Reversing the Trend: The Recent Expansion of the Reverse Mortgage Market

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Abstract

Reverse mortgages allow elderly homeowners to consume their housing wealth without having to sell or move out of their homes. However, very few eligible homeowners have used reverse mortgages to achieve consumption smoothing until recently when the reverse mortgage market in the U.S. witnessed substantial growth. This paper examines 1989-2007 loan-level reverse mortgage data and presents a number of findings. First, I show that recent reverse mortgage borrowers are significantly different from earlier borrowers in many respects. Second, I find that borrowers who take the line-of-credit payment plan, single male borrowers, and borrowers with higher housing values exit their homes sooner than other reverse mortgage borrowers. Third, I combine the reverse mortgage data with county-level housing price data to show that elderly homeowners are more likely to purchase reverse mortgages when the local housing market is at its peak. This finding suggests that the 2000-05 housing market boom may be partially responsible for the rapid growth in the reverse mortgage market. Lastly, I show that the Federal Housing Administration (FHA) mortgage limits, which cap the amount of housing wealth that an eligible homeowner can borrow against, have little effect on the demand for reverse mortgages. This paper is the first to perform such analyses using actual loan-level reverse mortgage data. The findings have important implications to both policy making and the economics of housing and aging.

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1 Introduction

Housing wealth is often the largest non-pension wealth component for many elderly homeowners. For example, the 2007 Survey of Consumer Finances (SCF) data suggest that for 6.5 million homeowners aged 62 or above, housing wealth represents at least 80% of their total wealth. To determine whether Americans are saving enough for retirement, it is crucial to decide how housing wealth should be treated - are elderly homeowners willing and able to consume their housing equity in retirement? According to the 2007 SCF, 4.2 million homeowners aged 62 or above have a house-value-to-income ratio of at least 10. For these house-rich but cash-poor elderly homeowners, economists believe that reverse mortgages have the potential to increase their consumption while allowing them to continue living in their homes.

The most common type of reverse mortgage loan is the Home Equity Conversion Mortgage (HECM), insured by the Federal Housing Administration (FHA) and constituting over 90% of all reverse mortgage loans originated in the U.S. market. Despite its potential economic appeal, using reverse mortgages to finance consumption after retirement has been the exception rather than the rule among elderly homeowners. From its inception in 1989 to the end of 2007, out of tens of millions of eligible homeowners, less than 400,000 loans have been originated through the HECM program. A number of factors have been suggested in explaining the small size of the reverse mortgage market, including but not limited to high costs, regulatory and legal barriers, moral hazard and adverse selection, financial awareness and literacy, perception of housing equity as a safety net for large medical expenses, bequest motives, and the difficulties associated with reverse mortgage securitization. Unfortunately, we have little evidence on to what extent each of these factors has prevented reverse mortgages from being more dominant among eligible homeowners.

Although usage remains relatively low, the reverse mortgage market in recent years has experienced significant growth. In the early 1990s, only a few hundred HECM loans were originated each year. In contrast, over 100,000 reverse mortgage loans were originated through the HECM program in 2007 alone. Plausible explanations include higher house values, lower interest rates, and increasing awareness of the product. Also, whether the expansion is transitory or permanent remains unclear. Addressing these questions is not only essential to understanding elderly homeowners' desire to consume housing wealth, but it also provides evidence for regulators to conduct cost-benefit analysis of the HECM program and to design more efficient policies in facilitating the conversion of home equity into liquid assets.

In this paper, I examine all HECM loans that were originated between 1989 and 2007. I first present descriptive evidence on the characteristics of HECM borrowers and HECM loans with an emphasis on how these characteristics have changed over time. I then study the loan termination and assignment outcomes using probit and proportional hazard models. A HECM loan is terminated when the borrower dies or permanently moves out of the house. The estimates suggest that borrowers who choose the line-of-credit payment plan, single male borrowers, and borrowers with higher housing values terminate HECM loans sooner than other reverse mortgage borrowers. In addition, I investigate the link between housing price appreciation and the growth in the reverse mortgage market. I show evidence suggesting that areas at the peak of the housing market tend to experience more growth in HECM loans. Lastly, I examine the role of FHA mortgage limits in the reverse mortgage market. The county-specific FHA mortgage limits effectively restrict the amount of housing equity a borrower can convert into liquid assets. I find little evidence supporting the claim that FHA mortgage limits have prevented reverse mortgages from becoming more popular.

To my best knowledge, this is the first paper using 18 years of HECM loan data to systematically study the reverse mortgage market. I take the first step to address questions including what factors have attributed to the rapid growth of the reverse mortgage market in recent years, and whether regulatory barriers such as FHA mortgage limits have reduced the demand for reverse mortgages. The uniqueness of the data enables me to draw conclusions that are more accurate and more relevant than previous literature. According to the Census Bureau, the number of persons above age 65 will increase to 40 million in 2010 and further to 81 million in 2040. The questions addressed by this paper will become increasingly important with the population aging and baby-boomers' entering retirement age.

The rest of this paper proceeds as follows. Section 2 overviews the existing literature on reverse mortgages and introduces the HECM program in detail. In section 3, I describe the data used in this paper. I then show the characteristics of HECM loans and HECM borrowers observed in the data in section 4. Section 5, 6, and 7 discuss the empirical evidence on loan termination and assignment outcomes, housing price appreciation, and FHA mortgage limits, respectively. The last section concludes and clarifies common misconceptions about the reverse mortgage market.

2 Background

2.1 Overview of Existing Studies

The question of whether Americans are financially prepared for retirement has inspired heated debates in the literature.[1] When evaluating retirement saving adequacy, economists and financial planners have to decide whether housing equity should be included as con-

[1] See Skinner (2007) for a review on this topic.

sumable wealth. Because housing is both a consumption good and an investment good, the correct treatment of housing equity may not be obvious in the retirement saving context. For example, while Mitchell and Moore (1998) add housing equity to household net worth, Bernheim et al. (2000) exclude it in their calculation. More recently, Sinai and Souleles (2008) suggest that the fraction of "consumable housing equity" ranges from 60% to 99% for elderly homeowners depending on their age.

To what degree we should consider housing equity as retirement savings depends on to what degree elderly homeowners are willing and able to consume their housing wealth. It is well known that many seniors prefer staying in their homes for as long as they can. For example, in a survey sponsored by the American Association of Retired Persons (AARP), 95% of persons 75 and older agreed with the statement "What I'd really like to do is stay in my current residence as long as possible."[2] A series of studies by Venti and Wise (e.g. Venti and Wise (1989, 1990, and 2004)) show that elderly homeowners do not reduce their housing wealth in the absence of precipitating events such as the death of a spouse or entry to a nursing home. If elderly homeowners have strong psychological attachment to their homes, then reverse mortgages, which generate additional income and liquid wealth for elderly homeowners while allowing them to continue living in their homes, may be welfare-improving for many households.

A number of studies have estimated the potential size of the reverse mortgage market. Venti and Wise (1991) analyze the 1984 Survey of Income and Program Participation (SIPP) data and find that a reverse mortgage in the form of annuity payments would substantially affect the income of the single elderly who are very old. Merrill et al. (1994) use the 1989 American Housing Survey (AHS) data to show that out of the 12 million elderly homeowners who own their homes free and clear, 800,000 could benefit substantially from

[2]See Bayer and Harper (2000).

reverse mortgages. Instead of looking only at the median household and focusing on the income-increasing aspect of reverse mortgages, Mayer and Simons (1994) examine the whole distribution of elderly households and consider both income increases and debt reductions as benefits of reverse mortgages. As a result, they find a much larger potential market for reverse mortgages than previous studies: over 6 million homeowners in the U.S. could see their effective monthly income being raised by reverse mortgages by at least 20%.

In practice, the reverse mortgage market is much smaller than expected. For example, the HECM program represents 90% of the U.S. reverse mortgage market. During the first ten years since its inception, less than 40,000 loans were originated through the HECM program. On the demand side, a number of factors may have prevented reverse mortgages from growing bigger. First, elderly homeowners with strong bequest motives may not find reverse mortgages attractive because reverse mortgages reduce the amount of wealth they can leave to their estates. Second, the probability of shouldering large medical expenses increases over time for the elderly. In the absence of other forms of protections such as Long-Term Care Insurance, many elderly homeowners use their housing equity to self-insure. Using a survey conducted on 2,673 homeowners aged 50-65, Munnell et al. (2007) report that nearly half of the respondents who claim they are not planning to tap their housing equity in retirement list "insurance against living and health expenses" as the reason. Davidoff (2008) present a model suggesting that such behaviors may even be optimal. Third, certain features of the HECM program and its interaction with some welfare programs may be undesirable. For example, a HECM loan usually requires large upfront costs, the amount of home equity against which one can borrow is capped by the FHA mortgage limit, and the additional income received from a HECM loan may disqualify one from public assistance such as Supplemental Security Income (SSI) or Medicaid. Michelangeli (2008) argues that reverse mortgages could be welfare-reducing if borrowers face significant moving risks. Fourth, reverse mortgages are complex financial products and can be particularly challenging for elderly homeowners.

Conversations with people in the industry suggest that many senior homeowners have misconceptions about reverse mortgages. Lastly, the elderly may value owning their homes free and clear so much that they are averse to the idea of borrowing against their homes.

On the supply side, lenders face various obstacles as well. First, reverse mortgages are significantly different from traditional "forward" mortgages. Lenders with little experience in the reverse mortgage market often have to confront unfamiliar documentation requirements. For example, lenders who are accustomed to forward mortgages have to prepare different documents for reverse mortgages to satisfy the Truth-in-Lending Act requirements. As a result, lenders must designate reverse mortgage specialists among their employees. Because the HECM program caps origination fees charged by lenders, such a move is only economical if there is a sufficient volume of HECM loan origination. Another consideration is that different states have different regulations with respect to reverse mortgages. To comply with such regulations, lenders who operate in multiple states have to bear additional costs. In addition, due to the unconventional cash-flow pattern, reverse mortgages are difficult to securitize and finance. In fact, according to Szymanoski et al. (2007), HECM loans were not securitized until August 2006. Finally, the Fair Housing Act prohibits pricing loans based on gender, despite the fact the males and females impose very different mortality risks.

Besides the factors discussed above, economists have also recognized that reverse mortgage markets may suffer from adverse selection and moral hazard problems. Because reverse mortgage loans are not due until the borrower dies, sells the house, or permanently moves out, people who know they are likely to stay in their homes for a long time will find reverse mortgages more attractive than others. However, Davidoff and Welke (2007) find advantageous selection in the HECM program. In other words, HECM borrowers appear to exit their homes at a faster pace than the general population. The authors suggest that higher discount rate among the borrowers combined with housing price appreciation may explain observed advantageous selection. Furthermore, economists are concerned that the moral hazard problem of home maintenance would make lenders think twice before entering the reverse mortgage market. Davidoff (2006) uses AHS data to show that homeowners over 75 spend less on routine maintenance than younger owners of similar homes. In practice, however, the moral hazard problem is mitigated because borrowers are the residual claimant of the house.

Overall, most of the studies on reverse mortgages do not have loan-level data and therefore, have to rely on hypothetical borrowers. Among the few studies that do look at loan-level data, Davidoff (2006) and Szymanoski et al. (2007) focus only on termination rates of HECM loans, and Case and Schnare (1994) and Rodda et al. (2000) analyze only the data from earlier years of the HECM program. Given that 88% of all HECM loans originated between 1989 and 2007 were taken out after 2000, the field calls for research using more recent data. This paper aims to fill the gap.

2.2 Background on the HECM Program

Congress established the Home Equity Conversion Mortgage (HECM) program in 1987 and authorized the Department of Housing and Urban Development (HUD) to administer the program. The first HECM loan was made in 1989. Since then, the HECM program has been the dominant reverse mortgage product in the United States.[3] To be eligible for a HECM loan, first, borrowers have to be 62 years of age or older. Second, the prospective borrower's property must be a one-unit dwelling. Third, borrowers have to own their homes free and clear, or have liens not exceeding the amount of HECM loans that they can receive.

[3] Other reverse mortgage products in the U.S. include the Home Keeper program offered by Fannie Mae and jumbo reverse-mortgage loans offered by Financial Freedom Senior Funding Corporation.

Moreover, a HECM loan is a "non-recourse" loan. This means that the borrower and her estate will never owe more than the value of the property and no other assets can be seized to repay the loan.

HECM loans differ from traditional home equity loans or home equity line of credit (HELOC) in two ways. First, a HECM loan does not have a fixed maturity date. The loan becomes due and payable only after the borrower dies or the borrower no longer occupies the property as a principal residence. Second, while home equity loans and HELOCs require borrowers to have sufficient income and credit worthiness, HECM loans do not have such requirements.[4] Therefore, house-rich but cash-poor elderly homeowners who cannot obtain home equity loans may find HECM loans particularly attractive.

The amount that the borrower can receive from a HECM loan is calculated in three steps. The first step is to determine the Maximum Claim Amount (MCA). The MCA is the lesser of the appraised value of the property or the county-specific FHA mortgage limit for a one-family residence under Section 203 (b) of the National Housing Act. The limit for any given county in a given year is usually set at 95% of the median sales price. However, there exist both ceiling and floor caps, creating nationwide maximum and minimum values for the FHA mortgage limit. For example, the ceiling was \$362,790 and the floor was \$200,160 in 2007. These limits effectively cap the amount of housing equity the borrower can use to purchase reverse mortgages.

The second step is to determine the "Initial Principal Limit" by multiplying the MCA with a factor that lies between zero and one. The magnitude of this factor depends on the age of the borrower and the "expected interest rate" at the time of loan closing.[5] The expected interest rate, a proxy for future interest rate, equals the sum of the ten-year

[4]However, borrowers who have delinquent or defaulted on federal debt may not be eligible for HECM loans.

[5]For married couples, only the age of the younger borrower is taken into consideration.

Treasury rate and the lender's margin. The lender's margin is typically between 1 and 2 percentage points. These principal limit factors are designed such that, under certain assumptions, the loan balance reaches the MCA at the time when the loan becomes due.[6] As a result, the factor increases with the borrower's age and decreases with the expected interest rate. For example, the factor equals 0.281 for a 65-year old at 10 percent expected rate, and it equals 0.819 for a 85-year old at 5 percent expected rate.

The third step is to calculate the "Net Principal Limit", which is the amount the borrower can take as a lump-sum in cash at closing, by subtracting from the initial principal limit the upfront costs associated with HECM loans. These upfront costs include the initial Mortgage Insurance Premium (MIP), origination fee, closing costs, and a set-aside for monthly servicing fees. The initial MIP is set at 2% of the MCA. The origination fee is set at $2,000 or 2% of the MCA, whichever is greater.[7] Closing costs include origination fees and other third-party fees such as appraisal fees, credit report fees, and title insurance fees. A servicing-fee set-aside is the present value of the monthly servicing fees charged by the lender, assuming that the loan becomes due when the borrower turns 100. The typical monthly servicing fee is $30 or $35. Overall, the upfront cost on a HECM loan ranges between $7,000 and $20,000, and it is financed rather than paid by the borrower out of pocket. Figure 1 summarizes the steps described above in calculating the net principal limit.

Given the amount of net principal limit, HECM borrowers can choose from five payment plans to receive the mortgage proceeds. Under the *Tenure* plan, the borrower will receive equal monthly payments from the lender for as long as the borrower lives and continues to occupy the property as her principal residence. This payment plan is also called

[6] See Szymanoski (1994) for detailed discussions on the assumptions that HUD makes to calculate the principal limit factors.

[7] The Housing and Economic Recovery Act of 2008 established new limits on the loan origination fee for HECM loans. The limit is the greater of $2,500 or two percent of the first $200,000 of the MCA, plus one percent of the portion of the MCA that is greater than $200,000. The total amount of loan origination fee may not exceed $6,000.

"reverse annuity mortgage" in the literature due to its resemblance to an annuity product. Under the *Term* plan, the borrower will receive equal monthly payments from the lender for a fixed period of months selected by the borrower. Note that even though payments stop at the end of the selected term, the loan is not due until the borrower dies or moves out of her home. Under the *Line of Credit* plan, the borrower will receive the mortgage proceeds in unscheduled payments or in installments, at times and in amounts of the borrower's choosing, until the line of credit is exhausted. This is the most popular payment plan among HECM borrowers. In addition, the *Modified Tenure* plan allows the borrower to combine a line of credit with monthly payments for as long as she is alive and continues to live in the house. The *Modified Term* plan allows the borrower to combine a line of credit with monthly payments for a fixed period of months.[8] Table 1 shows the principal limit factor, net principal limit, the monthly payment under a tenure plan, and monthly payment under a ten-year term plan for a hypothetical borrower, assuming a MCA of $200,000, an initial MIP of $4,000, an origination fee of $4,000, closing costs of $2,000, and a monthly servicing fee of $30.

One key feature of HECM loans is the FHA insurance program. Under this program, HUD insures the borrower against the risk that the lender can no longer make the contracted payments. It also insures the lender against the risk that the loan balance exceeds the property value. For example, lenders can assign loans to HUD when the loan balance reaches 98% of the MCA. In the event that the proceeds from the sale of the property are not sufficient to pay the outstanding loan balance, lenders who have not assigned the mortgage to HUD can submit a claim for insurance benefits up to the MCA. To pay for this insurance program, HUD charges a Mortgage Insurance Premium (MIP). The initial MIP, as mentioned before, is set at 2% of the MCA. The monthly MIP is set at an annual rate of 0.5% and is charged on the outstanding balance of a HECM loan.

[8]Borrowers may change their payment plan throughout the life of the loan at a small cost.

3 Data Description

The data that I analyze in this paper are the loan-level HECM data provided by HUD. I have all HECM loans made between 1989 and 2007, a total of 387,999 records in the raw data. For each of these loan records, I have information on the age of the borrower, age of the co-borrower, gender and marital status of the borrower, the appraised value of the property at origination, location of the property (i.e. state and ZIP code), the Maximum Claim Amount (MCA), expected interest rate, initial principal limit, choice of payment plan, monthly payment amount, loan origination date, loan termination date, loan assignment date, whether a claim was filed to HUD by the lender, and the nature of the claim.

In the process of data cleaning, I dropped irregular observations such as loans with missing borrower age, missing gender or marital status indictor, and loans that were not endorsed by HUD for various reasons. I also dropped borrowers from places other than continental U.S. because the FHA mortgage limit for Alaska, Guam, Hawaii and the Virgin Islands is very different from the rest of the country. After these procedures, I have a final sample of 375,392 observations.

Figure 2 shows the number of HECM loans originated each year between 1989 and 2007. In the early years of the program, only a small number of elderly homeowners took out HECM mortgages. In contrast, loan origination has grown substantially in recent years. For instance, the number of loans made in 2007 is ten times the number in 2001. One of the potential explanations for such significant growth is that elderly homeowners have become more comfortable taking equity out of their homes and taking on debt in general. To test the plausibility of this explanation, I use the 1989-2007 SCF data and plot the fraction of homeowners aged 62 or above who have credit card debt, debt secured by primary residence, or any type of debt in Figure 3. The fraction of elderly homeowners with credit card debt trended up slightly over the 18-year sample period. The fraction of elderly homeowners with mortgages, home equity loans, or home equity lines of credit increased steadily from 22% in 1989 to 39% in 2007. The fraction with any type of debt rose from 44% to 57%. The SCF data suggest that an increasing proportion of elderly homeowners feel comfortable taking on debt secured by their homes. However, such a shift in financial attitude is unlikely to fully explain the unusually large increase in reverse mortgage origination. Other factors may also have contributed to the growth of the HECM program, including the 2000-05 housing market boom, lower interest rates in recent years, and more awareness of reverse mortgages among elderly homeowners.

To perform the empirical analysis shown later in this paper, I merged the HECM loan-level data with a number of public and proprietary datasets. First, I used the 2000 Decennial Census ZIP code level data to characterize the neighborhoods where reverse mortgages were originated. Second, I used the monthly county-level housing price indexes purchased from First American CoreLogic to study the relationship between housing price appreciation and reverse mortgage market growth. This dataset covers 679 counties in the U.S. and merged with approximately 90% of the loans in the HECM dataset. To control for subprime mortgage activity in each county, I also used the First American LoanPerformance data which contain information on securitized non-prime mortgages from 1999 to 2008. Third, I used the 1990-2008 county level FHA mortgage limit data to examine the effect of these limits on the demand for reverse mortgages. Lastly, I used a dataset purchased from the United States Postal Service to match ZIP codes with counties for each HECM loan in my sample.

The administrative data analyzed in this paper are essential for studying the reverse mortgage market, because reverse mortgage borrowers are a tiny fraction of the general population and they are unlikely to be captured by public surveys. In addition, administrative data tend to be more accurate than self-reported data in most public surveys. Nevertheless, there are a couple of caveats associated with the data. First, similar to many administrative datasets, we do not know very much about these borrowers beyond their characteristics that are used in the HECM pricing model. For example, we do not know the income and financial wealth of these borrowers, nor do we know their demographic characteristics such as race, eduction, and number of children. Second, according to the staff member at HUD who shared the data with us, our data come from a snapshot at the end of 2007. Because borrowers are allowed to change their payment plans at a small cost, it is possible that the payment plan we observe is not the original payment plan chosen by the borrower.[9] Moreover, if a borrower chose the line-of-credit payment plan, I do not observe when and by how much she drew down the line of credit.

4 Characteristics of HECM Borrowers and Loans

In this section, I first compare reverse mortgage borrowers with the general population. I then show the difference between borrowers who took out reverse mortgages in early years of the HECM program and borrowers who took out reverse mortgages in 2007. This comparison highlights the significant changes in HECM borrower and loan characteristics over time. In addition, I present evidence on where reverse mortgage borrowers come from, using the geographic identifiers in the HECM data.

Reverse mortgage borrowers are generally older than eligible homeowners in the general population. The median age of HECM borrowers at the time of loan origination is 73.5, and the median age of homeowners 62 years and older in the 2000 Decennial Census

[9] According to industry specialists, most of the payment plan changes are adding a line-of-credit option to existing term or tenure policies. Because HUD does not keep records on the payment plan history of HECM loans, such assertions cannot be verified.

is 72.0. Single males and single females are more likely to purchase reverse mortgages than married couples. According to the 2000 Decennial census, 52.8% of homeowners of age 62 and above are married couples. However, only 36.0% of reverse mortgage borrowers are married couples. Moreover, reverse mortgage borrowers tend to have more expensive houses than the general population of elderly homeowners. Panel B of Table 2 compares the median home value of HECM borrowers with that of the SCF respondents who are homeowners aged 62 or older. In certain years, the median home value of HECM borrowers may be 50% above the median home value of the SCF elderly homeowners.

Characteristics of HECM borrowers and HECM loans change substantially over time. Figure 4 shows the age distribution of early borrowers and that of recent borrowers, where early borrowers refer to loans originated between 1989 and 1999 and recent borrowers refer to loans originated in 2007. Two features of this figure are worth mentioning. First, the distribution of borrower age shifts to the left over time, meaning that recent borrowers are younger than early borrowers at the time of loan origination. Second, there is a spike at age 62 in the histogram for recent borrowers but not in the histogram for early borrowers. Such a spike suggests that there may be homeowners younger than age 62 who would want to purchase reverse mortgages if allowed. These two features imply that the demand for reverse mortgages has been growing most rapidly among younger elderly homeowners.

Besides age, Panel A of Table 2 also shows the difference between early borrowers and recent borrowers along other dimensions. For example, an increasing number of single males and married couples entered the reverse mortgage market relative to single females. The average expected interest rate faced by HECM borrowers, which is the ten-year Treasury rate plus the lender's margin, declined from 7.51 percent in early years to 5.67 percent in 2007. The fraction of borrowers choosing the line-of-credit payment plan increased from 71.4% between 1989 and 1999 to 86.9% in 2007.

It has been argued in the literature that reverse mortgages may not be attractive to potential borrowers because of limitations on the fraction of housing equity against which one can borrow. In Figure 5, I plot the distribution of the ratio of Initial Principal Limit (IPL) to house value for early borrowers and recent borrowers respectively. Recall that the IPL represents the present value of all payments that may be received by the borrower plus the upfront costs. The higher the IPL-to-house-value ratio is, the larger a fraction of the illiquid housing equity can the borrower access at the time of origination. The IPL is the product of MCA and a factor that increases in age and decreases in expected interest rate. For early borrowers, the average IPL is 54.9% of the house value. For recent borrowers, the average IPL-to-house-value ratio is 65.9%. The increase in the IPL-to-house-value ratio is presumably driven by lower interest rates in recent years.

The HECM data used in this paper have information on state and ZIP code of the property for each loan. Figure 6 is a state map that displays the ratio of "reverse mortgages originated between 1989 and 2007" to "owner-occupied housing units with householders aged 60 and above". The housing units statistics are from the 2000 Decennial Census, and the ratio is expressed in percentage terms. Reverse mortgages are most concentrated in Washington D.C., Nevada, California, Colorado, and Utah where the ratio is over 3%. They are least concentrated in Mississippi, West Virginia, North Dakota, Kentucky, Alabama, and Iowa where the ratio is less than 0.5%.

To investigate where reverse mortgages come from at a finer level, I calculate the ratio of "reverse mortgages originated" to "housing units with householders aged 60 and above" for each ZIP code in the HECM sample. I then merge in the 2000 Census ZIP code level demographic and social-economic data and estimate a regression model where each observation is a ZIP code.

$$\left(\frac{\text{Reverse Mortgages}}{\text{Housing Units}}\right)_z = \alpha + \beta \mathbf{X}_z + \epsilon_z \tag{1}$$

A vector of demographic and social-economic variables are controlled for, including education, median household income, median housing price, race/ethnicity, and the fraction of elderly homeowners in the ZIP code. Column (1) includes all ZIP codes in the 2000 Decennial Census that have reasonable values of the control variables.[10] In column (2), I drop non-MSA ZIP codes and control for MSA fixed effects. Comparing the estimation results in column (1) with those in column (2) helps us understand the cross-MSA variation and the within-MSA variation in the geographic distribution of reverse mortgages. In both columns, the dependent variable is constructed using all HECM loans originated between 1989 and 2007. On average, the ratio of reverse mortgages to housing units is 1.11% among all ZIP codes and 1.66% among MSA ZIP codes. Note that the magnitudes of the estimates in the two columns are not directly comparable, because the means of the dependent variable are very different.

When all ZIP codes are included, the signs of the estimates suggest that reverse mortgages are more likely to originate in ZIP codes with better educated residents, lower median income, higher median housing value, higher fractions of minorities, and lower fraction of elderly homeowners. In contrast, when only the within-MSA variation is used, the estimation results in column (2) shows that median income and median house value of the ZIP codes do not correlate with reverse mortgage origination. This difference suggests that reverse mortgages are more likely to originate in income-poor but housing-rich MSAs but not necessarily in income-poor but housing-rich ZIP codes within any given MSA.

[10] A ZIP code is dropped if there are less than 200 residents, the homeownership rate is less than 0.1, the median income or the median house value is zero, or there are no homeowners aged 60 and above in that ZIP code.

In column (3) and (4), the dependent variable is constructed using 1989-2002 loans and 2003-07 loans respectively. I limit the sample to MSA ZIP codes and control for MSA fixed effects. Given the rapid growth in the reverse mortgage market in recently years, it is not surprising that the mean of the dependent variable in column (3) is much lower than that in column (4). Comparing column (3) with column (4) highlights the difference over time in the geographic distribution of reverse mortgages. Between 1989 and 2002, reverse mortgages were more likely to originate in low-income ZIP codes with any given MSA. Between 2003 and 2007, reverse mortgages were equally likely to originate in high-income ZIP codes. Such a shift is consistent with the notion that recent reverse mortgage borrowers may be very different from their earlier counterparts.

In summary, the above analyses indicate that reverse mortgage borrowers are not representative of elderly homeowners in the general population. The characteristics of reverse mortgage borrowers and loans changed notably from the early years of the HECM program to now. Thus, conclusions drawn by studies using early HECM loan data may no longer apply to recent borrowers. Moreover, there appears to be significant heterogeneity in the distribution of reverse mortgages across geographic areas.

5 Termination and Assignment Outcomes

A HECM loan is terminated when the borrower dies or permanently moves out the house. A HECM loan is assigned by the lender to HUD when the loan balance reaches 98% of the MCA. In this section, I examine whether various borrower and loan characteristics are correlated with the termination and assignment outcomes of HECM loans.

Figure 7 compares the termination rates of HECM borrowers with the mortality rates observed in the general population for males and females respectively. Throughout the age distribution, termination rates of HECM borrowers are consistently higher than mortality rates of the general population. For example, the termination rate of a single female HECM borrower at age 75 is 0.093 whereas the female mortality rate at age 75 is only 0.028. Presumably, this difference reflects the residential mobility rate among reverse mortgage borrowers because HECM loans are terminated when borrowers move out their homes permanently. Potential differences in mortality rate between HECM borrowers and the general population may also contribute to the observed pattern. For example, if elderly homeowners who experienced negative health shocks purchase reverse mortgages to cover medical expenses, then reverse mortgage borrowers are also likely to have a higher mortality rate than non-borrowers. The HECM program assumes that termination rates among borrowers are 1.3 times the age-specific female mortality rate. As shown in Figure 7, this assumption is overly conservative and HECM borrowers exit homes as a much faster pace.

To understand how loans of different characteristics terminate differently, I first estimate a probit model of the 5-year loan termination outcome.

$$\begin{aligned}\Pr(Terminate_{iat}) = \Phi(\alpha &+ \beta_1 Term_{iat} + \beta_2 Tenure_{iat} + \gamma_1 Female_{iat} + \gamma_2 Couple_{iat} \\ &+ \delta log(HV_{iat}) + \eta_a + \theta_t)\end{aligned}$$

$Terminate_{iat}$ equals one if loan i terminates within 5 years of origination. HV_{iat} is the real house value at the time of loan origination. η_a is a full set of age fixed effects, and θ_t is a full set of origination year fixed effects.

Column (1) of Table 4 displays the estimation results. Compared to borrowers who choose the line-of-credit payment plan, borrowers who choose the tenure payment plan are on average 13.6% less likely to exit homes permanently within 5 years of loan origination. Because the line-of-credit option allows borrowers to withdraw home equity more quickly than the tenure option, this finding is consistent with the conjecture that borrowers who believe that they will stay in their homes for a long time tend to choose the more back-loaded payment plan - the tenure option. Compared to single male borrowers, single females are on average 19.0% less likely to exit homes permanently. This difference is unsurprising since females tend to live longer than males. Recall that for married couples, reverse mortgages do not become repayable until both spouses die or move out of the house. Married reverse mortgage borrowers are 36.1% less likely to terminate reverse mortgage loans within 5 years of loan origination than single male borrowers. A higher house value at the time of loan origination appears to increase the reverse mortgage termination probability. Perhaps borrowers with high house values can extract additional housing equity by selling their homes, while borrowers with low house values cannot. In column (2), I control for state fixed effects to rid of heterogeneity across states. The results are largely unchanged.

Compared to the probit model, a hazard model takes into account censoring and time-varying explanatory variables. I estimate a Cox proportional hazard model

$$\begin{aligned}\lambda_{iat,s} = \lambda_s^0 \quad &* \quad \exp(\beta_1 Term_{iat} + \beta_2 Tenure_{iat} + \gamma_1 Female_{iat} + \gamma_2 Couple_{iat} \\ &+ \quad \delta_1 log(HV_{iat,s}) + \delta_2 h_{iat,s} + \eta_a + \theta_t)\end{aligned}$$

where $\lambda_{iat,s}$ is the termination hazard rate s periods after loan origination for borrower i of age a who originated the loan at time t. λ_s^0 is the non-parametric baseline hazard rate. $HV_{iat,s}$ refers to the real house value s periods after loan origination. It is calculated using the real house value at origination and the county-level housing price indexes. $h_{iat,s}$ is the real housing appreciation rate s periods after loan origination in the county where borrower i lives.

Column (1) of Table 5 shows the estimation results of the above hazard model.

Consistent with the probit model results, borrowers who choose the line-of-credit payment option and single male borrowers tend to terminate reverse mortgage loans sooner than other borrowers. Contemporaneous house values and housing price appreciation rates have positive effects on the termination hazard rate. This finding suggests that when housing price rises, borrowers are tempted to withdraw additional housing equity by selling their homes. In column (2), I control for state fixed effects and the qualitative results remain the same.

One of the most prominent features of the HECM program is the FHA insurance component. Under this insurance mechanism, borrowers pay an upfront as well as an ongoing mortgage insurance premium. In return, lenders are allowed to assign a HECM loan to HUD when the loan balance reaches 98% of the MCA. If sales proceeds fall short of the outstanding loan balance when the borrower dies or moves away permanently, HUD shoulders the loss - the difference between the loan balance and sales proceeds. Because loans assigned by lenders to HUD often incur a loss for HUD, assignment outcomes are important indictors of the long-term viability of the HECM program.[11]

Similar to studying the termination outcome before, I examine the assignment outcome using both a probit model and a Cox proportional hazard model. The estimation results are shown in column (3) and (4) of Table 4 and Table 5. Both models suggest that loans with term or tenure payment plans are much less likely to be assigned from lenders to HUD than loans with the line-of-credit payment plan. For example, the hazard model estimates indicate that term loans are 20% less likely to be assigned than line-of-credit loans and tenure loans are 80% less likely to be assigned than line-of-credit loans. The probit model shows that loans made to single female and married couples tend to be assigned more

[11] Thanks to the housing price run-up between the late 1990s and early 2000s, the number of HECM loans that eventually resulted in losses for HUD is small. Consequently, HUD has earned a profit from the insurance program. It will be interesting to see the impact of the recent housing market downturn on the profitability of the FHA insurance program.

often than loans made to single males. However, these estimates are no longer statistically significant in the hazard model. In addition, house values and housing price appreciation rates appear to have little effect on loan assignment outcomes.

Under the FHA insurance program, borrowers pay 2% of the MCA as the upfront mortgage insurance premium regardless of what payment plan they choose. The estimation results shown above suggest that line-of-credit loans impose consistently and significantly higher risks of financial losses on HUD. As a result, there exists cross-subsidization from reverse mortgage borrowers who choose term or tenure payment plans to those who choose the line-of-credit payment plan. Given that an increasing proportion of HECM borrowers chooses the line-of-credit payment plan in recent years, increasing the monthly ongoing mortgage insurance premium while lowering the upfront premium will reduce total upfront costs of reverse mortgage loans and decrease the risk of financial losses for HUD.

6 Housing Price Appreciation

During the first decade of the HECM program, the number of loans originated each year is relatively small and stable. Between 2001 and 2006, the reverse mortgage market experienced substantial growth. The same time period also witnessed an unusual housing market boom across the country. In this section, I investigate the link between local housing price movements and reverse mortgage growth.

The amount of loan that a reverse mortgage borrower can access is an increasing function of the appraised housing value. When housing prices go up, elderly homeowners can borrow more against their homes. For example, Table 1 shows that a homeowner of age 75 with a $200,000 home can pocket $107,715 at the time of loan origination, assuming an expected interest rate of 7 percent. Suppose housing prices in the area rises by 25% and the homeowner's home is now appraised at $250,000. Under the same assumptions about interest rate and upfront transaction costs, he can now take home $137,165. The additional $30,000 makes reverse mortgages more attractive. Therefore, all else equal, housing price appreciation rates should have a positive effect on the demand for reverse mortgages.

To estimate this effect, I collapse the loan-level data into county-year level data. I then regress the percentage change in the number of reverse mortgage loans between time t and $t+1$ in each county on the real housing price appreciation rate between time $t-1$ and time t.

$$\left(\frac{\text{Orig}_{c,t} - \text{Orig}_{c,t-1}}{\text{Orig}_{c,t-1}}\right) = \alpha + \beta h_{c,t-1} + \eta_c + \theta_t + \epsilon_{c,t}$$

I control for county fixed effects η_c and year fixed effects θ_t. To make sure that the dependent variable is measured meaningfully, I limit the sample to counties that have at least 50 reverse mortgages at time $t-1$.[12]

Column (1) in Panel A of Table 6 displays the estimation results. The estimated coefficient on real housing price appreciation rate is positive and statistically significant, suggesting that places with rising housing values tend to have more reverse mortgage originated in the following period. The sample average of the dependent variable is 38.6, meaning that on average the number of reverse mortgages within a county increased by 38.6% per year in the analysis sample. The sample average of $h_{c,t-1}$ equals 4.0, meaning that on average the county-level real housing price appreciation rate is 4.0 percent per year. The magnitude of the estimate suggests that a one percentage point increase in the annual real housing price appreciation rate within the county induces the number of reverse mortgages to grow by 2.5 percentage points. In column (2) and (3), I add lags of the real housing price appreciation rate. It appears that the growth rate in reverse mortgages responds most significantly to

[12]In robustness checks not shown here, I also tried limiting the sample to counties that have at least 30 or 100 reverse mortgages at time $t-1$. The results are essentially the same.

last year's housing price appreciation rate. The housing market movement from three years ago no longer has a noticeable effect on the demand for reverse mortgages.

From 2001 to 2006, median housing values in the U.S. increased by approximately 10% a year in real terms. During the same period of time, the number of reverse mortgages grew by almost 9 times, or 50% a year. The estimates shown in Panel A of Table 6 imply that a housing price appreciation rate of 10% raises the reverse mortgage growth rate by 25%. Therefore, the model estimated above suggests that housing price appreciation accounts for about one half of the overall growth in the reverse mortgage market between 2001 and 2006.

Because a higher house value means more liquid assets can be extracted from the same physical house through the HECM program, elderly homeowners should find reverse mortgages most desirable when the local housing market is at its peak. To certain extent, the FHA insurance program insures against the risk of significant housing price drops after a HECM loan is originated. If local residents have private information on the future housing price movement in the area, they may take advantage of the FHA insurance program and borrow reverse mortgage loans when they expect their housing price to decline. The analysis shown earlier in this section suggests that past housing price appreciation encourages reverse mortgage borrowing. Now I estimate a regression model to test whether areas with rapid growth in reverse mortgage origination also experienced subsequent housing price deceleration. More specifically, I regress the change in housing price appreciation rates from time t to $t+1$ on the change in the number of reverse mortgages in the county from time $t-1$ to t.

$$\Delta h_{c,t+1} = \alpha + \beta \left(\frac{\mathrm{Orig}_{c,t} - \mathrm{Orig}_{c,t-1}}{\mathrm{Orig}_{c,t-1}} \right) + \eta_c + \theta_t + \epsilon_{c,t}$$

Note that I use the change rather than the level of housing price appreciation rate as the dependent variable, because housing price appreciation rate is known to be auto-correlated and I have shown before that a higher housing price appreciation rate induces more reverse mortgage origination.

Column (1) in Panel B of Table 6 displays the estimation results. The estimated coefficient on the change in reverse mortgage origination within the county is negative and statistically significant. The magnitude of the estimate suggests that a 50% increase in reverse mortgage origination in the last period, which is about one standard deviation from the sample mean, is correlated with a 1.7 percentage point drop in the county-level housing price appreciate rate in the next period. This finding is consistent with the hypothesis that reverse mortgages are most desirable when the local housing market reaches its peak.

Recent research such as Lehnert and Saks (2009) shows that subprime mortgages may have caused the housing market boom and bust from 2002 to 2008. To control for county-level subprime mortgage activity, I include the percentage change in the number of non-prime mortgages within the county as an explanatory variable in column (2). The estimate of the coefficient on the percentage change in reverse mortgage origination remains unchanged, suggesting that the correlation between reverse mortgage origination and subsequent housing price deceleration is unlikely to be driven by the activities in the subprime mortgage market.

In summary, evidence shown in this section suggests that elderly homeowners in areas where the housing market is at its peak are more likely to borrow reverse mortgages. Previous housing price run-up leads to increases in reverse mortgage origination which in turn is correlated with declines in housing price appreciation. A large literature has pointed out that many older households in the U.S. lack basic financial knowledge and make mistakes in saving and planning for retirement. For example, Lusardi and Mitchell (2005) find that financial illiteracy is widespread among older Americans. The evidence shown in this section seems to suggest the opposite in the reverse mortgage market: many reverse mortgage borrowers appear to be making sound financial decisions.

7 FHA Mortgage Limits

As mentioned before, the amount of housing wealth an elderly homeowner can borrow against her home is the Maximum Claim Amount (MCA). MCA equals the appraised house value or the county-specific FHA mortgage limit on HECM loans, whichever is smaller. The FHA mortgage limit usually is close to the median house value in the county, but a national ceiling applies to counties with very high median house values and a national floor applies to counties with very low median house values. For example, the national ceiling in 2007 is \$362,790. Therefore, all counties with median house values above \$362,790 will have a FHA mortgage limit of \$362,790 in 2007. These limits effectively restrict how much housing equity can be transformed into liquid assets for HECM borrowers. For example, for a borrower with a house worth \$500,000, he can borrow against at most \$362,790 of her housing wealth. On the other hand, a borrower with a \$300,000 can potentially borrow against all of her housing wealth. In this section, I examine whether the FHA mortgage limits reduce the demand for reverse mortgages in areas with very high housing prices.

To estimate the effect of the FHA limits, I use a difference-in-differences framework and compare counties where the national ceiling is binding with counties where the national ceiling is not binding. When housing price increases in a county, we expect to see reverse mortgage origination to increase accordingly. However, the increase in reverse mortgage origination should be smaller in counties where the national ceiling is binding. For example, in a county where the median home value is well above the national ceiling, homeowners can only borrow up to the national ceiling. Additional housing equity caused by housing price appreciation does not translate into more consumable housing wealth for potential reverse mortgage borrowers in this county. More specifically, I estimate the following model

$$\left(\frac{\text{Orig}_{c,t} - \text{Orig}_{c,t-1}}{\text{Orig}_{c,t-1}}\right) = \alpha \quad + \quad \beta h_{c,t-1} * \mathbf{1}(AboveCeiling)_{c,t-1} + \gamma h_{c,t-1}$$
$$+ \quad \delta \mathbf{1}(AboveCeiling)_{c,t-1} + \eta_c + \theta_t + \epsilon_{c,t}$$

where $\mathbf{1}(AboveCeiling)_{c,t-1}$ indicates whether the median house value in county c at time $t-1$ is above the national ceiling for HECM loans at that time. It is a measure of whether the national ceiling is binding in that county. If FHA limits reduce the demand for reverse mortgages in high housing value areas, then β would be negative.

Column (1) of Table 7 shows the estimation results. Consistent with previous section's finding, real housing price appreciation rate in the last period has a large and positive effect on reverse mortgage origination. Counties where the national ceiling is binding have less reverse mortgage origination on average, although the effect is not statistically signification. The coefficient of interest, β, is estimated to be negative but very small and statistically insignificant, which suggests that FHA mortgage limits on HECM loans have little impact on reverse mortgage origination. In column (2) and (3), I try alternative measures of whether the national ceiling is binding in a county. For example, I use an indicator variable that equals one if the county's median home value is at least 20% above the national ceiling in column (2). In column (3), I use the amount of the median home value above the ceiling in percentage terms as a continuous measure. Regardless of which measure I use, the estimated coefficient on the interaction term is small and statistically insignificant. Therefore, I find little supporting evidence that FHA mortgage limits held back the growth of reverse mortgage market.

Given that only about 1% of eligible elderly homeowners actually took out reverse mortgage loans, perhaps it is not surprising that FHA limits do not seem to have a noticeable effect on the reverse mortgage market. Even in counties where the national ceiling binds, a great number of elderly homeowners have homes worth less than the national ceiling. The fraction of homeowners with house values below the national ceiling in these counties may be smaller than in other counties, but it is still much larger than the fraction of homeowners who actually purchased reverse mortgages. As reverse mortgages become a more popular financial product among elderly homeowners, the effect of FHA limits may become more important. The Economic Stimulus Act of 2008 (ESA) raised the national ceiling for HECM loans from $362,790 in 2007 to $625,000 in 2008. Such an unprecedented large increase in the FHA limit may draw in elderly homeowners who previously regarded reverse mortgages as an unattractive option.

8 Conclusion

The HUD-sponsored HECM program accounts for most reverse mortgages originated in the United States. In the 2000s, the number of HECM loans made each year has been growing substantially. In this paper, I carry out empirical analyses on all HECM loans originated between 1989 and 2007. I find that characteristics of reverse mortgages have changed significantly over time. Borrowers who choose the line-of-credit payment plan, single male borrowers, and borrowers with higher housing values exit their homes sooner than other reverse mortgage borrowers. Elderly homeowners are more likely to purchase reverse mortgages when the local housing market is at its peak. Additionally, the FHA mortgage limits do not appear to have impeded the growth of the reverse mortgage market thus far.

There have been various misconceptions among researchers and potential borrowers about how the HECM program works. For example, some people think once a borrower enters the HECM program, she relinquishes her house entirely to the lender. In fact, the borrower pays back the lesser of the loan balance or proceeds from the property sale. Hence, the borrower remains the residual claimant on the value of the property, and the moral hazard problem on home maintenance may not be as severe as many people believe.

Another common misconception about the HECM program is that the tenure payment plan, which gives borrowers equal monthly payments for as long as they are alive and continue living in their homes, is equivalent to an annuity. For immediate life annuities, insurance against outliving one's assets is provided by pooling mortality risks across a group of people. However, the tenure plan of HECM loans involves little risk-pooling: if a borrower dies shortly after her HECM loan is originated, she pays back only the loan balance, which presumably is small. HUD does not inherit this borrower's entire housing equity to pay another borrower who lives to be over 100 years old. Thus, the longevity insurance aspect of a tenure HECM loan is very limited. In addition, only 10% of HECM borrowers choose the tenure payment plan or the modified tenure payment plan, which suggests that the annuity aspect of reverse mortgages is irrelevant to most borrowers.

Furthermore, many people believe the high costs associated with HECM loans indicate that these loans are a bad deal for elderly homeowners. One reason why a reverse mortgage costs more than a regular forward mortgage is the MIP charged by HUD to insure both the lender and the borrower. Precisely because there is little risk-pooling in the HECM program, insurance premiums have to be high for HUD to break even. As a result, one may have to change the fundamental structure of the HECM program in order to cut the costs significantly. We hope that the descriptions and analyses presented in this paper help correct these misconceptions.

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Figure 1: Calculating the Amount of Payment One can Receive from a HECM Loan

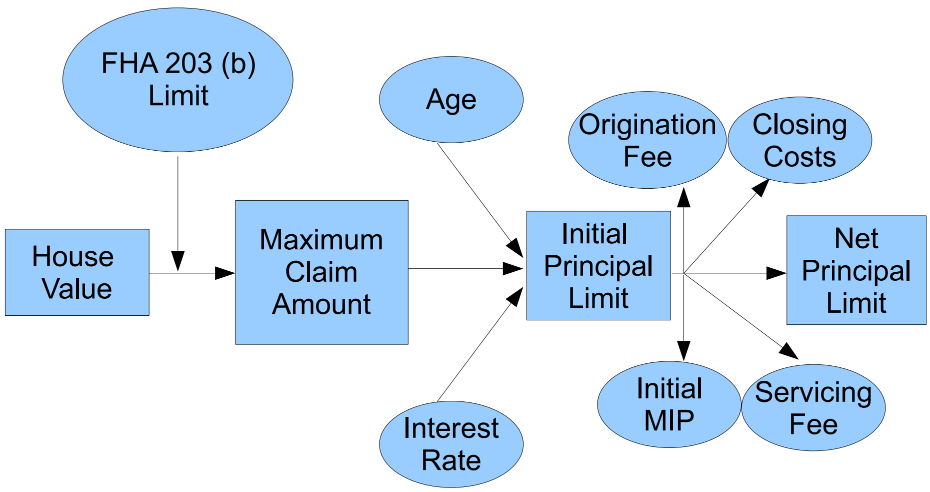


Figure 2: Growth in HECM Loans 1989-2007

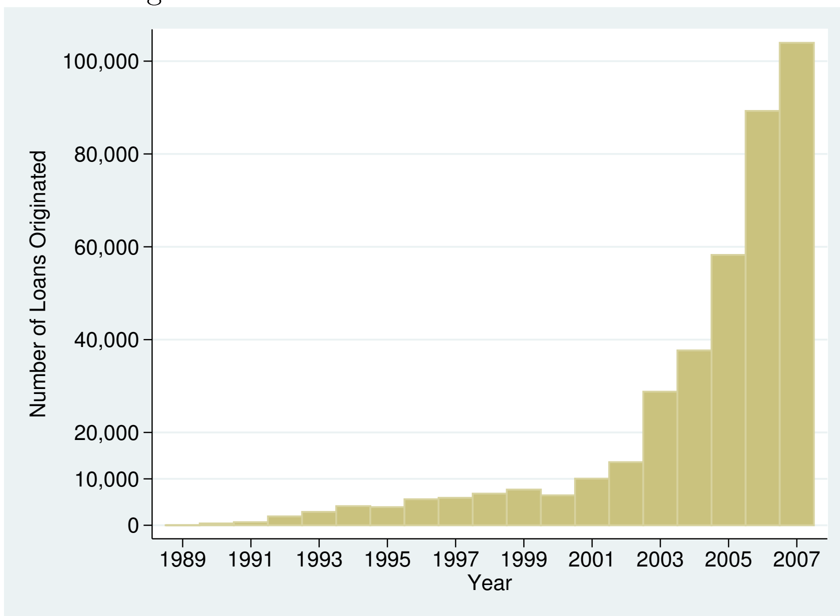
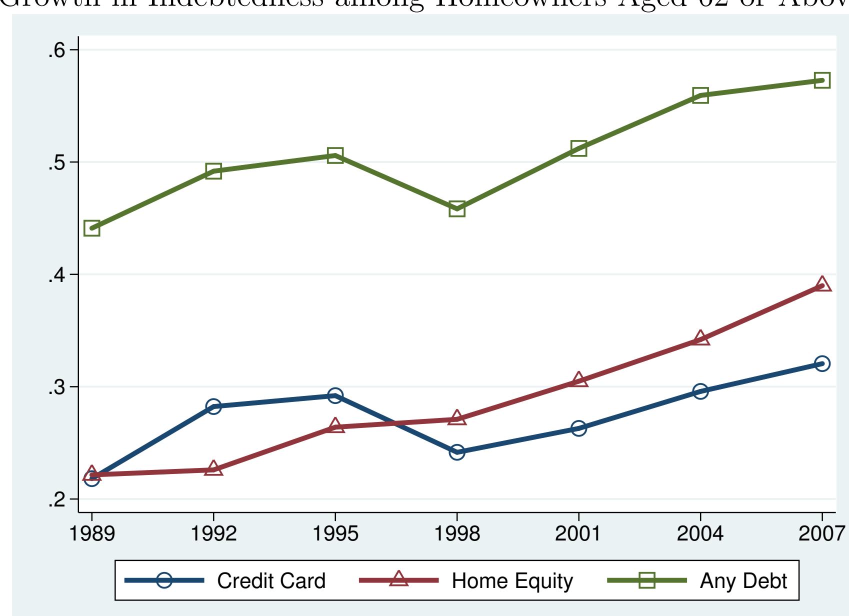


Figure 3: Growth in Indebtedness among Homeowners Aged 62 or Above 1989-2007



Note: Data are from 1989, 1992, 1995, 1998, 2001, 2004, and 2007 Survey of Consumer Finances.

Figure 4: Distribution of HECM Borrower Age

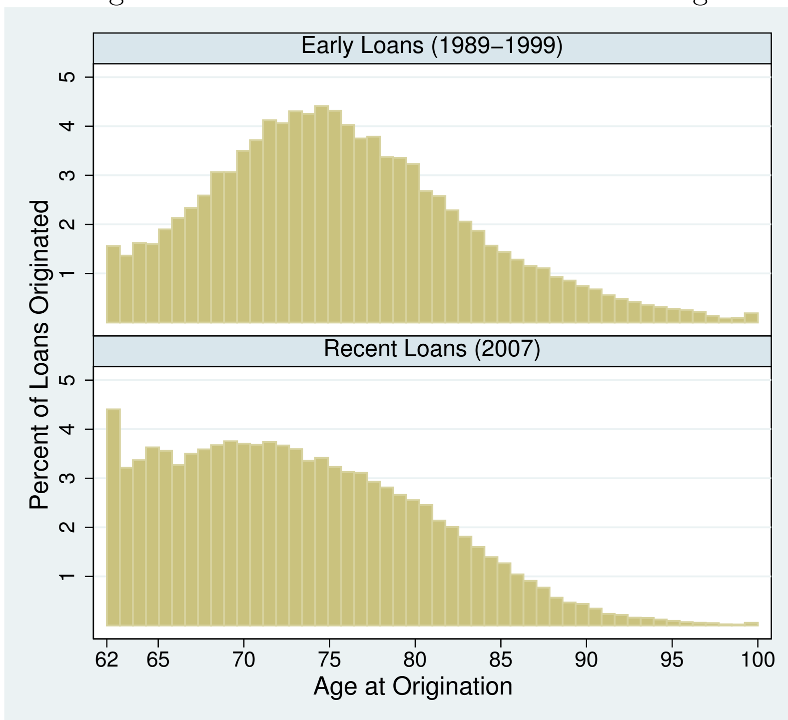


Figure 5: Distribution of the Initial Principal Limit (IPL) to House Value Ratio

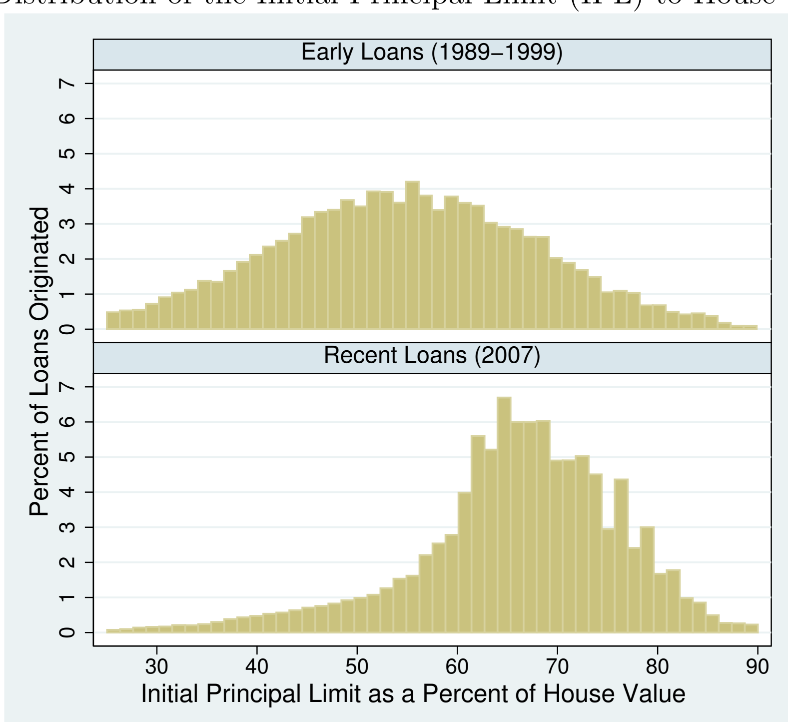


Figure 6: Reverse Mortgage Origination between 1989 and 2007 as a Percent of Owner-Occupied Units with Householders Aged 60 and Above by State

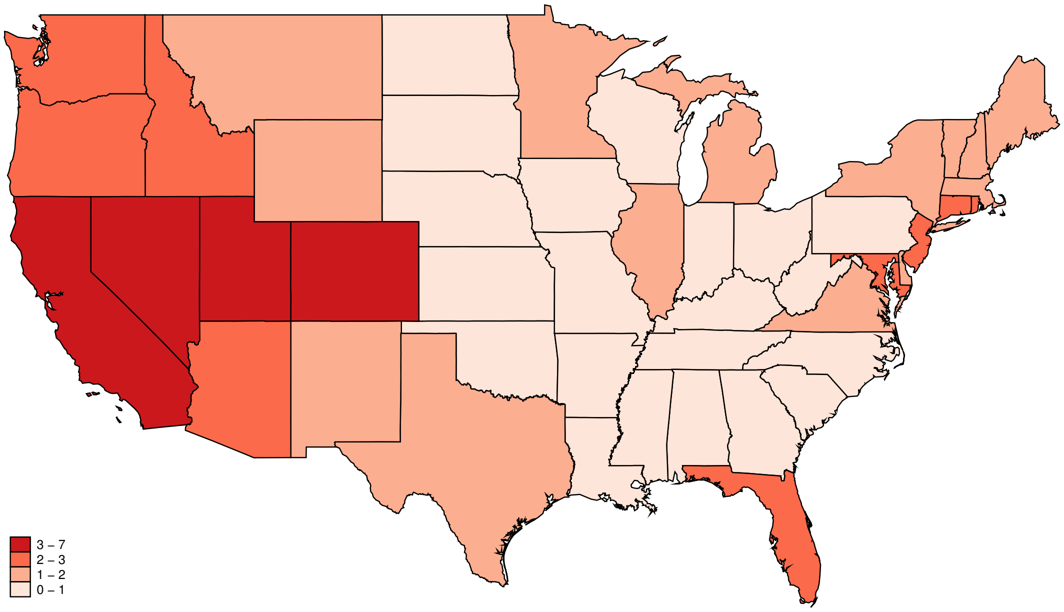
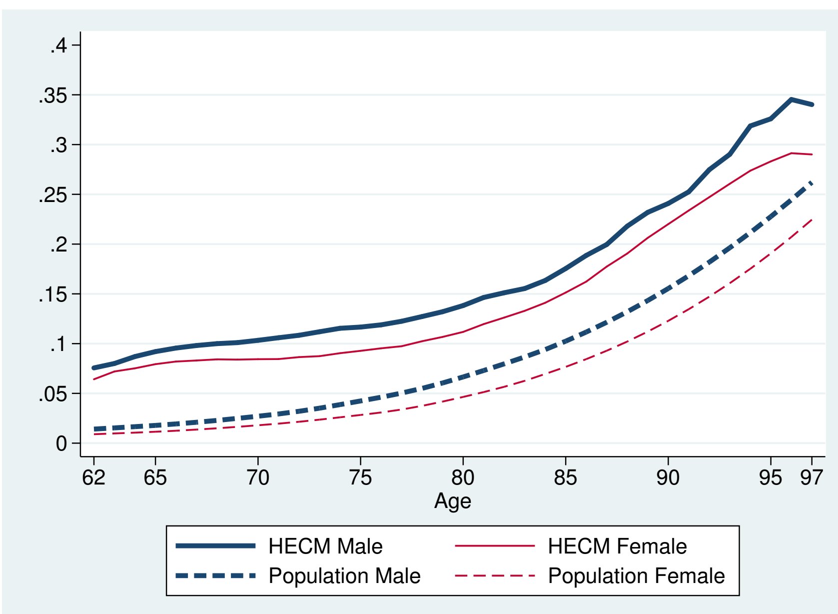


Figure 7: Termination Rates of HECM Borrowers and Mortality Rates of the General Population



Note: Termination rates of HECM borrowers are based on 1989-2006 loan level data. Mortality rates of the general population are based on 2004 National Center for Health Statistics (NCHS) mortality tables.

Table 1: HECM Payments for a Hypothetical Borrower

A. Principal Limit Factor			
Expected Rate	Age=65	Age=75	Age=85
0.05	0.649	0.732	0.819
0.07	0.489	0.609	0.738
0.09	0.336	0.472	0.636
B. Net Principal Limit			
Expected Rate	Age=65	Age=75	Age=85
0.05	$114,188	$131,492	$150,112
0.07	$83,323	$107,715	$134,344
0.09	$67,200	$94,400	$127,200
C. Tenure Plan Monthly Payment			
Expected Rate	Age=65	Age=75	Age=85
0.05	$610	$804	$1,221
0.07	$558	$791	$1,238
0.09	$436	$702	$1,184
D. 10-Year Term Plan Monthly Payment			
Expected Rate	Age=65	Age=75	Age=85
0.05	$1,234	$1,421	$1,622
0.07	$983	$1,271	$1,585
0.09	$687	$1,039	$1,467

Note: Assume MCA =$200,000, initial MIP =$4,000, origination fee = $4,000, closing costs = $2,000, monthly servicing fee = $30.

Table 2: Summary Statistics of HECM Loans

A. Compare Early Loans with Recent Loans

	Early Loans (1989-1999)	Recent Loans (2007)	2000 Census (owners 62+)
Median Age	75.0	72.5	72.0
Single Males	13.9%	19.2%	11.8%
Single Females	56.3%	45.2%	35.4%
Couples	29.8%	35.6%	52.8%
Expected Interest Rate	7.51	5.67	
% Term Plans	16.6%	4.9%	
% Tenure Plans	11.9%	8.3%	
% Line of Credit Plans	71.4%	86.9%	

B. Median House Values in HECM and SCF

	HECM	SCF
1989	110,337	100,307
1992	161,053	103,428
1995	144,865	108,819
1998	137,352	114,460
2001	166,215	140,463
2004	208,507	164,611
2007	222,000	175,000

Note: 2000 Census numbers are calculated using the IPUMS data. Median house values are in 2007 dollars.

Table 3: The Distribution of HECM Loan across MSA ZIP Codes

	All Originations	All Originations	1989-2002 Originations	2003-2007 Originations
	(1)	(2)	(3)	(4)
Fraction of High School Graduates	2.595**	3.029**	0.537**	2.492**
	(0.174)	(0.433)	(0.103)	(0.389)
Fraction of College Graduates	0.201	1.121**	0.579**	0.542
	(0.211)	(0.434)	(0.104)	(0.380)
Log (Median Income)	-0.336**	-0.042	-0.158**	0.116
	(0.072)	(0.122)	(0.033)	(0.112)
Log (Median House Value)	1.247**	-0.071	0.025	-0.096
	(0.041)	(0.135)	(0.025)	(0.126)
Fraction of Blacks	1.919**	2.924**	0.359**	2.565**
	(0.087)	(0.165)	(0.037)	(0.151)
Fraction of Hispanics	3.374**	1.861**	0.248**	1.613**
	(0.123)	(0.270)	(0.061)	(0.239)
Fraction of Homeowners Aged 60+	-0.814**	-2.025**	0.018	-2.043**
	(0.166)	(0.325)	(0.072)	(0.291)
MSA Fixed Effects	N	Y	Y	Y
Mean of Dependent Variable	1.11	1.66	0.30	1.36
N	28,808	14,048	14,048	14,048
R2	0.157	0.332	0.226	0.333

Note: The dependent variable is the number of HECM loans originated as a percent of owner-occupied units with householders 60 years or older in the ZIP code. Each observation is a ZIP code in the 2000 Decennial Census. Robust standard errors are reported in parentheses. * significant at 0.05 level. ** significant at 0.01 level.

Table 4: Probit Model of 5-Year Loan Termination and Loan Assignment Outcomes

	Termination		Assignment	
	(1)	(2)	(3)	(4)
Term Payout Policy	0.010	0.011	-0.356**	-0.352**
	(0.015)	(0.015)	(0.054)	(0.055)
Tenure Payout Policy	-0.136**	-0.164**	-0.882**	-0.890**
	(0.016)	(0.016)	(0.084)	(0.086)
Female Borrower	-0.190**	-0.185**	0.112*	0.116*
	(0.015)	(0.015)	(0.052)	(0.053)
Married Couple Borrower	-0.361**	-0.358**	0.190**	0.195**
	(0.016)	(0.016)	(0.069)	(0.070)
Log (Real House Value at Origination)	0.204**	0.117**	-0.032	-0.029
	(0.010)	(0.012)	(0.033)	(0.040)
Age Fixed Effects	Y	Y	Y	Y
Origination Year Fixed Effects	Y	Y	Y	Y
State Fixed Effects	N	Y	N	Y
N	68,006	68,006	47,223	46,919

Note: The dependent variable in column (1) and (2) is whether the loan terminates within five years of origination. The dependent variable in column (3) and (4) is whether the loan is assigned by the lender to HUD within five years of origination. The numbers shown are the marginal effect on termination and assignment probabilities. * significant at 0.05 level. ** significant at 0.01 level.

Table 5: Proportional Hazard Model of Loan Termination and Loan Assignment Outcomes

	Termination		Assignment	
	(1)	(2)	(3)	(4)
Term Payout Policy	-0.042*	-0.034	-0.220**	-0.211**
	(0.021)	(0.020)	(0.039)	(0.039)
	[0.959]	[0.966]	[0.803]	[0.810]
Tenure Payout Policy	-0.224**	-0.235**	-1.544**	-1.541**
	(0.014)	(0.013)	(0.050)	(0.050)
	[0.799]	[0.790]	[0.214]	[0.214]
Female Borrower	-0.207**	-0.198**	0.057	0.056
	(0.011)	(0.011)	(0.057)	(0.056)
	[0.813]	[0.820]	[1.058]	[1.058]
Married Couple Borrower	-0.426**	-0.423**	0.058	0.048
	(0.013)	(0.012)	(0.061)	(0.059)
	[0.653]	[0.655]	[1.060]	[1.049]
Log (Real House Value)	0.249**	0.107**	-0.040	-0.063
	(0.026)	(0.023)	(0.034)	(0.034)
	[1.282]	[1.113]	[0.961]	[0.939]
Real Housing Appreciation Rate	0.018**	0.012**	0.003	-0.000
	(0.002)	(0.002)	(0.003)	(0.003)
	[1.018]	[1.012]	[1.003]	[1.000]
Age Fixed Effects	Y	Y	Y	Y
Origination Year Fixed Effects	Y	Y	Y	Y
State Fixed Effects	N	Y	N	Y
N	677,870	677,870	668,878	668,878

Note: Standard errors in parentheses are clustered at county level. Hazard ratios are reported in brackets. * significant at 0.05 level. ** significant at 0.01 level.

Table 6: Housing Price Appreciation (HPA) and HECM Loan Origination

A. Effect of HPA on Loan Origination

(Dep. Var. = % change in loan origination in the county)

	(1)	(2)	(3)
Real HPA in Year -1	2.528**	2.141**	1.940**
	(0.287)	(0.324)	(0.366)
Real HPA in Year -2		1.082**	1.341**
		(0.355)	(0.409)
Real HPA in Year -3			-0.517
			(0.436)
N	880	880	880
R2	0.399	0.409	0.410

B. Subsequent Change in HPA

(Dep. Var. = % change in county HPA in the next year)

	(1)	(2)
% Change in HECM Loan Origination	-0.034**	-0.038**
	(0.008)	(0.008)
% Change in Non-prime Mortgage Activity		0.085**
		(0.022)
N	880	805
R2	0.397	0.381

Note: A county has to have at least 50 reverse mortgage loans in the previous year to be included in the sample. There are a total of 261 unique counties included in the sample. A full set of year fixed effects and county fixed effects are included in all columns. Standard errors are clustered at county level. * significant at 0.05 level. ** significant at 0.01 level.

Table 7: Effect of FHA Mortgage Limit on HECM Loan Origination

	(1)	(2)	(3)
Real HPA	2.538**	2.589**	2.493**
	(0.344)	(0.317)	(0.320)
Above Ceiling	-2.559		
	(9.032)		
(Above Ceiling)*HPA	-0.060		
	(0.358)		
20% Above Ceiling		6.453	
		(8.423)	
(20% Above Ceiling)*HPA		-0.206	
		(0.373)	
Amount Above Ceiling			-11.285
			(18.586)
(Amount Above Ceiling)*HPA			-0.001
			(0.620)
N	880	880	880
R2	0.397	0.397	0.397

Note: The dependent variable is the percentage change in reverse mortgage origination during the past year in the county. A county has to have at least 50 reverse mortgage loans in the previous year to be included in the sample. There are a total of 261 unique counties included in the sample. A full set of year fixed effects and county fixed effects are included in all columns. Standard errors are clustered at county level. * significant at 0.05 level. ** significant at 0.01 level.