.3%	18.7%	48.9%	25.1%
<b>Extremely High Rent</b>	1,866	NA	33.8%	39.2%	27.0%
<b>Total</b>	39,756	17.9%	41.9%	25.0%	15.2%

Overall, more rental units came from more affordable categories than from less affordable categories—25.0 percent versus 17.9 percent. Table 5 showed downward filtering at the top of the rental affordability scale and upgrading at the bottom; Table 8 shows the consequences of those changes. Only the six middle categories can receive units from both less affordable and more affordable categories. Among the least affordable four of these six middle categories, a higher proportion of units came from more affordable categories than from less affordable categories. Among very low rent and extremely low rent units, a higher proportion came from the less affordable categories than from the more affordable categories.

Table 5 showed net filtering up among lower rent units and net filtering down among higher rent units. Table 8 shows net filtering down among lower rent units and net filtering up among higher rent units. While the reported patterns may seem contradictory, they are not. Table 5 tracks movements *out of* affordability classes; Table 8 tracks movements *into* affordability classes.<sup>17</sup>

Of the 39,756,000 rental units in 2007, 6,049,000 (or 15.2 percent) were not in the rental stock in 2005. Over 60 percent of these gains were due to changes in tenure, with 3,694,000 rental units

<sup>17</sup> Table 5 describes what happened to units that moved out of each affordability category after 2005; Table 8 describes where the units came from that moved into each affordability category between 2005 and 2007. Table 5 sums counts in the rows of Table 2; Table 8 sums counts in the rows of Table 6. One could construct an alternative estimate of Table 5 using the counts in the columns of Table 6, and an alternative estimate of Table 8 using counts in the columns of Table 2. This approach produces numbers very close to those in Tables 4 and 7 for movements among affordability classes.

having been owner-occupied in 2005. Another 1,180,000 units had been seasonal units, units occupied by persons with usual residence elsewhere, or units used for migratory workers. New construction added 652,000 rental units. Finally, 523,000 rental units were other additions to the housing stock since 2005. These include mobile home move-ins, units created by mergers and conversions, and units that had been used for nonresidential purposes.

Movement from owner-occupancy was the source of 9.3 percent of all rental units. The percentage of movement across the categories ranged from a high of 16.4 percent for high rent units to a low of 7.3 percent for very low rent units. Units in the three highest rent categories were more likely to have been owner-occupied, but extremely low rent units had a higher than average propensity to have been owner-occupied.

Among 2007 rental units, 3.0 percent were seasonal or related vacant in 2005. Extremely low rent units had the highest proportion of units that were previously seasonal or vacant (6.4 percent); the second highest proportion belonged to extremely high rent units (5.8 percent).

Of all 2007 rental units, 1.6 percent came from new construction. The three highest rent categories had substantially higher than average rates of new construction, ranging from 4.1 to 6.4 percent. Another 1.3 percent came from other additions. Extremely high rent units and extremely low rent units both had 2.1 percent of their 2007 stock originate from other additions, the highest reported percentages from other additions.

Taking all outside sources into account, movement into the rental stock is greatest at the high end of the affordability spectrum. Combining columns J, K, L, and M of Table 7, 15.2 percent of 2007 rental units were not rental in 2005. The rates by category are: non-market (14.6 percent), extremely low rent (21.9 percent), very low rent (11.4 percent), low rent (12.1 percent), moderate rent (13.6 percent), high rent (24.4 percent), very high rent (25.1 percent), and extremely high rent (27.0 percent).

## **Combining Forward-Looking and Backward-Looking Analyses**

By themselves, forward-looking and backward-looking rental dynamics analyses leave an important question unanswered: Has the supply of affordable rental housing been growing or declining? Each type of analysis lacks a key piece of the puzzle. Forward-looking analysis does not produce data on the movement of units into rental housing, while backward-looking analysis does not produce data on the movement of units out of rental housing. This section combines the two types of analyses to answer this question.

The combination process is simple but potentially dangerous. One can start with the 2005 rental stock and estimate the 2007 rental stock by (1) using forward-looking analysis to track the 2005 rental stock to 2007 and then (2) adding additions to the rental stock since 2005 from the backward-looking analysis. Alternatively, one can start with the 2007 rental stock and estimate the 2005 rental stock by (1) using backward-looking analysis to project the 2007 rental stock back to 2005 and then (2) adding back in rental units that were lost to the rental stock between 2005 and 2007 from the forward-looking analysis. Table 9 performs the first of these combinations while Table 10 performs the second.

The danger arises because the two analyses combine weights created for different purposes and could produce misleading answers. To illustrate the need for caution, the discussion of Tables 8 and 9 begins with two inconsistencies between the tables:

- Table 9 starts with the forward-looking estimate of the 2005 rental stock and produces an estimate of the 2007 rental stock that is 884,000 less than the estimate from the backward-looking analysis. Table 10 starts with the backward-looking estimate of the 2007 rental stock and produces an estimate of the 2005 rental stock that is 884,000 more than the forward-looking estimate.<sup>18</sup>
- Table 9 estimates that 16,106,000 units were in the same affordability category in both 2005 and 2007; Table 10 estimates this number as 16,654,000. These estimates are based on the same AHS sample units and differ only because the weights applied to the sample units differ.

These inconsistencies point out the need for caution in using Tables 9 and 10. This paper looks at these tables for information on the direction and magnitude of changes in affordability and for estimates of the relative magnitude of the underlying causes.

In Table 9, the estimation process runs from left to right. The calculations begin with the 2005 rental stock in 2005 (column A). The forward-looking analysis tracks movement of these units either out of the rental stock (column C) or to other affordability categories (columns D and E). Column F counts the number of units that were rental in 2005, remained rental in 2007, and were in the same affordability category in both years. Column F equals column A minus the sum of columns C, D, and E. At this point, for each affordability category, the table has taken the count of units in that category in 2005 and stripped out all the units that are not in that category in 2007. Now the table adds in units that are in the category in 2007 but did not start out in that category in 2005. Columns G and H add units that came from other affordability categories and column I adds units that were non-rental in 2005. Column J is the estimate for 2007 of the number of units in each affordability category produced by this process. For comparison, column K contains the estimates for 2007 from the backward-looking analysis.

In Table 10, the estimation process runs from right to left. The calculations begin with the 2007 rental stock (column K). The backward-looking analysis removes units that were not rental in 2005 (column I) and units that came from other affordability categories (columns G and H). Column F counts the number of units that were rental in 2007, were also rental in 2005, and were in the same affordability category in both years. Column F is column K minus the sum of columns G, H, and I. At this point, for each affordability category, the table has taken the count of units in that category in 2007 and stripped out all the units that were not in that category in 2005. Now the table adds in units that are in the category in 2005 but did not continue in that category in 2007. Columns D and E add units that had moved out of the affordability

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<sup>18</sup> The difference is the same in both cases because of the symmetry in the estimation procedure. The difference between columns A and K is 1,312,000 in both tables. The movement among affordability categories netted across all categories must be zero. So the only source of net gain or loss is the difference between columns I and C, which is 429,000 in both tables.  $1,312,000 - 429,000 = 883,000$ . The differences in the tables are 884,000 instead of 883,000 because of rounding.

**Table 9: Tracking the Rental Stock Forward (all counts in thousands, source of estimates in parentheses)**

Affordability Categories	A 2005 Rental Units (forward)	B Not Applicable	C 2005 Rental Units Non- Rental in 2007 (forward)	D In Less Affordable Categories in 2007 (forward)	E In More Affordable Categories in 2007 (forward)	F In Same Affordability Category in Both Years (forward)	G In More Affordable Category in 2005 (forward)	H In Less Affordable Category in 2005 (forward)	I 2007 Rental Units Non- rental in 2005 (backward)	J Estimated 2007 Rental Stock (combined)	K 2007 Rental Units (backward)
<b>Non-market</b>	8,606		1,291	2,883		4,432		2,501	1,242	8,175	8,488
<b>Extremely Low Rent</b>	2,297		535	1,000	266	496	266	1,042	493	2,297	2,254
<b>Very Low Rent</b>	10,728		1,507	2,893	1,328	5,001	1,363	1,665	1,061	9,089	9,339
<b>Low Rent</b>	5,843		668	1,635	1,636	1,904	2,663	849	765	6,181	6,325
<b>Moderate Rent</b>	6,556		797	995	1,880	2,884	2,992	589	1,043	7,508	7,667
<b>High Rent</b>	1,983		385	331	747	520	1,174	94	585	2,373	2,399
<b>Very High Rent</b>	923		156	139	371	257	688	101	356	1,402	1,418
<b>Extremely High Rent</b>	1,508		281		614	613	730		504	1,847	1,866
<b>Total</b>	38,444		5,620	9,876	6,842	16,106	9,876	6,841	6,049	38,872	39,756

**Table 10: Tracking the Rental Stock Backward (all counts in thousands, source of estimates in parentheses)**

Affordability Categories	A 2005 Rental Units (forward)	B Estimated 2005 Rental Stock (combined)	C 2005 Rental Units Non- Rental in 2007 (forward)	D In Less Affordable Categories in 2007 (backward)	E In More Affordable Categories in 2007 (backward)	F In Same Affordability Category in Both Years (backward)	G In More Affordable Category in 2005 (backward)	H In Less Affordable Category in 2005 (backward)	I 2007 Rental Units Non- rental in 2005 (backward)	J Not Applicable	K 2007 Rental Units (backward)
<b>Non-market</b>	8,606	8,688	1,291	2,828		4,570		2,677	1,242		8,488
<b>Extremely Low Rent</b>	2,297	2,338	535	1,025	278	501	252	1,009	493		2,254
<b>Very Low Rent</b>	10,728	10,978	1,507	2,924	1,372	5,175	1,366	1,737	1,061		9,339
<b>Low Rent</b>	5,843	6,030	668	1,666	1,705	1,991	2,689	880	765		6,325
<b>Moderate Rent</b>	6,556	6,724	797	998	1,959	2,969	3,033	621	1,043		7,667
<b>High Rent</b>	1,983	2,055	385	336	781	552	1,161	100	585		2,399
<b>Very High Rent</b>	923	960	156	148	391	265	693	104	356		1,418
<b>Extremely High Rent</b>	1,508	1,555	281		643	631	731		504		1,866
<b>Total</b>	38,444	39,328	5,620	9,925	7,129	16,654	9,925	7,128	6,049		39,756

class since 2005, and column C adds units that had moved out of the rental stock since 2005. Column B is the estimate for 2005 of the number of units in each affordability category produced by this process. For comparison, column A contains the forward-looking estimate for the 2005 rental stock.

Columns A and K are the same in both tables. This paper uses the difference between column K and column A as the CINCH estimate of change in the size of each category over the period. Table 9 estimates the change in the size of each category by subtracting column A from column J, while Table 10 estimates the change by subtracting column B from column K.

To facilitate the discussion, Table 11 collects the information from Tables 9 and 10 to explain how the rental housing stock changed from 2005 to 2007. Columns C and I are identical in both Tables 9 and 10. The difference between column I and column C is an estimate for each affordability category of the net gain between 2005 and 2007 from outside the rental stock and is reported as column D in Table 11.

Columns D, E, G, and H in Tables 9 and 10 measure movement of rental units between affordability categories. Column D measures movements from more affordable categories in 2005 to less affordable categories in 2007 while column G measures movements into less affordable categories in 2007 from more affordable categories in 2005. The sum of movements in column D must be the same as the sum of the movements in column G in both tables.<sup>19</sup> Column E measures movements from less affordable in 2005 to more affordable categories in 2007 while column H measures movements into more affordable categories in 2007 from less affordable categories in 2005. Again, the sum of movements in column E must be the same as the sum of the movements in column H in both tables.

For this reason, the sum of the totals of columns G and H minus the sum of the totals of columns D and column E must equal zero in both tables. However, column G + column H – column D – column E will not equal zero for individual affordability categories. This sum is the net of all movements into and out of other affordability categories. In Table 11, column E reports this sum from Table 9 while column F reports the same sum for Table 10.

The paper now examines changes in rental affordability between 2005 and 2007. To facilitate the discussion, Table 11 collects the information from Tables 9 and 10. Table 11 also contains the estimates using AHS weights from Table 1. Using Table 11, the paper discusses each affordability category separately.

- Rental housing stock
  - The rental housing stock – both renter-occupied units and vacant rental units – grew between 2005 and 2007.

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<sup>19</sup> Column D in Table 9 sums *horizontally* the numbers in the cells between columns A and I of Table 3 in the area above the diagonal in that section of Table 3. Column G in Table 9 sums *vertically* the numbers in the same area of Table 3. The same is true for columns D and G of Table 10 with respect to the area above the diagonal in columns A through I of Table 6.

- The AHS published counts and the estimates in Table 2 based on CINCH weights both show an increase of approximately 1,250,000 units. Estimates in Table 1 derived from the AHS PUF using AHS weights indicate a larger increase, 1,405,000.
- This paper examines only units for which information on rental status and rents is available in both 2005 and 2007. This more limited universe showed an increase of approximately 1,300,000 units.

**Table 11: Changes in the Rental Stock by Affordability Category, Combined Analysis (all counts in thousands)**

	A	B	C	D	E	F	G
<b>Rent groups</b>	<b>AHS estimates of 2005-2007 change (Table 1)</b>	<b>CINCH estimate of 2005-2007 change (column K - column A)</b>	<b>Table 9 estimate of 2005-2007 change (column J - column A)</b>	<b>Table 10 estimate of 2005-2007 change (column K - column B)</b>	<b>Net Gain from non-rental sources (column I - column C)</b>	<b>Table 9 estimate of net gain from movement across categories</b>	<b>Table 10 estimate of net gain from movement across categories</b>
<b>Non-market</b>	-177	-118	-431	-200	-49	-382	-151
<b>Extremely Low Rent</b>	-61	-43	0	-84	-42	42	-42
<b>Very Low Rent</b>	-1,137	-1,389	-1,639	-1,639	-446	-1,193	-1,193
<b>Low Rent</b>	395	482	338	295	97	241	198
<b>Moderate Rent</b>	1,082	1,111	952	943	246	706	697
<b>High Rent</b>	451	416	390	344	200	190	144
<b>Very High Rent</b>	486	495	479	458	200	279	258
<b>Extremely High Rent</b>	366	358	339	311	223	116	88
<b>Total</b>	1,405	1,312	428	428	429	-1	-1

- **Non-market units:**
  - The number of non-market units decreased between 2005 and 2007. Estimates of the number of non-market units lost range from 118,000 to 431,000.
  - Both the forward-looking and backward-looking analyses indicate that most of the loss resulted from movement of non-market units into market units.
- **Extremely low rent units**
  - The analyses produced inconclusive results about changes in the number of extremely low rent units. The forward-looking analysis (column C) suggested no change while the backward-looking analysis (column D) showed a loss of 84,000 and the AHS weights (column A) suggest a loss of 61,000 units.
  - The two CINCH analyses reach different conclusions because the forward-looking analysis (column F) shows a net movement into the extremely low rent category from other rental categories while the backward-looking analysis (column G) shows a net movement out.

- **Very low rent units**
  - The number of very low rent units declined substantially. Both the forward-looking and backward-looking estimates indicate a loss of approximately 1,600,000 very low rent units. The estimate based on the starting points for the forward-looking and backward-looking analyses shows a loss of approximately 1,400,000 (column B), while the AHS weights indicate a loss of approximately 1,100,000 (column A).
  - The decline appears to come mainly from a net movement into and out of other affordability categories. Only one quarter of the decline is due to movement out of the rental stock.
  
- **Low rent units**
  - The number of low rent units increased between 2005 and 2007. The forward-looking and backward-looking analyses estimate an increase of approximately 300,000, while column B, which uses the starting points for the two analyses, shows an increase of approximately 500,000.
  - The tables ascribe approximately a third of the increase to movements into and out of the rental stock and approximately two-thirds to a net movement into and out of other affordability categories.
  
- **Moderate rent units**
  - The number of moderate rent units increased by approximately 1,000,000 units.
  - Most of the gain came from net movement into the moderate rent category from other categories.
  
- **High rent units**
  - The number of high rent units increased. The forward-looking analysis shows an increase of approximately 400,000, while the backward-looking analysis shows an increase of approximately 350,000.
  - The gain from movements into and out of the rental stock was larger than the gain from net movements into and out of other affordability categories.
  
- **Very high rent units**
  - The number of very high rent units increased. The forward-looking analysis shows an increase of approximately 500,000, while the backward-looking analysis shows an increase of approximately 450,000.
  - The gain from net movements into and out of other affordability categories was larger than the gain from movements into and out of the rental stock.
  
- **Extremely high rent units**
  - The number of extremely high rent units increased by approximately 300,000 units.
  - The gain from movements into and out of the rental stock was larger than the gain from net movements into and out of other affordability categories.

## **Conclusion**

This paper began with two questions that can now be answered:

- Did the number of rental units affordable to lower income households grow or decline between 2005 and 2007?

The three most affordable categories—non-market units, extremely low rent units, and very low rent units—posted large decreases in the number of units between 2005 and 2007. The three categories combined declined by between 1.5 and 2.0 million units.

- What factors caused the number of affordable rental units to grow or decline during this period?

Overall, approximately three quarters of the decline was due to net movement into and out of other affordability categories. Approximately 500,000 were lost due to net movements into and out of the rental stock.

There appears to have been a modest filtering up of the housing stock between 2005 and 2007. While the three most affordable categories decreased by 1.5 to 2.0 million units, the low and moderate rent categories increased by 1.2 to 1.6 million units. Just as the majority of the loss among the most affordable units was due to movements into and out of other affordability categories, the majority of the gain among low and moderate income units was due to movements into and out of other affordability categories.