Housing Units With Negative Equity, 1997 to 2009

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This article is intended to inform interested parties of ongoing research and to encourage discussion of work in progress. The views expressed on methodological, technical, and operational issues are those of the author and not necessarily those of the U.S. Census Bureau.

Abstract

Homeownership rates in the United States[1] increased between 1997 and 2004 and by 2007 had declined from 2004 levels. Home prices peaked in 2006 and have since fallen at the national level.[2] According to First American CoreLogic, an increasing number of homeowners are "under water." Underwater homeowners have negative equity, meaning that they owe more on their mortgages than their homes are worth.[3] The American Housing Survey (AHS) collects longitudinal data on self-reported home values and outstanding principal on mortgages, making it possible to calculate estimates of home equity, underwater status, and loan-to-value ratios at the national level and for individual housing units over time. Using data from the 1997–2009 AHS, this study explores national and regional trends in negative equity, housing and mortgage characteristics associated with negative equity, and demographic characteristics of householders with negative equity. In addition, this study examines the persistence of negative equity over time and the relative contributions of home value and mortgage debt to making homes under water. The percentage of underwater mortgages increased in the AHS from 2007 to 2009, but the 2009 percentage was lower than CoreLogic estimates. Negative equity impedes wealth accumulation and decreases spending power, and it can lead to several different outcomes for homeowners. Some homeowners may have limited mobility while they wait for the market to improve. Other homeowners may choose to strategically default on their mortgage because their home will not appreciate enough to make the unit profitable.

[1] U.S. Census Bureau, Current Population Survey. For more information, refer to http://www.census.gov/hhes/www/housing/hvs/qtr108/q108tab5.html.

[2] Standard & Poor's Case-Shiller® Home Price Index. For more information, refer to http://www2.standardandpoors.com.

[3] The end of data collection for the 2009 American Housing Survey fell in the third quarter of 2009. At the end of the third quarter of 2009, First American CoreLogic estimated that 23 percent of mortgages were under water.

Abstract (continued)

Still others may default on their mortgage if their income declines or if they experience significant life events that make it difficult for them to make mortgage payments, such as unemployment, divorce, or a death in the family. The AHS does not collect data on mortgage default, but it does capture information on the purchase prices when homes are sold to new owners. Analysts using internal AHS data can use this information to determine if the sale was distressed. Examining individual housing units longitudinally, this study uses the previous owner's outstanding principal and the new owner's purchase price to develop an estimate of the prevalence of distressed sales.

Introduction

Homeownership rates in the United States[4] increased between 1997 and 2004 and by 2007 had declined from 2004 levels. Home prices peaked in 2006 and have since fallen at the national level. Since 2006, home prices have fallen at the national level.[5] As home prices have fallen, an increasing number of homeowners are now "under water." Homeowners who are "under water" have negative equity, meaning that they owe more on their mortgages than their home is worth. First American CoreLogic estimated that 23 percent of homeowners were under water at the end of the third quarter of 2009.[6]

The American Housing Survey (AHS), which the U.S. Census Bureau conducts for the U.S. Department of Housing and Urban Development (HUD), collects data on home values and mortgage debt, making it possible to estimate underwater status. The AHS has followed the same housing unit sample since 1985 and collects information on housing characteristics and housing quality in the United States and information on household characteristics.

In this article, internal data from the 1997–2009 AHS national files are used to explore national and regional trends in negative equity, housing and mortgage characteristics associated with negative equity, and the demographic characteristics of householders with negative equity. The AHS does not collect data on mortgage default, foreclosures, or short sales. To measure distressed sales, units sold since the last survey are identified with purchase prices equal to or less than the previous owner's outstanding principal. Prevalence of distressed sales is estimated between 1999 and 2009.

[4] U.S. Census Bureau, Current Population Survey. For more information, refer to http://www.census.gov/hhes/www/housing/hvs/qtr108/q108tab5.html.

[5] Standard & Poor's Case-Shiller® Home Price Index. For more information refer to http://www2.standardandpoors.com/.

[6] *First American CoreLogic Negative Equity Report.* For more information refer to https://www.corelogic.com/About-Us/ResearchTrends/Negative-Equity-Report.aspx. CoreLogic includes both occupied and vacant single-family residential properties with a mortgage, but the American Housing Survey analyses presented in this article are restricted to owner-occupied housing units.

The next section of this article provides a brief overview of the AHS. Following that, the discussion turns to what it means to be under water, how underwater mortgages are measured, and how underwater mortgages affect the housing market. Existing research on self-reported home values, home equity, mobility, and distressed sales is then discussed. This section is followed by a discussion of research methodology and results, before turning to concluding remarks in the last section.

Overview of the AHS

The AHS started in 1973 and has sampled the same housing units since 1985, drawing additional sample to account for new construction. From 1973 to 1981, the Census Bureau conducted the AHS, formerly called the Annual Housing Survey, annually. The AHS consists of two surveys: a national survey and a metropolitan area survey. Since 1983, the national survey has collected data on a nationally representative sample of approximately 55,000 housing units every 2 years, in odd-numbered years. The national and metropolitan surveys are longitudinal, following the same housing units over time until a new sample is collected.

The 1973 AHS through the 1983 AHS followed a sample of housing units drawn from the 1970 Census. Since 1985, the AHS has followed a sample of housing units drawn from the 1980 Census. The AHS sample is updated with building permit data for permit-issuing areas and through listing procedures for areas that do not issue permits. The AHS has drawn additional sample for housing units missed in the 1980 Census, for units added to existing sample units, for manufactured/mobile homes from Census 2000, and from a sample of assisted-living units to improve coverage of elderly people.[7] Dependent interviewing techniques on some items confirm housing characteristics of returning cases recorded in previous interviews.[8] Since 1997, the AHS has been collected via in-person and telephone interviews using an electronic questionnaire.

Data analyzed in this article come from the internal versions of the 1997–2009 AHS national files. From 2005 to 2009, the data collection period for the AHS national survey was between late April and mid-September. In 2003, the data collection period was between June and September. From 1997 to 2001, the data collection period was between July and November.

Underwater Mortgages

Home equity is calculated by subtracting the outstanding principal on all mortgages or loans on a property from the home's value. Home equity calculated from the AHS uses self-reported home values and outstanding principal calculated from self-reported mortgage characteristics. Underwater properties have negative equity, meaning that the home's value is less than the outstanding principal on all mortgages and loans on the property. First American CoreLogic began reporting on negative

[7] The sample frame of assisted-living units was developed by matching independent lists of assisted-living units to addresses of housing units from Census 2000. Although improving coverage of elderly people, this methodology may have missed assisted-living housing units that were erroneously enumerated as group quarters in Census 2000.

[8] Further detailed information concerning the AHS sample is available at http://www.census.gov/hhes/www/housing/ahs/ahs01/appendixb.pdf.

equity in 2008. CoreLogic calculates negative equity using public record data on mortgage debt outstanding and estimates of home values using Automated Valuation Models (AVMs). Using this methodology, the percentage of homes with negative equity was 18 percent in the fourth quarter of 2008, 23 percent in the third quarter of 2009, and 24 percent in the first quarter of 2010.[9]

Being under water can lead to several different housing outcomes. Underwater mortgages impede housing wealth accumulation and decrease spending power. For some homeowners, being under water may limit residential mobility as they wait for the market to improve. Some homeowners decide to take a loss or negotiate with their bank to conduct a short sale. Other homeowners choose to strategically default on their mortgage when they decide that their home will not appreciate enough to make the unit profitable. Still others default on their mortgages if their incomes decline or if they experience significant life events that make mortgage payments difficult, such as job loss, divorce, or death in the household. At the community level, increasing defaults may contribute to continuing price declines and lead to even more underwater homes (Leonard and Murdoch, 2009; Rogers and Winter, 2009; Schuetza, Been, and Ellen, 2008; Wassmer, 2011).

Literature Review

Home equity estimates are affected by the accuracy of home value estimates. In this section, research on the validity and reliability of self-reported home values is discussed first. Second, previous research on home equity is reviewed. Lastly, research on relationship between negative equity, mobility, and distressed sales is explored.

Home Values

Unlike CoreLogic's home equity estimates, the AHS uses self-reported home value measures in its estimates. The AHS asks respondents, "How much do you think the house and lot would sell for on today's market?" The AHS asks respondents to exclude rental properties attached to the residence from their calculation of home value.

The earliest research on owners' home value estimates, using appraisal data and national data from the Survey of Consumer Finance, found that owners overstate their home values by about 4 percent (Kish and Lansing, 1954). Kain and Quigley (1972) replicated Kish and Lansing's study on a single city and found that home value estimate errors were systematically related to the owners' socio-economic characteristics. Kiel and Zabel (1999) compared AHS home value data with sales prices of houses sold in the 12 months before the interview. They found that owners reported their home values 5.1 percent higher than stated sales prices, and a subset of owners who bought their unit recently reported home values 8.4 percent higher than stated sales prices. They found AHS estimates to be reliable, but that the survey consistently overestimated home values. Unlike Kain and Quigley (1972), they did not find differences between sales prices and owners' estimates to be

[9] *First American CoreLogic Negative Equity Report*. For more information, refer to https://www.corelogic.com/About-Us/ResearchTrends/Negative-Equity-Report.aspx.

related to owner characteristics other than length of tenure. Recent research by Benitez-Silva et al. (2008) suggests that respondents who purchase their homes during soft housing markets, in which sellers outnumber buyers, are more accurate in assessing their home's value.

Home Equity

The AHS does not provide a home equity variable on its public use file. Some researchers have approximated a value for home equity for the AHS by subtracting the total remaining principal on all mortgages and loans from the housing unit's current value (Bourassa and Yin, 2008; Krivo and Kaufman, 2004). HUD states that home equity can be calculated in this way, using AHS national publication table specifications code but advises against doing so, because both the home value and the loan amounts used to calculate outstanding principal are top-coded on the AHS public use file (Vandenbroucke, 2008). In this article, the internal use version of the AHS is used to calculate home equity, which is then used to produce an indicator of negative equity. The AHS internal use file contains variable values before they have been top-coded and geographic information not found on the public use file. Using the internal use file removes errors in calculating the home equity measure due to top-coding.

Negative Equity, Mobility, and Distressed Sales

Previous research has found that households with negative equity are less likely to move and are more likely to default on their mortgages than households with positive equity. Recent research by Ferreira, Gyourko, and Tracy (2010, 2011), using data from the AHS from 1985 to 2007, found that owners with negative equity are one-third less mobile than owners with positive equity, but other research has found that homeowner's with high levels of negative equity are more likely to move (Schulhofer-Wohl 2011). Examining listing data from the Listing Information Network, Inc., on the Boston condominium market in the early 1990s, Genesove and Mayer (2001, 1997) found that owners with high loan-to-value ratios were more likely to set higher asking prices and have higher expected time on the market.

Some studies have found a link between high loan-to-value ratios and mortgage default. Van Order and Zorn (2000) found negative equity to be positively correlated with default across different income groups and neighborhoods. Examining FHA single-family mortgage foreclosures in the 1980s, Hendershott and Schultz (1993) found that unemployment and the book value of equity, or what a seller would receive without defaulting, are significant predictors of default.

Research Methodology

This study has three goals: (1) to analyze trends in negative equity since 1997, (2) to analyze the persistence of negative equity within individual housing units between 1997 and 2009, and (3) to estimate the prevalence of distressed sales since 1999. Analyses are restricted to owner-occupied housing units with at least one mortgage. First, negative equity trends between 1997 and 2009 are presented at national and regional levels and by householder and housing characteristics. Second, longitudinal analyses of the persistence of negative equity and the prevalence of distressed sales are examined.

Results

The results[10] of the research fall into three categories: (1) trends in home values, outstanding principal, and loan-to-value ratios; (2) trends in underwater mortgages between 1997 and 2009; and (3) longitudinal analyses of the persistence of underwater status over time and the prevalence of distressed sales, using linked AHS data from 1997 and 1999, 1999 and 2001, 2001 and 2003, 2003 and 2005, 2005 and 2007, and 2007 and 2009.

Trends in Home Values, Outstanding Principal, and Loan-to-Value Ratios

Standard & Poor's Case-Shiller® 10-City Composite House Price Index is a weighted repeat sales home price index of 10 major metropolitan statistical areas (MSAs) in the United States. Exhibit 1 presents average seasonally adjusted yearly house price index values from 1997 to 2009. The Case-Shiller® 10-City Index increased between 1997 and 2006 and declined from 2006 to 2009.[11] Data on self-reported home values from the AHS in exhibit 1 follow a similar pattern to the Case-Shiller® 10-City Index, showing a steady increase in home values from 1997 to 2007 and the decline in home values from 2007 to 2009. During this time period, median outstanding principal in the AHS increased sharply in 2003. Exhibit 1 shows that the percentage of units with two mortgages or loans increased in 2005.

Using data from a large loan database from a major secondary mortgage market participant, LaCour-Little, Rosenblatt, and Yao (2010) examined homeowners' home equity extraction decisions from 2000 to 2006 and found that, although 43 percent of households decided to take out equity when they refinanced, their home price appreciation was sufficient to decrease loan-to-value ratios on average during the time period. They found that home price appreciation was the main factor in explaining the amount borrowed during this time period.

However, while outstanding principal continued to increase through 2009, home values declined between 2007 and 2009, resulting in increases in median loan-to-value ratios between 2007 and 2009 (exhibit 1). Increases in percentages of units with loan-to-value ratios at or above 80 percent during this time period fueled these increases in median loan-to-value ratios (exhibit 2). Mortgages with loan-to-value ratios at or above 80 percent are a greater default risk, and owners with such mortgages are often required to purchase private mortgage insurance to insure the mortgage lender against default. Underwater units, or those with negative equity, have loan-to-value ratios above 100 percent.

[10] All differences reported in the text have been tested at the 5-percent significance level. Differences were tested with z tests for differences in proportions and differences in medians.

[11] The 10 MSAs in the Case-Shiller® 10-City Composite House Price Index are Boston-Cambridge-Quincy, MA; Chicago-Napierville-Joliet, IL-IN-WI; Denver-Aurora, CO; Las Vegas, NV-AZ; Los Angeles-Long Beach-Santa Ana, CA; Miami-Fort Lauderdale-Pompano Beach, FL; New York-Northern New Jersey-Long Island, NY-NJ-PA; San Diego-Carlsbad-San Marcos, CA; San Francisco-Oakland-Fremont, CA; and Washington-Arlington-Alexandria, DC-VA-MD-WV. The index is a quality-adjusted, 3-month moving average that is normalized to have a value of 100 in January 2000. The index is published monthly by Standard & Poor's. Annual index values in exhibit 1 were calculated by taking the average of seasonally adjusted monthly values for each year.

Exhibit 1

Home Value, Total Outstanding Principal, and Number of Mortgages and Loans, 1997–2009

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Case-Shiller® 10-City HPI average	80.22	86.93	95.13	107.38	120.02	133.28	151.24	178.84	209.08	224.52	214.61	178.76	155.56
AHS: Home value (median)[a]	$108,000		$120,000		$130,000		$150,000		$180,000		$200,000		$185,000
AHS: Total outstanding principal (median)[a]	$52,867		$64,923		$69,208		$82,060		$92,915		$100,971		$106,917
AHS: Loan-to-value ratio (median)[a]	0.55		0.60		0.56		0.58		0.55		0.54		0.63
AHS: Number of mortgages, lump sum home equity loans, and home equity lines of credit (weighted percentages)[a]													
1	79.88		79.87		76.78		78.03		72.14		70.99		73.92
2	18.81		18.99		20.77		19.91		25.19		27.05		24.31
3	1.19		1.02		2.21		1.92		2.48		1.85		1.58
4 or more	0.12		0.13		0.24		0.15		0.18		0.11		0.18

AHS = American Housing Survey. HPI = Housing Price Index.

[a] Of owner-occupied housing units with at least one regular mortgage or lump-sum home equity loan.

Source: U.S. Census Bureau, 1997–2009 American Housing Survey, National Sample

Exhibit 2

Loan-to-Value Ratios, 1997–2009 (weighted percentages)

	1997	1999	2001	2003	2005	2007	2009
Loan-to-value ratio[a]							
Less than 50 percent	44.67	38.42	43.02	40.62	44.90	45.85	37.68
50 to 69 percent	22.33	25.15	24.13	24.21	22.85	21.80	19.16
70 to 79 percent	12.04	13.63	12.96	12.93	11.94	11.04	10.76
80 to 89 percent	9.99	10.33	9.54	9.85	8.83	9.63	10.73
90 to 99 percent	6.80	7.53	6.78	7.27	6.49	6.85	10.08
100 to 109 percent	0.96	1.17	0.78	1.01	0.94	1.34	3.17
110 to 124 percent	0.78	0.79	0.73	0.85	0.83	0.77	2.70
125 to 174 percent	1.01	1.15	0.84	1.25	1.17	0.88	3.02
175 to 299 percent	0.59	0.84	0.55	1.02	0.97	0.69	1.56
300 percent or more	0.83	0.99	0.69	0.99	1.07	1.15	1.16

[a] *Of owner-occupied housing units with at least one regular mortgage or lump-sum home equity loan.*

Source: U.S. Census Bureau, 1997–2009 American Housing Survey, National Sample

Trends in Underwater Mortgages

Trends in underwater mortgages are presented in exhibit 3. Overall, the percentage of housing units under water increased from 4.17 to 4.94 percent from 1997 to 1999; dipped to 3.58 percent in 2001; increased to 5.12 percent in 2003; remained steady during 2003, 2005, and 2007; and shot up to 11.59 percent in 2009. As previous research by Kiel and Zabel (1999) found, self-reported home values are, on average, 5.1 percent higher than actual home values. Adjusting home values by 5.1 percent increases the percentage of underwater units in 2009 from 11.59 to 16.40 percent. Even after adjusting home values downward, estimates of the percentage of underwater mortgages in 2009 in the AHS are lower than CoreLogic's estimates of 23 percent. Remaining differences may be because of differences in how AHS and CoreLogic measure negative equity and the types of units for which they estimate negative equity. Whereas the AHS estimates negative equity from self-reported home values and outstanding principal from self-reported mortgage characteristics,[12] CoreLogic estimates negative equity from AVM-calculated home values and outstanding principal from public record data on mortgage debt outstanding. Whereas the AHS calculates negative equity for occupied housing units with at least one mortgage or loan, CoreLogic includes both single-family occupied and vacant residential properties with mortgages in its estimates. Although AHS estimates are lower than CoreLogic's estimates, both the AHS and CoreLogic detect increases in underwater units in 2009.

Examining regional differences in underwater housing units between 1997 and 2009, we find a decline in the percentage of underwater units in the Northeast in 2007 and an increase in 2009.

[12] The American Housing Survey collects detailed mortgage information on the first two mortgages on the housing unit and less detailed information on other mortgages on the unit. It asks for initial loan amount, origination date, mortgage term, and interest rate of the first two mortgages, and only initial loan amount of other mortgages. In the formula for outstanding principal, origination date, loan amounts, mortgage term, and interest rate are used to calculate the remaining principal on the first two mortgages. For housing units with more than two mortgages, the assumption is made that homeowners have paid off 25 percent of the principal of mortgages past the first two. For more recently purchased homes, this assumption may underestimate the amount of outstanding principal.

Exhibit 3

Underwater Housing Units, 1997–2009 (weighted percentages) (1 of 2)

	1997	1999	2001	2003	2005	2007	2009
Total units[a]	4.17	4.94	3.58	5.12	4.98	4.83	11.59
Total with adjusted home value	7.08	7.96	6.61	8.36	8.01	8.00	16.40
Race[b]							
White only	3.89	4.73	3.54	5.12	4.99	4.76	11.12
Black only	5.33	6.09	3.52	5.60	4.27	4.59	14.74
Asian only	7.63	7.44	3.24	3.51	6.27	5.97	13.62
Other	7.43	5.20	5.43	5.28	5.79	7.08	13.90
Hispanic origin							
Hispanic	7.96	5.50	3.22	4.83	4.55	6.12	20.51
Non-Hispanic	3.92	4.90	3.61	5.14	5.03	4.70	10.69
Marital status							
Married	3.93	4.70	3.38	5.25	4.95	4.51	11.07
Not married	4.76	5.54	4.04	4.82	5.06	5.52	12.71
Educational attainment							
Less than high school	6.08	8.10	4.69	8.31	6.16	7.63	14.28
High school	4.34	6.13	4.22	6.21	6.21	5.65	12.09
Some college	4.30	4.78	3.78	5.33	4.81	4.93	12.96
College	3.65	3.52	2.86	3.36	4.08	4.02	10.51
Advanced degree	2.81	2.64	2.09	3.20	3.95	2.97	8.37
Region							
Northeast	5.12	5.22	4.15	4.70	5.53	3.66	7.46
Midwest	2.94	3.74	3.44	5.23	4.62	4.74	11.36
South	3.65	5.52	3.29	5.97	5.65	4.97	11.04
West	5.57	5.17	3.73	4.03	3.93	5.60	15.87
Age							
Less than 35	6.98	7.99	4.43	6.28	6.99	7.23	18.92
35 to 44	4.20	4.66	3.99	5.65	5.66	5.29	13.97
45 to 54	3.26	4.32	3.11	4.55	4.23	3.99	8.81
55 to 64	3.22	3.30	3.20	4.13	4.31	3.55	8.03
65 or older	1.59	3.29	2.49	4.40	2.43	3.80	6.54
Interest rate type							
Adjustable rate mortgage	5.50	4.78	4.73	3.55	7.05	8.31	21.54
Fixed	4.35	5.33	3.75	5.61	5.04	4.67	11.59
Interest rate (%)[c]							
Less than 5.00	4.66	4.93	9.18	3.71	3.45	3.56	7.09
5.00 to 5.875	3.08	5.73	3.87	4.07	4.05	3.63	8.77
6.00 to 6.875	2.39	3.64	2.39	4.29	5.06	4.38	13.92
7.00 to 7.875	3.49	3.95	2.83	5.07	5.61	6.17	15.88
8.00 or more	4.95	6.99	5.24	9.14	9.61	9.40	17.89
Monthly income quintile							
First	4.65	6.53	4.40	6.61	5.84	6.54	11.92
Second	5.67	7.24	4.62	6.31	5.92	6.43	13.20
Third	5.72	7.54	4.46	6.81	6.62	6.74	13.30
Fourth	4.02	4.28	3.67	5.53	5.05	4.95	12.59
Fifth	2.74	2.96	2.54	3.19	3.45	2.74	9.21

Exhibit 3

Underwater Housing Units, 1997–2009 (weighted percentages) (2 of 2)

	1997	1999	2001	2003	2005	2007	2009
Building Type							
One-unit detached	2.25	2.38	2.19	3.26	3.58	3.34	9.99
One-unit attached	3.96	4.41	2.98	2.98	2.95	3.50	13.48
Two or more apartments	16.10	16.40	11.25	9.83	10.27	9.31	18.99
Manufactured (mobile) home	20.97	31.88	18.06	33.30	25.97	30.43	32.71
First-time homeowner	3.54	5.32	3.58	5.66	5.53	5.24	13.95
Owned home before	5.07	5.98	3.71	4.83	4.68	4.58	10.15

[a] *Units in table are restricted to owner-occupied housing units with at least one regular mortgage or lump-sum home equity loan.*

[b] *Before 2003, the race categories in the American Housing Survey (AHS) were White; Black; American Indian, Aleut, or Eskimo; Asian or Pacific Islander; and Other Race. The category American Indian, Aleut, or Eskimo was combined with Other Race in the analyses for 1997 through 2001.*

[c] *In the 1997 AHS, interest rates were collected in increments of one-fourth of a percent. In the 1999 through 2009 AHS, interest rates were collected in increments of one-eighth of a percent.*

Source: U.S. Census Bureau, 1997–2009 American Housing Survey, National Sample

The Midwest saw increases in the percentage of underwater units in 2003 and 2009. The South saw increases in the percentage of underwater units in 1999, 2003, and 2009, and a decrease in 2001. The West had a lower percentage of underwater mortgages in 2003 than it did in 1997, but, like all other regions, showed an increase in 2009. In 2003, the West had a smaller percentage of underwater homes than the South and Midwest, but was not statistically different than the Northeast. In 2005, the West had a smaller percentage of underwater homes compared with all other regions except the Midwest. In 2007, the South and the West had higher percentages of underwater homes than the Northeast. Rates began to rise in the West in 2007. In 2009, the highest rates were in the West and the lowest rates were in the Northeast.

Prevalence of underwater status was examined by demographic characteristics of householders. Using the public use version of the 2001 AHS, Krivo and Kaufman (2004) found Black and Hispanic householders had lower levels of home equity than White householders. They found age, education, income, length of residence, being a previous owner, and having lower interest rates to be positively related to higher home equity levels. As shown in exhibit 3, percentages of underwater units increased among White householders between 2007 and 2009. For Black householders, the percentage of underwater units decreased from 1999 to 2001; increased in 2003; remained steady in 2003, 2005, and 2007; and increased in 2009. For Asian householders, the percentage of underwater units declined in 2001 and increased in 2005 and 2009. In 2009, housing units with White householders had lower underwater mortgage percentages than Black householders. Percentages for Black, Asian, and other householders were about the same in 2009.

For Hispanic householders, the percentage of underwater units declined between 1997 and 2001, remained steady from 2003 to 2007, and increased in 2009. For Non-Hispanic householders, the percentage of underwater units increased from 1997 to 1999, declined from 1999 to 2001, increased from 2001 to 2003, remained steady from 2003 to 2007, and increased in 2009. In 2003 and 2005, no statistically significant differences existed between Hispanic and non-Hispanic householders. In 2007, the percentage of Hispanic households with underwater mortgages rose to 6.12 percent,

while non-Hispanic percentages remained steady at 4.70 percent. In 2009, 20.51 percent of Hispanic householders and 10.69 percent of non-Hispanic householders were under water.

The percentage of underwater units for householders under age 35 declined in 2001 and increased in 2003 and 2009, age 35 to 44 and 45 to 54 increased in 2003 and 2009, age 55 to 64 increased in 2009, and age 65 and older declined in 2005 and increased in 2007 and 2009. In 2003, householders less than 35 years old and those between 35 and 44 were more likely to be under water than householders age 45 and older. In 2005, householders who were 65 or older were less likely than other age groups to be under water. In 2007 and 2009, householders who were less than 35 were more likely than other age groups to be under water. The percentage of underwater housing units increased for all groups in 2009.

The percentage of underwater units among married and nonmarried householders declined in 2001 and increased in 2009. In 2009, married householders were slightly less likely to be under water than nonmarried householders.

Socioeconomic status was examined through an analysis of householder education level and household income. The results revealed that householders with advanced degrees were less likely than those with less than a high school education to be under water in all years. The percentages of homes that were under water increased in all education categories in 2009. Householders with a high school education or less saw a decline in 2001 and an increase in 2009. Householders with some college education saw increases in 2003 and 2009. Householders with a college degree had similar underwater percentages between 1997 and 2007 and increases in 2009. Householders with advanced degrees saw increases in 2003 and 2009. In 2003, 2005, and 2007, householders with some college education or more had lower rates of underwater mortgages compared with householders with lower education levels.

Housing units in the fifth income quintile were less likely to be under water than all other income quintiles between 1997 and 2009. Percentages of underwater homes increased across the board in all income quintiles in 2009.

Underwater status was examined by characteristics of the first mortgage on the property. Higher percentages of units with interest rates below 5 percent, from 5 to 5.875 percent, and from 6 to 6.875 percent were under water in 2009 than in 2007. Units with interest rates between 7 and 7.875 percent experienced a decline in the percent that were under water in 2001 and increases in the percent in 2003 and 2009. Units with interest rates at 8 percent or more experienced a decline in the percent under water in 2001 and increases in 1999, 2003, and 2009. In 2007, housing units with first mortgage interest rates at 7 percent or more were more likely to be under water compared with units with interest rates below 7 percent. In 2009, all categories experienced an increase.

For units in which the first mortgage is an adjustable rate mortgage (ARM), we find increases in the percent under water in 2005 and 2009. In 2003, ARMs were less likely to be under water compared with fixed-rate mortgages. In 2005, 2007, and 2009, the percentage of ARMs that were under water was greater than that of fixed mortgages.

The effect of the housing bust on first-time homeowners was examined. The percentage of first-time homeowners whose mortgages were under water increased in 1999, 2003, and 2009 and

decreased in 2001. No statistically significant differences emerged between the percentages for first-time homeowners and repeat homeowners in 2007. In 2009, first-time homeowners were more likely to be under water.

Manufactured and mobile homes do not appreciate in the same way as detached and attached single units and condominiums (Jewell, 2003). Manufactured and mobile home financing is different from that of single-family homes and condominiums, because the homeowner does not always own the land on which the home sits. Across all years, except 1997, manufactured and mobile homes were more likely to be under water than other building types. The percentage of underwater units increased for all building types, except for manufactured and mobile homes, in 2009. For one-unit detached buildings, the percent under water also increased in 2003. For one-unit attached buildings, the percent under water declined in 2001 and remained steady in 2003, 2005, and 2007. Manufactured and mobile homes saw increases in the percent under water in 1999 and 2003 and declines in 2001 and 2005.

Was the increase in underwater units concentrated in newly constructed units and among owners who bought units at the top of the market? Exhibit 4 presents the percentages of units under water by the year the unit was built and the year the unit was bought, obtained, or received for each AHS survey year. Units built in all time periods were more likely to be under water in 2009 than

Exhibit 4

Percent of Units Under Water by Year Unit Built and Year Unit Bought, Obtained, or Received, 1997–2009 (weighted percentages)

	1997	1999	2001	2003	2005	2007	2009
Year Built[a]							
1919–69	3.59	3.93	3.53	3.95	4.09	3.72	9.57
1970–89	3.58	3.92	2.84	4.45	4.15	4.64	9.93
1990–94	6.73	5.71	3.68	6.22	4.55	5.51	10.26
1995–99	7.18	11.01	5.60	9.12	7.92	6.66	13.77
2000–04	—	—	4.64	7.29	7.57	6.06	14.29
2005	—	—	—	—	12.95	5.50	21.10
2006	—	—	—	—	—	10.19	25.35
2007	—	—	—	—	—	5.20	25.68
2008	—	—	—	—	—	—	14.19
2009	—	—	—	—	—	—	15.65
Year Unit Bought, Obtained, or Received[a]							
1919–69	0.34	1.09	1.27	1.85	2.16	3.89	4.93
1970–89	1.94	2.51	2.03	2.40	2.54	2.13	3.29
1990–94	5.61	4.35	2.86	4.07	2.89	3.11	3.53
1995–99	6.06	7.34	4.62	6.27	5.35	4.29	6.85
2000–04	—	—	5.21	6.69	6.07	4.77	11.64
2005	—	—	—	—	10.21	6.78	20.49
2006	—	—	—	—	—	9.38	23.81
2007	—	—	—	—	—	8.91	23.20
2008	—	—	—	—	—	—	15.75
2009	—	—	—	—	—	—	7.42

[a] *Restricted to owner-occupied housing units with at least one regular mortgage or lump-sum home equity loan.*

Source: U.S. Census Bureau, 1997–2009 American Housing Survey, National Sample

in previous AHS survey years. In the 2009 AHS, units built between 2005 and 2007, at the height of the market, were more likely to be under water than units built before 2005 or after 2007. In all survey years before 2009, recently purchased units were more likely to be under water than units purchased between 1919 and 1969. In 2009, units were more likely to be under water if they were purchased between 2000 and 2008 than if they were purchased before 2000 or in 2009.

Longitudinal Analyses

Data for individual housing units linked across 2 survey-year periods (1997 and 1999, 1999 and 2001, 2001 and 2003, 2003 and 2005, 2005 and 2007, and 2007 and 2009) are presented in exhibits 5 and 6. In exhibit 5, units are linked that are the same dwelling unit[13] in both years and had at least one continuing household member 2 years later. Exhibit 6 is restricted to units with a new owner 2 years later.[14] Exhibit 5 shows that, in 2007, 21.78 percent of units that were under water in the previous survey year remained under water 2 years later. This percentage rose to 38.85 percent in 2009. In exhibit 6, sales as distressed if the unit's purchase price was less than or equal to the outstanding principal on the unit in the previous survey year. Distressed sales rates were relatively steady between 11.21 and 13.77 percent before 2009. Exhibit 6 shows that, in 2007, 11.64 percent of sales were distressed. In 2009, the percentage of distressed sales rose to 20.97 percent.

Exhibit 5

Negative Equity Persistence (weighted percentages)

Years	Percent of Units Under Water at First Survey Year That Are Under Water 2 Years Later[a]
2007 and 2009	38.85
2005 and 2007	21.78
2003 and 2005	26.80
2001 and 2003	23.44
1999 and 2001	20.21
1997 and 1999	28.21

[a] *Underwater status calculated for owner-occupied housing units with at least one regular mortgage or lump-sum home equity loan.*

Source: U.S. Census Bureau, 1997–2009 American Housing Survey, National Sample

[13] A unit is considered not the same dwelling if any of the following conditions are met: "the unit is the result of a conversion or merger since the previous survey, the interviewer went to the wrong place last survey, the current unit is a replacement mobile home (or, much less frequently, a replacement structure), the unit is a vacant mobile home site that was occupied in the previous survey, or the address identifies a location that is now a type C noninterview" (ICF International, 2009: 1274).

[14] Both the pure weight (PWT) and Components of Inventory Change (CINCH) weights were used in the analyses. HUD and the Census Bureau recommend that PWT, or the inverse of the probability of selection, be used as a longitudinal weight, but the PWT may vary from year to year because of adjustment to the sample size to account for new construction, supplemental samples, and sample reductions. For 2001 to 2007, the CINCH analyses used an adjusted PWT value that accounts for differences in the PWT and sample over a 2-year period. CINCH weights were used to analyze the linked data for 2001 and 2003, 2003 and 2005, and 2005 and 2007. For other years, the PWT for the first survey year was used in the analysis. See Watson (2007) for more information on AHS weighting methodology and Eggers (2009) for more information on the CINCH weighting methodology. New households were identified with the SAMEHH variable. HUD has warned of potential problems with the SAMEHH variable but notes that the variable is reliable for units that remain occupied in both years. Ferreira, Gyourko, and Tracy (2010), in their research on household mobility using the AHS, use demographic data on the household to edit their data longitudinally and identify false moves.

Exhibit 6

Distressed Sales

Years	Percent of Sales Distressed 2 Years Later[a]
2007 and 2009	20.97
2005 and 2007	11.64
2003 and 2005	11.21
2001 and 2003	13.77
1999 and 2001	13.12
1997 and 1999	12.83

[a] *Restricted to owner-occupied housing units with at least one mortgage or lump-sum home equity loan in both years. Vacant units, usual residence elsewhere (URE) units, and units owned free and clear 2 years later are not included.*

Source: U.S. Census Bureau, 1997–2009 American Housing Survey, National Sample

Summary and Conclusions

The study presented in this article documented increases in underwater mortgage percentages across all types of owners and units, except manufactured and mobile homes, in 2009. Estimates of the percentage of units with negative equity in 2009 in the AHS (11.59 percent) were found to be lower than CoreLogic's estimates (23 percent). These differences were attributed to differences in how the methodologies AHS and CoreLogic use to measure negative equity and the housing populations they cover in their estimates. The persistence of negative equity was examined for units that remained the same dwelling unit in both years and had at least one continuing household member 2 years later. Analyses of the prevalence of distressed sales were conducted on units that remained the same dwelling unit in both years and had a new household 2 years later. Negative equity persistence increased between 2007 and 2009, as did the prevalence of distressed sales. The question remains: What effects have increases in negative equity had on distressed sales in the wake of the housing bust? Future research plans include analyzing the AHS to explore the effects of negative equity and housing burden on distressed sales.

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