Home Equity Conversion Mortgage Program Analysis

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

HOME EQUITY CONVERSION MORTGAGE PROGRAM ANALYSIS

Prepared for

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Prepared by

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FOREWORD

Starting in the 1990s, the U.S. Department of Housing and Urban Development (HUD) has offered the Home Equity Conversion Mortgage (HECM) loan program which provides reverse mortgages to qualifying seniors. Since then, the program has grown from a small pilot to serving more than a million borrowers endorsing roughly 50,000 new loans each year. This report evaluates the performance of the HECM program by considering borrower trends, cumulative net financial gains or losses to HUD's Federal Housing Administration (FHA) from the HECM loans endorsed, and the effect of recent policy changes.

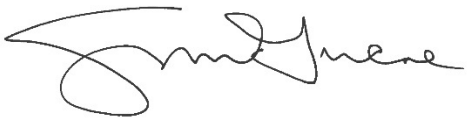
HECM was created to help elderly households borrow against their home equity without resorting to selling their home or continuing to make regular mortgage payments. Under a HECM loan, the loan is repaid with a single payment when a termination event occurs, such as the sale of the home. If the lender cannot recover the principal and accruing expenses upon the sale, HUD makes up the difference. By supporting homeowners' ability to access home equity while living in their home, the program generally increases their ability to spend, although this may also reduce wealth passed onto heirs. This study shows that more than half of the borrowers' report using the funds for additional income; another one-third used the funds to extinguish a forward lien.

Examining the 1.1 million HECM loans issued between the fiscal years (FYs) 2000 and 2020, this study shows that of the 533,894 of those loans that have completed, two-thirds ended without claim. However, those completed without claim were not enough to offset the cost resulting from the remaining one-third of loans that ended in a claim. The vast majority of the loans ending in claim were made between FY 2006 and FY 2010. Loans from this period experienced market conditions where home values fell or were stagnant in many areas.

In response to HECM losses during the foreclosure crisis, HUD implemented several policy changes intended to reduce future loan claim risk. These policies included reductions in the Principal Limit Factor (PLF), which limits the amount that could be borrowed, the imposition of a 60-percent limit on the amount of principal a borrower could draw down in the first year, and introducing a requirement for lenders to evaluate the borrower's financial capacity (a financial assessment) to pay property expenses including taxes and insurance. The policy changes associated with the greatest loan loss reduction have been those that limited the amount that could be borrowed or used (PLF reduction) and those that required lenders to verify appraised home values more regularly and consistently. Policies requiring lenders to perform financial assessments of applicants were associated with a reduced likelihood of loan defaults and unscheduled draws. These policy changes had other implications, notably the PLF reductions being associated with a decrease in demand for HECM loans. Of loans that originated in 2013 and beyond and have also terminated, 95 percent of loans on average have resulted in net financial gains for FHA.

In addition to finding that program changes have made the program more stable, the study also finds that how HUD manages the properties with a claim can impact the cost to HUD. Specifically, this study finds that the average loss per loan is lower for loans disposed through the note sales program compared with those disposed through the conveyance program, largely due to the higher holding costs associated with real estate owned sales. Overall, the study provides evidence that the program changes and the trends in the economy have led to a somewhat smaller program with less financial risk.

This research provides valuable insight into the HECM program performance that could potentially underscore further policies and inform future HUD efforts toward improving the scope and reach of the HECM program.



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EXECUTIVE SUMMARY

This report examines the recent 20-year history of the U.S. Department of Housing and Urban Development (HUD) Home Equity Conversion Mortgage (HECM) loan program. It provides a comprehensive look at trends among borrowers who used the HECM program from fiscal years 2000 to 2020, the cumulative net gains or losses to HUD's Federal Housing Administration (FHA) from the 1.1 million HECM loans endorsed during this period, and the effect of recent policy changes. The analysis in this report uses HUD-provided HECM loan data, plus economic data from other public data sources to illuminate significant changes in the HECM program in the context of macroeconomic and market dynamics and government policy responses.

The HECM program has grown, contracted, and stabilized during the study period. From 2000 to 2008, the annual volume of HECM loan endorsements grew from less than 10,000 loans to more than 100,000 loans. The program benefited from low-interest rates, rising home values, high loan limits, and increased market liquidity. After the housing market collapsed in 2008, annual HECM loan endorsements declined and trended downward to 30,000–40,000 loans in 2019.

The HECM program continues to serve borrowers in all parts of the country who are "house rich and cash poor;" however, this characteristic is less pronounced than in the past. The number of lower-income borrowers (less than $30,000 in annual income) was consistently double the number of higher-income borrowers before the housing market crash in 2009. In more recent years, lower-income borrowers outnumber higher-income borrowers at a rate of 15 to 40 percent. At the same time, the share of higher-wealth borrowers (those with home values more than $300,000) has increased. The pattern of HECM endorsements by census divisions has not changed significantly.

The change in borrower income and wealth is reflected in changes in other characteristics. For instance, HECM serves the senior population—but the age profile of borrowers has trended younger during the period of 2000–09. Although women outnumber men, the share of men has increased. At the same time, most HECM borrowers are unmarried, live in a single-person household, and identify as non-Hispanic White.

This report estimates the actual (not projected) financial gains and losses to FHA for the HECM program overall and its two main termination and disposition options. This study analyzes the cashflows for all HECM loans that originated and terminated between fiscal years 2000 and 2020 to generate an estimate of future loan value at termination. The cashflows do not include HUD's administrative costs for operating the loan program, such as the cost of direct and indirect staff, contractors, facilities, data systems, and other resources used in administering the HECM program that are not recorded as program costs. The estimated gains and losses are only applicable to terminated loans and do not represent the economic value of the entire HECM portfolio.[1]

For the 533,894 HECM loans that originated and terminated during the 20-year period, the estimate shows that FHA incurred a net loss of approximately $10.4 billion, or $19,556 per HECM loan. Mortgage insurance premium payments contributed approximately $5.5 billion of

[1] This approach differs from that used in actuarial studies of the HECM program. Those studies focus on losses to the Mutual Mortgage Insurance Fund, excluding HECM loans in the General Insurance fund, and estimate losses using financial models that project the future performance of all loans outstanding in a given reporting period. See HUD (2020).

cash inflows, whereas claim payments accounted for approximately $18 billion of cash outflows, and net recoveries on property and note sales provided approximately $2.2 billion in offsets. The bulk of losses came from loans that originated between 2006 and 2010 at the height of the housing market bubble and the depth of the crash. These results are censored after the study period. As a result, results occurring after the study period (which could include losses from later claims as well gains from later fully paid-off terminations) will influence the final comprehensive gains and losses for the loans in the study. Comparing HUD's foreclosure and disposition of property versus their assignment and sale of notes, the analysis found that the average loss per Secretary-held loan is lower for note sales than for Secretary-held real estate owned sales, and note sales have lower holding costs.

This report analyzes the effects of HECM policy changes HUD made between 2009 and 2018. For the most part, HUD initiated these policy changes to mitigate or reduce the risk of losses to FHA.[2] From 2009 to 2017, HUD reduced the Principal Limit Factor (PLF), which limits the amount that could be borrowed, four times. In 2013, HUD also imposed a 60-percent limit on the amount of principal a borrower could draw down in the first year, which reduces HUD's initial risk. In 2014, HUD changed the treatment of nonborrowing spouses to avoid the complication of unrecognized spouses who survived the death of the borrower. In 2015, HUD instituted credit underwriting by requiring lenders to evaluate the borrower's financial capacity to pay taxes, insurance, maintenance, and repairs and to use loan proceeds to fund borrower Life Expectancy Set-Aside (LESA) accounts, if needed. In 2016, HUD established incentives for lenders to procure tax payment verification services to reduce the risk of tax liens. In 2018, HUD began requiring lenders to use a collateral risk valuation tool to determine whether borrowers had to obtain a second appraisal for their HECM loan application. This policy change was designed to control the risk of the loan amount exceeding the value of the collateral.

Using a series of regression models and HECM loan-level data from HUD, the analysis in this report attempted to isolate the effect of each policy on the net gains or losses to FHA, the demand for HECM loans, and other program outcomes while controlling for confounding factors. The results of these regression models indicate that the first and second PLF reductions were associated with reducing net losses to the program and the demand for HECM loans and the incidence of unscheduled draws. The third PLF reduction did not have a statistically significant effect on net losses, loan demand, or unscheduled draws. The fourth PLF reduction was associated with a reduction in net losses to the program and unscheduled draws but not with a discernible impact on HECM loan demand. The regression models also found that HUD's policies requiring lenders to perform financial assessments of borrowers and provide LESAs, as needed, were associated with a reduced likelihood of loan defaults and unscheduled draws. These models could not determine, however, whether that policy change reduced net losses to FHA. Finally, the regression models found that the policy to require second home appraisals for some borrowers was associated with reduced net losses to FHA and appraised home values. The regression models did not find much or any effect from the other policy changes—namely, the

[2] In 2013, Congress passed the Reverse Mortgage Stabilization Act, granting the Secretary of HUD the authority to "establish, by notice or mortgagee letter, any additional or alternative requirements that the Secretary, in the Secretary's discretion, determines are necessary to improve the fiscal safety and soundness of the program." See H.R.2167 - Reverse Mortgage Stabilization Act of 2013 https://www.congress.gov/bill/113th-congress/house-bill/2167.

treatment of nonborrowing spouses and incentives to lenders to acquire property tax verification services.

These results suggest that the policy changes that HUD has introduced in the HECM loan program since 2009 have been successful overall in reducing FHA's net losses from that program. The policy changes that appear to be most effective have been those that limit the amount that could be borrowed or used and those that require lenders to verify appraised home values more regularly and consistently. These policy changes had other effects, intended or not, such as the first and second PLF reductions associated with a decrease in demand for HECM loans.

SECTION 1. PURPOSE AND GOALS

This study is HUD's first comprehensive effort in the past 10 years to examine the evolution of the Home Equity Conversion Mortgage (HECM) loan insurance program, chart changes in how the program is used, measure its actual financial performance, and assess the effectiveness of policies intended to manage its risks.[3] The HECM program was authorized as a small pilot in 1987 as HUD's first foray into reverse mortgages. It became permanent in 1998 under Section 255 of the National Housing Act and is now a major component of the Federal Housing Administration (FHA) Mutual Mortgage Insurance (MMI) Fund's portfolio.

The HECM program began small but started to expand rapidly in 2003. After the 2007–08 financial crisis, the program experienced growing accrual losses that eventually reduced the capital reserve ratio of the MMI Fund.[4] To control the program's losses, HUD undertook a series of programmatic rule changes. During this period, the program shrank and has continued at a reduced level.

OVERVIEW OF THE HECM PROGRAM

FHA insures reverse mortgages, or HECMs, under Section 255 of the National Housing Act. The HECM program enables senior homeowners to borrow against the value of their homes up to an amount determined by the borrower's or nonborrowing spouse's age and loan interest rate under different disbursement options, thereby, converting the borrower's home equity into a stream of income or line of credit as the borrower chooses. Unlike a traditional "forward" residential mortgage, which is repaid in periodic payments, a reverse mortgage may be repaid in one payment, often after the death of the borrower or when the borrower no longer occupies the property as a principal residence. One termination outcome is that the borrower or their estate can sell the property for the lesser of the loan balance, or 95 percent of the appraised value. HECM loans are "nonrecourse," meaning that no assets other than the home are used to repay the debt. The HECM loan has neither a fixed maturity date nor a fixed mortgage amount. The mortgages on the property secure the mortgage proceeds that the lender or HUD pay. These liens allow the lender and FHA to recover losses when the borrower dies or no longer maintains the property as their principal residence, among other reasons.

Reverse mortgages have different life-cycle patterns, cashflows, and risk factors compared with traditional forward mortgages.

- For forward mortgages, debt typically goes down, and home equity goes up, as the homeowner makes principal and interest payments as required by the forward mortgage. Home equity may not increase if home values decline. In a reverse mortgage, debt goes up with the disbursement of equity and accrual of interest on the growing debt, and home equity usually goes down unless home price appreciation exceeds the growth in debt.
- For traditional mortgages, the main termination drivers are scheduled amortization, prepayment, or foreclosure. For reverse mortgages, the main termination drivers are the death of the borrower, moving, repayment, refinancing, or borrower default due to the

[3] SP Group LLC and its subcontractor, Econometrica, Inc., prepared this study under a contract with HUD's Office of Policy Development and Research.

[4] The HECM program was transferred from the General Insurance (GI) fund to the MMI Fund in 2009. The GI fund incurred losses on loans originated prior to the transfer.

borrower not meeting occupancy requirements or failing to pay property charges of tax, insurance, maintenance, and so on (GAO, 2019).

- For traditional mortgages, the debt amount usually follows a fixed amortization schedule. For reverse mortgages, the debt amount depends on cash payments to the homeowner, interest rates, mortgage insurance premiums (MIPs), servicing fees, and the duration of the mortgage accruals.
- For traditional mortgages, the main financial risks to lenders are borrower default and prepayment. For reverse mortgages, the main financial risks to lenders are rates of mortality and mobility, shortfalls from property sales, and prepayment (Szymanoski, 2010).

Based on a review of recent literature and interviews with lenders, the research team found that FHA's HECM loan program is the most popular reverse mortgage product available, accounting for more than 90 percent of all underwritten reverse mortgages. The HECM program likely dominates the reverse mortgage market because HECM mortgages have less liquidity risk than private reverse mortgages. The latter lack the benefit of a federal credit guarantee and are, therefore, either less attractive to large investors such as Fannie Mae, which was a large purchaser of HECM loans in the past, or have fewer options for secondary mortgage market securitization, as with Ginnie Mae's HECM Mortgage-Backed Securities program (Szymanoski, Lam, and Feather, 2017). According to a recent HUD report, total HECM endorsements to date now exceed 1 million loans. The annual HECM loan volume peaked in 2009 at around 115,000 endorsements and has stabilized at around 50,000 endorsements per year. From the early 2000s through 2009, house price appreciation and interest rate declines fueled growth in HECM originations (Szymanoski, 2010).

The literature notes that HECM loans offer advantages for borrowers and lenders. Unlike a commercial second mortgage or home equity line of credit, a HECM loan creates no pressure for repayment during the homeowners' tenure. FHA ensures that, when lenders comply with all program requirements, they will usually receive the full value of the HECM loan at term regardless of property values. This insurance from FHA lowers lender risk and makes better loan terms possible. On the downside, a reverse mortgage uses up the equity in a home, and interest continually accrues to the household's debt.

Academic studies have observed that the financial characteristics of borrowers who use reverse mortgages are weaker than those of borrowers who can use other equity extraction financial products, such as second mortgages or home equity lines of credit (Moulton, Loibl, and Haurin, 2017).[5] Reverse mortgage borrowers tend to have much lower incomes than borrowers who can take advantage of other equity extraction loan programs, and considerably lower credit scores, more credit card debt, and more debt that is more than 60 days past due. The benefits to the HECM borrower include having access to cash payments or a credit line with little to no risk of being forced to sell the house. The costs to the HECM borrower are both upfront and monthly, including MIPs, closing costs, origination fees, and loan servicing fees that may be folded into and accrue with the mortgage.

[5] Moulton, Loibl, and Haurin (2017) found that HECM borrowers have lower incomes, fewer additional assets, and higher levels of mortgage debt than other senior homeowners.

FEATURES OF HECM LOANS

Special features of HECM loans include (HUD, 1994)—

- **Eligible Borrowers.** All eligible borrowers must be at least 62 years old. Married spouses or other co-borrowers may be living apart because one of them is temporarily or permanently in a healthcare facility; at least one borrower must be living in the home, however. If the borrower is delinquent on any federal debt or has a lien, including taxes, placed against their property for a debt owed to the United States, the delinquent account must be brought current, paid, or otherwise satisfied, or a satisfactory repayment plan must be made between the borrower and the federal agency prior to closing on a HECM loan (HUD, 2016). A borrower suspended, debarred, or otherwise excluded from participating in HUD's programs is not eligible for a HECM.
- **Eligible Properties.** For eligibility, the property must be the principal residence of the borrower and either a single-family dwelling or a two- to four-unit property where the borrower occupies one unit.
- **Title Evidence.** The lender must submit a title insurance commitment at least equal to the Maximum Claim Amount (MCA; see the following) with the borrower's application to HUD.
- **Appraisal and Collateral Risk Assessment.** In Mortgagee Letter 2018-06, HUD announced an interim procedure whereby FHA would perform a collateral risk assessment of the appraisal submitted for use in the HECM origination. Based on the assessment, FHA may require a second appraisal prior to approving the HECM. If FHA requires a second appraisal and it provides a lower value, the mortgagee is required to use the lower value of the two appraisals for originating the HECM. The second appraisal requirements provided under this interim procedure were scheduled to expire on September 30, 2019. Subsequently, in Mortgagee Letter 2019-16, HUD announced that the second appraisal requirement will remain in effect, as it was determined that the collateral risk assessment was having the desired effect of mitigating the significant collateral valuation risks posed to the MMI Fund and borrowers.
- **Closing Costs.** All allowable closing costs may be added to the loan amount. Closing costs include fees for appraisals, inspections, credit reports, document preparation, title examination, property survey, lawyer fees, sponsored third-party originator fees, recording fees, tax service fees, and courier fees.
- **Principal Limit.** The principal limit, which represents the maximum payment a borrower may receive, determines the amount that the borrower can receive from a reverse mortgage. The principal limit at origination is based on the age of the youngest borrower or eligible nonborrowing spouse, the expected average mortgage interest rate, and the MCA.[6] The principal limit increases each month by one-twelfth of the sum of the

[6] HUD provides lenders a table of principal limit factors, which vary by the age of the borrower and interest rate and can be used to calculate the principal limit for any loan. For example, the factor for a 75-year-old borrower and a 7-percent interest rate is 0.609. If a home is worth $100,000, then the principal limit for that home value, borrower age, and interest rate combination would be $60,900 ($100,000 multiplied by 0.609). The net present value of all cash advances that the borrower receives during the life of the loan, including loan fees paid on behalf of the borrower, must not exceed $60,900.

mortgage interest rate and the annual MIP rate of 0.5 percent. Except in limited circumstances, the borrower will be unable to receive additional payments once the loan's outstanding balance equals the principal limit.

- **Maximum Claim Amount.** The MCA is the lesser of the appraised property value determined by the collateral risk assessment, the national FHA mortgage limit, or the sales contract price (for HECM purchase transactions). The MCA is established when the conditional commitment is issued and represents the maximum amount HUD will pay on a claim for insurance benefits.
- **Payment Plan.** The borrower has the choice of receiving the mortgage proceeds through six payment plans based on the fixed or adjustable interest rate option that the borrower choses, including (1) single lump sum, when the borrower receives most of the mortgage payment up front, subject to a 60-percent limit on first-year draws, (2) tenure, when the borrower receives equal monthly payments from the lender for as long as the borrower lives and continues to occupy the property as a principal residence, (3) term, when the borrower receives equal monthly payments from the lender for a fixed period of months that the borrower selects, (4) line of credit, when the borrower receives the mortgage proceeds in installments at times and in amounts of the borrower's choosing until the line of credit is exhausted, (5) modified tenure, when the borrower combines a line of credit with monthly payments for life or as long as the borrower continues to live in the home as a principal residence, and (6) modified term, when the borrower combines a line of credit with monthly payments for a fixed period of months that the borrower selects. The borrower may change the term of payments, receive an unscheduled payment, suspend payments, establish or terminate a line of credit, or receive the entire net principal limit (that is, the difference between the current principal limit and the outstanding balance) in a lump-sum payment that is subject to a 60-percent limit on first-year draws. With all payment plans, the lender must be able to make lump sum payments up to the net principal limit at the borrower's request.
- **Non-recourse.** HECMs are non-recourse loans. The property is the only collateral for the mortgage. No other assets or income of the borrowers can be accessed to cover any shortfall between the unpaid principal balance and the net sale proceeds from the disposition of the collateral property.
- **Counseling.** The borrower is required to receive counseling before the HECM application is processed. HUD-approved housing counseling agencies provide counseling and focus on the features of a HECM, the terms and conditions of the HECM, and the evaluation of the borrower's credit and property charge payment history and residual income qualifications, the different types of HECMs available, the suitability of a HECM for the borrower, and the alternatives to a HECM.
- **Interest Rate.** Interest accrues at a fixed or adjustable rate as negotiated between the borrower and the lender. For adjustable-rate mortgages during the study, the mortgage interest rate was set at the U.S. Department of the Treasury (hereafter, Treasury) securities rate or London Interbank Offered Rate (LIBOR), adjusted to a constant maturity of 1 year, plus the same margin used to determine the expected average

mortgage interest rate.[7] The lender must offer a rate that adjusts annually (with a 2-percent annual cap and a 5-percent lifetime cap) but may also offer a rate that adjusts monthly (with only a lifetime cap, established by the lender). Interest will accrue daily and be added to the outstanding balance monthly. The borrower will not be able to change from a fixed to an adjustable rate or vice versa after closing.

- **Expected Average Mortgage Interest Rate.** This rate is used to determine payments to the borrower and is fixed throughout the life of the loan. For a fixed-rate loan, the expected rate is the fixed interest rate. For an adjustable-rate loan, the expected rate is the sum of the lender's margin and the index rate, adjusted to a constant maturity of 10 years.
- **Mortgage Insurance Premium.** The borrower will be charged MIPs to cover the insurance program's risk of losses that occur when the outstanding balances—including accrued interest, MIP, and fees—exceed recoveries from the properties at the time that mortgages are due and payable. For HECMs originated after October 2, 2017, the types of MIPs include (1) a one-time, nonrefundable initial MIP equal to 2 percent of the MCA assessed at closing, which the borrower may pay in cash or add it to the outstanding balance (in the latter case, the lender must remit it to HUD before the loan can be endorsed), and (2) a monthly MIP equal to one-twelfth of the annual rate of 0.5 percent of the outstanding balance assessed throughout the life of the loan, which will be added to the outstanding balance and remitted to HUD monthly by the lender (HUD, 2017). The scope of this study did not include examining changes to the MIP structure under the HECM program.
- **Mortgage Default.** A default occurs for a HECM loan when the borrower fails to meet the loan conditions, either by not paying property charges (for example, property tax and homeowner's insurance) or not meeting occupancy requirements. Borrowers risk foreclosure and loss of their homes if they do not pay the outstanding taxes or insurance debt or correct the situation that caused the default. More information on the definition and ramifications of HECM loan defaults can be found in Sarah Mancini's 2019 congressional testimony.[8]
- **Servicing Fee.** The lender is permitted to charge the borrower a servicing fee if this cost has not already been priced into the borrower's mortgage interest rate. The lender adds this fee to the borrower's outstanding balance monthly and cannot assess any other fees to cover the servicing costs.
- **Recovery of Mortgage Proceeds.** A mortgage will become due and payable (except for deferral periods) when the last surviving borrower dies, the property is no longer the borrower's principal residence, the borrower does not occupy the property for 12 consecutive months for health reasons, or the borrower violates the mortgage covenants. When the mortgage becomes due and payable, the borrower or the borrower's estate can sell or mortgage the property to repay the outstanding balance on the mortgage. Because

[7] Other rates used in the past include Cost of Funds Index. LIBOR and the Cost of Funds Index will be transitioning to the Secured Overnight Financing Rate (HUD, 2021). Also, see Ginnie Mae (2020).
[8] Mancini, Sarah Bolling. 2019. *Protecting Seniors: A Review of the FHA's Home Equity Conversion Mortgage (HECM) Program*. Testimony before the U.S. House of Representatives, Financial Services Committee, Subcommittee on Housing, Community Development, and Insurance. https://www.congress.gov/event/116th-congress/house-event/LC65642/text?s=1&r=41.

a HECM is a nonrecourse loan, the lender's recovery from the borrower will be limited to the home's value if it is subject to foreclosure. No deficiency judgment will be taken against the borrower or the estate, because no personal liability exists for payment of the loan balance. When proceeds from the sale of the property are insufficient to pay the outstanding balance, the lender may file an insurance claim with HUD for allowable losses and expenses associated with the HECM from the sale of the property and the outstanding balance up to the MCA (Calhoun, 2017).

- **Assignments, Holding Expenses, and Recoveries.** The assignment option is a unique feature of the HECM program. When the balance of a HECM loan reaches 98 percent of the MCA and meets other assignment requirements, the lender can choose to assign the mortgage note to FHA at face value. FHA will then pay an assignment claim in the full amount of the mortgage balance (up to the MCA) and continue to hold the note until termination. During the note-holding period, the mortgage balance will continue to grow by the annual MIP, additional draws, advances FHA makes, accrued interest, and fees. Borrowers can continue to draw cash as long as the mortgage balance is below the current principal limit. The program offers borrowers a short sale option. Borrowers or their estates are required to repay FHA the lesser of the mortgage balance and the net sale proceeds of the home at mortgage termination. These repayments—along with other recovery options available to FHA through foreclosure, loan sales, and real estate owned (REO) sales—are referred to as *post-assignment recoveries.*

Effect of the HECM Program on the FHA MMI Fund

FHA's MMI Fund currently covers the insurance risk for both forward mortgages and HECM loans. FHA provides lenders with a backstop against both borrower longevity and falling home equity by buying loans when the outstanding balance reaches the home's value and covering losses when loans terminate. Some HECM loans terminate with an insurance claim from lenders to cover eligible losses. To offset this risk, FHA collects upfront and annual MIPs. Lenders can also assign HECM loans in good standing to FHA once the outstanding balance reaches or exceeds 98 percent of the MCA. In the assignment process, the lender is paid either the outstanding loan balance or the MCA, whichever is lower. According to the 2016 actuarial study, approximately 40 percent of loans with unpaid principal balances reaching 98 percent of the MCA are assigned, with 60 percent of loans that reach assignment being ineligible due to such reasons as ongoing bankruptcies, foreclosures, and loss mitigation activities (IFE, 2016; Pinnacle, 2020). After assignment, FHA continues to be at risk for any shortfall when the loan is repaid (Baily, Harris, and Wang, 2019). HUD may lose money if the value of the collateral property is below the amount of the loan at the time an assigned loan terminates.

According to the annual actuarial reviews of the MMI Fund, the value of single-family forward mortgage insurance in the MMI Fund has consistently been positive and has increased since the fiscal year 2012, although the value of HECM mortgage insurance has fluctuated between negative and positive values.

Managing HECM Program Risks

According to HUD's 2019 *Housing Finance Reform Plan,* the following features shaped the risks in the HECM portfolio (HUD, 2019).

- HECMs accrue loan balances over time as opposed to forward mortgages, whereas loans generally amortize as they mature.
- Unique mobility risks are generally dependent on the longevity of borrowers (and eligible nonborrowing spouses that remain in homes secured by HECMs).
- HECMs are nonrecourse loans, meaning FHA has limited ability to recover financial losses on loan terminations beyond the property's value.
- HECMs can carry fixed or adjustable rates, although, since fiscal year 2014, new HECM endorsements have predominantly been adjustable-rate mortgages.
- HECMs remain subject to front-end appraisal bias risks. Analyses have shown the prevalence of appraisal inflation in HECM transactions—reaching as high as 29 percent in 2009—which ultimately increased losses to the MMI Fund (Mayer, 2020; Park, 2017).
- Programmatic and capital fund management challenges include distantly valued collateral (based on long-term forecasts of interest rates and home price changes).

HUD undertook several policy changes during the past decade to address or mitigate these risks, such as reducing the principal limit factor (PLF), requiring the financial assessment of borrowers, modifying the treatment of nonborrowing spouse, and requiring second appraisals. Section 2 and appendix B of this report evaluate the effect of those policies.

HUD controls its risk of loss by limiting the net present value of all cash advances at any point in time to the principal limit for that point in time. Principal limits are calculated for each loan when it is underwritten. The PLF multiplied by the MCA is the maximum loan amount available at origination absent other constraints. The available loan balance grows each year by one plus the expected interest rate plus the mortgage insurance rate. If servicing fees are not included in the interest rate, they also factor into the growth of the available loan balance each year. The PLF increases with a borrower's age and decreases with higher interest rates, both measured at loan origination.

HUD places an additional constraint on the HECM loan amount by capping it at an amount equal to the PLF multiplied by the loan's MCA, which is at the lesser of the home's value, the FHA loan limit, and the sales price if the HECM is a purchase transaction. Properties valued above the single-family statutory maximum FHA loan limit remain eligible for a HECM, but because the MCA is capped, homeowners with higher-valued homes may opt for a home equity line of credit or private reverse mortgage, which the FHA loan limit does not constrain.[9]

Property values are important for the HECM program, because only the mortgaged property secures the loan. HUD found that HECM loan terminations are actuarially driven mostly by mortality and age-related factors and are much less driven by economic factors (HUD, 2008).

According to analysis by the U.S. Government Accountability Office (GAO), a growing percentage of HECM loans terminate because of default, increasing from 2 percent in fiscal year 2014 to 18 percent in fiscal year 2018.[10] According to one study, reverse mortgage default rates

[9] One example of a private reverse mortgage option is from Finance of America Reverse, which offers reverse mortgages that top out at $4 million in total proceeds to the borrower, depending on home value (Clow, 2020).
[10] 116th Congress. 2019. *Protecting Seniors: A Review of the FHA's Home Equity Conversion Mortgage (HECM) Program.* Hearing before the U.S. House of Representatives, Financial Services Committee, Subcommittee on

are 2 percentage points higher for minority borrowers than majority borrowers (Moulton, Haurin, and Wei, 2015). The current study does not attempt to replicate GAO's analysis of HECM defaults, but it does examine the use of this program in communities of color and the performance of HECM loans in those communities (see section 2).

FHA data show that although options to prevent foreclosure exist, the use of such options is limited and at the discretion of the lender. In 2015, FHA promulgated guidance for HECM servicers to offer new repayment plan options to borrowers who are behind on property charges to help prevent foreclosures. The servicers' assessment of borrowers' ability to repay out of their own funds limits the use of this option. As of the end of fiscal year 2018, according to a GAO analysis, approximately 22 percent of borrowers behind on property charges had received this option (GAO, 2019).

The most recent comprehensive evaluation of the HECM program was in 2000 (Puente, 2019).[11] This current study, which attempts to fill in this gap, relies primarily on data coming from the FHA data system that monitors HECM loans. That data system contains a wealth of information on HECM loans but does not contain comprehensive data on the reason for a loan's termination. Using this system, for example, GAO was unable in the previously cited analysis to determine the reason for termination for approximately 30 percent of the HECMs that terminated in fiscal years 2014–18.

Another source of data on HECM loans that this current study does not use comes from the Consumer Financial Protection Bureau, which has been collecting reverse mortgage consumer complaints since 2011. According to their data, the most common complaints about HECM loans concern foreclosures; poor communication from lenders or servicers; problems at loan origination; estate management; and unfair interest rates, fees, or costs (Rodda, Herbert, and Lam, 2000).

GOALS OF THIS STUDY

The objective of this research is to provide a comprehensive examination and assessment of the HECM program's history, service offerings and use, program participants and characteristics, program performance, changes, and resulting effects to date. The research design is divided into three broad study topics focusing on research questions, data sources, and analysis that will frame and describe the key elements of the approach to a comprehensive examination and assessment of the HECM program as it has developed. Studying the three topics requires qualitative and quantitative analysis of data and relevant information that will be drawn from HUD and other sources.

The study comprises three separate studies: Borrower study, financial impact study, and policy impact study. The goal of the borrower study is to understand who uses the HECM program in terms of age, race, location, and other factors; the choices they make regarding loan payment

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Housing, Community Development, and Insurance. https://www.congress.gov/event/116th-congress/house-event/LC65642/text?s=1&r=41.

[11] See also 116th Congress. 2019. *Protecting Seniors: A Review of the FHA's Home Equity Conversion Mortgage (HECM) Program.* Hearing before the U.S. House of Representatives, Financial Services Committee, Subcommittee on Housing, Community Development, and Insurance. https://www.congress.gov/event/116th-congress/house-event/LC65642/text?s=1&r=41.

terms; their intended use of loan proceeds; and how those characteristics and choices have changed over time.

The *financial impact study* centers on understanding the financial impact of the HECM loan program on the insurance funds and exploring aspects of the program that have affected the program's financial gains and losses during the past 20 years.

The *policy impact study* evaluates the effect of policy changes on the performance of the HECM program using quantitative and linear regression analyses of HUD data. The study looks at six policy changes that have affected the terms under which loans have been made during approximately the past 10 years. These policy changes were implemented to reduce risks and losses to the FHA program or, in some cases, to increase benefits to the borrower. The overriding objective of this study is to identify to the extent possible how policy changes do or may be expected to affect the MMI Fund and borrower outcomes.

Most data sources for this study came from HUD data systems and data marts, including the Home Equity Reverse Mortgage Information Technology system, Integrated Database data mart, REO sales data in the Single Family Acquired Asset Management System, and other components of the Single-Family Data Warehouse. This study also uses data from the American Housing Survey and publicly available sources, such as the U.S. Census Bureau's American Community Survey and the Federal Housing Finance Agency's House Price Index. The research team also reviewed relevant literature on the HECM program and spoke to HUD staff and a select group of interested parties from industry and academia. Section 3 of this report provides a detailed discussion of the methodology and data sources.

RESEARCH QUESTIONS

The borrower study poses research questions regarding who are HECM loan borrowers, for what do they use the loans, and what loan terms do they prefer. Some of the questions posed include—

- What are the characteristics of HECM borrowers in terms of age, gender, race, marital status, income, wealth, household size, property type, and location? How do HECM borrowers compare and contrast with broader populations of senior-owned households?
- How do HECM borrowers use loan proceeds—for example, for supplementing current consumption, responding to shocks (death, medical, unexpected retirement), home maintenance, or paying off the existing mortgage and other debts?
- How did borrower characteristics and use of loan proceeds change over time? Do more recent borrowers differ from earlier borrowers? If there are differences, when did they occur?

The financial impact study seeks to address research questions centered on the financial gains and losses HUD incurred through the operation of the HECM loan program. Questions this study poses include—

- What have been the actual and estimated accrued financial gains and losses to HUD from the HECM loan program?
- What is the incidence and financial impact of termination and disposition alternatives?

The policy impact study poses several research questions regarding the effect on HUD and the HECM loan program of changes in policies and practices HUD adopted in recent years, including—

- Reduction of PLF and the restriction on first-year draws.
- Requirement to perform underwriting to evaluate the ability to pay taxes, insurance, maintenance, and repairs.
- Introduction of Life Expectancy Set-Asides to provide funds for taxes and insurance.
- Change in the treatment of loans with nonborrowing spouses.
- Requirement for second appraisal to deter overappraisals.
- Incentives to procure tax services.

SECTION 2. FINDINGS

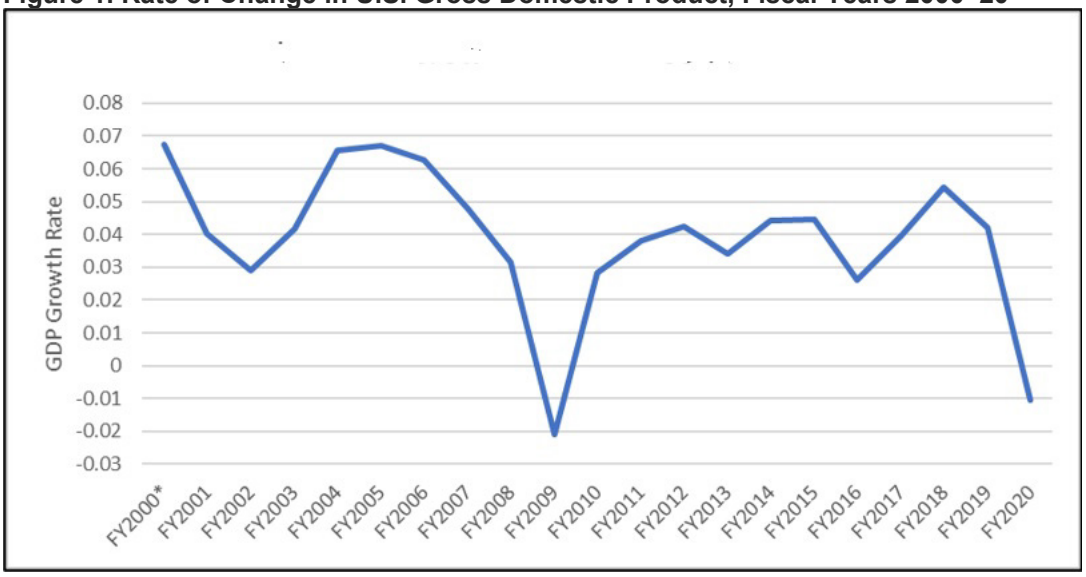
ECONOMIC BACKGROUND

As with any long-term financial instrument, the general state of the economy is likely to affect the demand and performance of Home Equity Conversion Mortgage (HECM) loans. Lower interest rates make long-term loans, such as HECMs, more attractive to borrowers, and higher interest rates make them less attractive. Rising housing prices make certain mortgage products—such as second mortgages, equity takeout mortgage refinancing, and reverse mortgages—more appealing. Homeowners can use these products to tap into the growth in their home equity as housing prices increase. If housing prices fall, however, one would expect fewer homeowners to be willing or able to access these sources of financing.

The following charts show changes in key economic indicators during the 20-year period covered in this study. These indicators include rate of growth in gross domestic product (GDP), short- and long-term interest rates, and change in housing prices.

As Figure 1 shows, the U.S. GDP growth rate during the 2000–20 period hovered between 2 and 7 percent in most years but fell into negative territory (meaning the economy contracted) in 2009 and 2020.

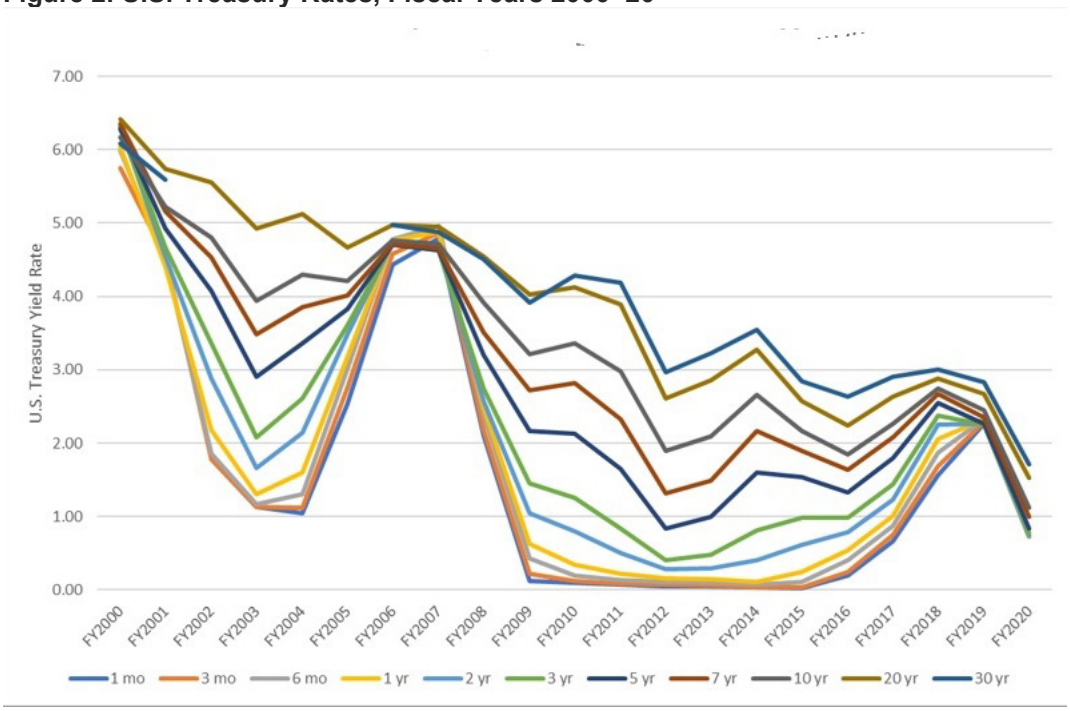
Figure 1. Rate of Change in U.S. Gross Domestic Product, Fiscal Years 2000–20



FY = fiscal year. GDP = gross domestic product.
Source: Federal Reserve Bank of St. Louis https://fred.stlouisfed.org

The economic contraction in 2009 and 2020 coincided with a drop in Treasury short-term interest rates. Although the Federal Reserve Board kept medium- and long-term rates high, the 1-, 3-, and 6-month rates fell close to 0.0 percent in 2009 and stayed that low for the next 6 years (Figure 2).

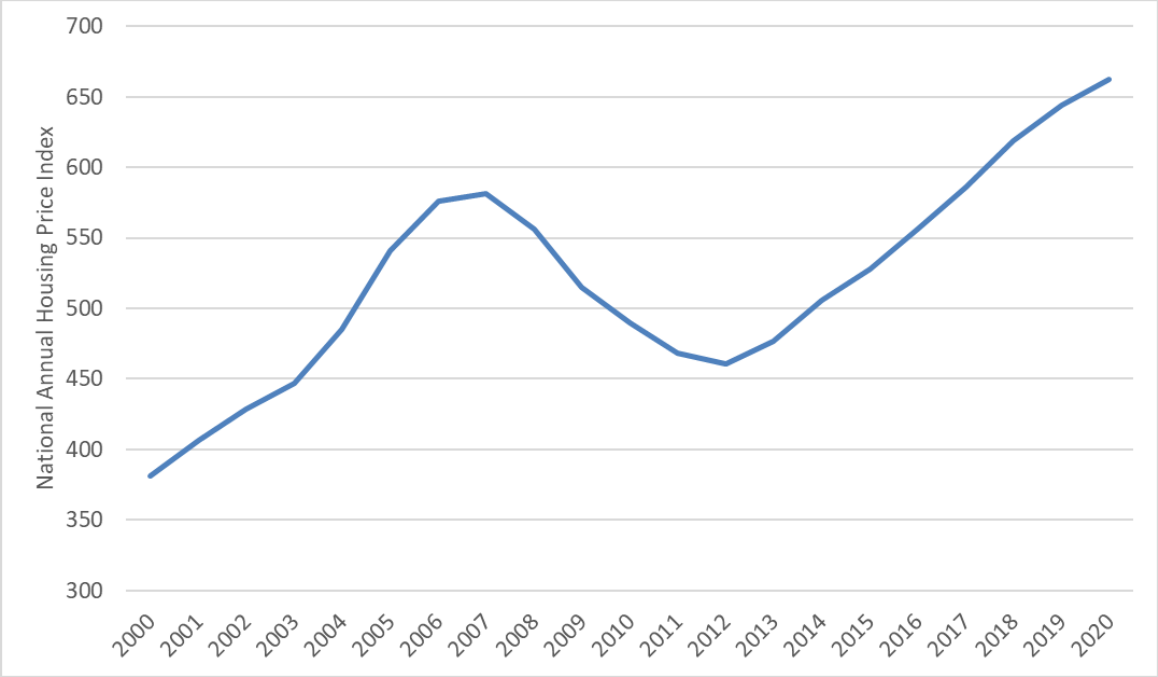
Figure 2. U.S. Treasury Rates, Fiscal Years 2000–20



FY = fiscal year. mo = month. yr = year.
Source: U.S. Department of the Treasury https://www.treasury.gov/resource-center/data-chart-center/interest-rates/pages/textview.aspx?data=yield

Housing price appreciation, represented by the Federal Housing Finance Agency House Price Index, displays a similar pattern to GDP growth and Treasury short-term interest rates in 2009 but diverges from their experience thereafter (Figure 3). After falling sharply in 2007 and 2008, the Housing Price Index continued to decrease through 2012. It has been positive and stable since then.

Figure 3. Federal Housing Finance Agency House Price Index, 2000–20



Source: Federal Housing Finance Agency House Price Index (For Nation, All-Transactions Index) Experimental Indexes Showing Cumulative Annual Appreciation
https://www.fhfa.gov/DataTools/Downloads/Pages/House-Price-Index.aspx

The economic changes that Figures 1 through 3 illustrate may have impacted the HECM loan volume and performance. The fall in GDP in 2009 combined with continued, high long-term interest rates, may have dampened demand for HECMs. The sharp collapse in housing prices at the same time may have constrained the demand for new HECM loans while increasing the risk that outstanding loans would default or result in claim losses to the FHA. The impact of these macroeconomic forces on the characteristics of HECM borrowers and their choice of loans terms is less obvious.

Loan Volume

The HECM program has grown, contracted, and stabilized during the past 20 years in response to macroeconomic forces, competitive market factors, and, possibly, changes in government policies. Looking at key economic indicators during the 20 years covered in this study, this period can be broken into three phases.

- An ***economic growth phase*** and housing bubble from 2000 to 2008, when the annual volume of HECM loan endorsements grew dramatically from less than 10,000 loans to more than 100,000 loans. The program demand benefited from lower interest rates, higher home values, and higher loan limits. The HECM secondary market liquidity was enhanced with the introduction of Ginnie Mae's HECM Mortgage-Backed Securities in 2006.
- An ***economic contraction phase*** in 2009 and 2010, when annual HECM loan endorsements initially remained steady but then declined below 80,000 by 2010. PLF reductions and house price depreciation further contributed to a reduction in HECM demand. In 2009, Ginnie Mae's course reversal limiting HECM Mortgage-Backed

Securities to fixed-rate pools likely contributed to the fall in HECM lending in 2010 and 2011, as did the Fannie Mae decision to stop purchasing Treasury-indexed adjustable-rate HECMs that same year.

- A slow ***economic recovery phase*** throughout the rest of the 2010s, during which HECM loan endorsements stabilized below their precontraction peak. The initial disbursement limitation and additional reduction in PLFs in 2014 coincided with decreased HECM volumes, which continued to trend downward to 30,000–40,000 loans per year by 2019 and 2020. The loan volume in these years included a significant portion of refinance activity.

The exogenous forces and programmatic changes described have likely affected loan performance. The research team found that most HECM loans from 2000 to 2005 were terminated without a claim to HUD, whereas a majority of those endorsed from 2014 onward remain active as insurance-in-force. Loans that originated during the 2006–09 growth period and during the 2010–13 contraction period account for a bulk of FHA assignments, foreclosures, and short sales.

BORROWER CHARACTERISTICS

During the 20-year period of October 1, 1999–September 30, 2020, FHA endorsed approximately 1.1 million HECM loans. Using HUD's administrative data, the research team identified some fundamental characteristics and trends of the HECM borrower population during this period. Appendix A provides Figures with the number of HECM loans by the various borrower characteristics during the 20-year period. This research shows that, in general, the age distribution of the HECM portfolio is skewed toward the younger end of the senior age range, with 45 percent of HECM borrowers aged 62 to 70. Females (68 percent) tend to use the HECM program at more than twice the rate as males (32 percent), which is a much higher ratio of females to males than in the general senior population. Approximately 60 percent of HECM borrowers live alone in one-person households, and a similar percentage are unmarried, which is a much higher percentage than the unmarried population in the general senior population.

With respect to race and ethnicity, 84 percent of HECM borrowers were White, 14 percent were Black, and only 2 percent were of another race. White borrowers comprised the largest portion of HECM loan borrowers throughout this 20-year period, which is consistent with their predominance in the general population during this time. Non-White borrowers have consistently been the minority in this program. Black borrowers comprised the largest share of non-White borrowers in the HECM program. Few HECM borrowers (approximately 6 percent) identified as Hispanic or Latino, which is below the share represented in the general population of seniors. Non-Hispanic and non-Latino borrowers vastly outnumbered Hispanic and Latino borrowers in all years the 20-year period of this study covers.

HECM borrowers tend to be "house rich and income poor."[12] Using U.S. Census Bureau data, the research team estimated that the median income for the senior population living in a one-person household was $30,000 in 2019 dollars. The research team added the annual incomes for

[12] A recent study of more than 1,700 households that sought counseling for a reverse mortgage between 2006 and 2011 found that homeowners seeking a HECM reverse mortgage were "house rich and cash poor." Baseline income was 30 percent less than the control group, and they had significantly fewer assets outside the equity in their homes (Moulton, Loibl, and Haurin, 2017).

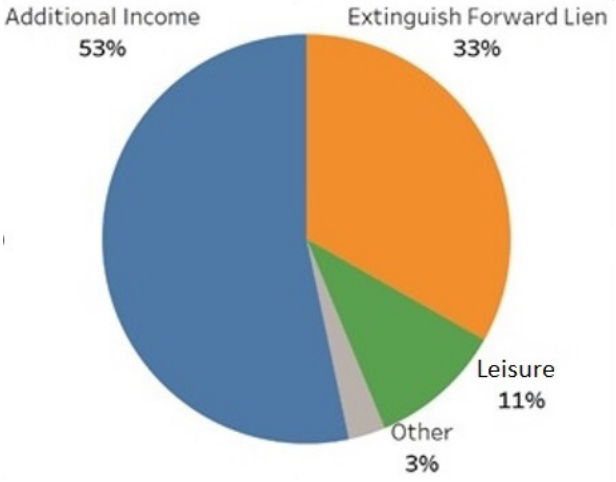
HECM borrowers, for whom HUD recorded the annual income, to 2019 dollars. Although two-thirds of HECM borrowers had annual incomes below the $30,000 benchmark, most of the borrowers in the program had sufficient equity in their homes along with home values higher than average for the general senior population. Data show that 43 percent of HECM borrowers had homes valued greater than $300,000 in 2019 dollars. It illustrates that the HECM program provides extra income security to borrowers who are "house rich and income poor." In addition, a high proportion of borrowers draw down large amounts of their HECM line of credit within the first month.

HECM borrowers live in every region of the country. Approximately 70 percent of borrowers live in four census divisions: Pacific, South Atlantic, Middle Atlantic, and Mountain. In contrast, only 13 percent live in three census divisions: New England, West North Central, and East South Central.[13]

USE OF PROCEEDS

Starting in 2011, HUD began asking borrowers how they intended to use HECM loan proceeds. As part of the loan application, borrowers were given a list from which they could select one or more reasons for obtaining a HECM loan. Approximately one-half of the borrowers selected only one reason, and the other one-half selected multiple reasons. Figure 4 shows that most of the borrowers (53 percent) who indicated only one reason selected "additional income" as the primary reason for obtaining a HECM loan. This finding is in line with the HECM program goal of providing seniors the ability to turn their home equity into supplemental income (HUD, n.d.; IFE, 2011).

Figure 4. Share of Home Equity Conversion Mortgage Portfolio by Use of Loan Proceeds



Note: This graph is based on 215,821 loans in which the borrower reported a single intended use of proceeds.
Source: Authors' own calculations using HECM data

[13] The four census divisions represent several states with some of the highest home values in the nation. The Pacific division includes Alaska, California, Hawaii, Oregon, and Washington. The South Atlantic division includes Delaware, District of Columbia, Florida, Georgia, Maryland, North Carolina, South Carolina, Virginia, and West Virginia. The Middle Atlantic division includes New Jersey, New York, and Pennsylvania. Finally, the Mountain division includes Arizona, Colorado, Idaho, Montana, New Mexico, Nevada, Utah, and Wyoming.

Approximately one-third of the borrowers (33 percent) indicated that they intended to use the loan to pay off an existing lien on their property. It could be argued that this reason is no different than the prior reason of obtaining "additional income," because extinguishing existing forward liens with HECM proceeds is a mandatory program requirement. For those borrowers whose forward mortgage is extinguished and converted into a reverse mortgage, the HECM loan provides relief from forward mortgage payments, and the net equity proceeds provide a source of "additional income."

The third most common reason for a HECM loan was for leisure activities. Approximately 11 percent of borrowers indicated leisure as their primary reason for taking out a HECM loan. The bulk of responses indicating leisure as the primary reason were concentrated in the years 2016 and 2017. It is unclear if this response was due to a change in borrower preferences or an alteration in how the data were collected during those years.[14]

PROGRAM FINANCIAL IMPACTS

The research team analyzed the financial performance of the program in terms of gains and losses realized during the past 20 years. All the data to estimate the gains and losses were derived from HUD's data systems, including mortgage insurance premiums (MIPs), claim payments, note-holding and property-holding expenses, and net recoveries on dispositions for terminated loans.

METHODOLOGY FOR ANALYZING FINANCIAL GAINS AND LOSSES

Gains and losses are defined as those that affect the solvency of the Mutual Mortgage Insurance Fund or the budgetary cost of the HECM program. They do not include HUD's administrative costs for operating the loan program, which includes the cost of direct and indirect staff, contractors, facilities, data systems, and other resources used in administering the HECM program that are not recorded as program costs. Because cashflows occur at different points in time during the life of a loan, the estimate of gains or losses were adjusted for the time value of money. The financial gains and loss analysis under this study focused on providing insights into HUD's asset management practices to inform decision making regarding the disposition options with respect to conveyance or note sales, or both, and as such, the financial analysis does not include loans resolved through short sales or payoffs.

For insured loans, the cashflows associated with HECM loans have two major components: MIPs and claims. Once the loans are assigned to the FHA, the cashflows include three additional components: Note-holding expenses, property-holding expenses, and net recoveries on the proceeds from the sale of notes or collateral. The following explains each component.

- The **MIP** comprises an upfront portion paid to FHA at the time of mortgage closing and an annual amount that is earned over time.
- **Claims** are cash outflows FHA pays to the lender. The three claim types are—

[14] A recent study of those who sought out HECM loan counseling found that the most common reason for seniors to seek out reverse mortgage counseling was the desire for extra income for basic everyday expenses, followed by a desire to use reverse mortgage money to pay off an existing mortgage. Other reasons for seeking reverse mortgages included paying for home improvements and financially helping family members. Only 15 percent of borrowers said that paying for healthcare was their primary motivation (Moulton, Loibl, and Haurin, 2017).

- **Claim Types 21 and 23.** These claim types represent cash outflows for loans that are no longer active for which the net proceeds (from foreclosure or short sale) resulted in insufficient funds to cover the mortgage.
- **Claim Type 22.** This claim payment represents cash outflows for eligible loans that are assigned to HUD and are no longer FHA insured. "Assigned" loans are either active or disposed—through foreclosure and real estate owned (REO) sale, short sale, payoff, or through a note sale.

- **Note-holding expenses** are cash outflows on assigned loans that include additional cash draws by the borrower and/or property taxes paid by FHA for those borrowers who default on their tax and insurance payments during the assignment period.
- **Property-holding expenses** are cash outflows paid by FHA on terminated loans after assignment.[15] The expenses reflect property maintenance costs, such as property upkeep, listing fees, and commission fees.
- **Net recoveries** represent the property recovery amount received by FHA at the time of note termination after assignment.[16] Property recovery can occur when the loan is foreclosed and the REO is sold to a third party, or the loan is sold to a third party through note sales.

Estimate of Gains and Losses

Of the 1.1 million HECM loans endorsed during the 20-year period, the research team identified 533,894 HECM loans that were terminated and disposed as of September 30, 2020, and no further transactions occurring after September 30, 2020.[17]

Based on this sample, the research team estimated that FHA incurred a total loss of approximately $10.4 billion, or an average loss of $19,556 per loan, as Table 1 shows.

Table 1. Estimate of Gains and Losses by Federal Housing Administration Insurance Termination

Type of Termination	Number of Loans	Percent of Sample	Total Gains and Losses	Gain or Loss Per Loan
Terminated Without Claim	350,960	66%	$3,554,816,684	$10,129
Terminated With Claim Type 21 and 23	167,554	31%	-$12,176,349,413	-$72,671
Terminated With Claim Type 22 and Disposed as REO Sale	9,993	2%	-$1,418,053,363	-$141,905
Terminated With Claim Type 22 and Disposed Through Note Sales	5,387	1%	-$401,280,594	-$74,491
Total	533,894	100%	-$10,440,866,686	-$19,556

REO = real estate owned.

[15] Based on HUD's guidance, property-holding expenses were estimated as the sum of the capitalized expense post termination entries in the Claims 601 table and the sum of capitalized income and expenses in the Single Family Acquired Asset Management System (SAMS) for loans sold through note sale and loans sold through REO sale, respectively.

[16] Based on HUD's guidance, net recoveries were estimated using the sale price of the properties amount in the Claims 601 table and the bid amount in SAMS for loans sold through note sale and loans sold through REO sale, respectively.

[17] Loans that terminated during this 20-year period but had transactions occurring after September 30, 2020, were not included in this analysis.

Source: Authors' own calculations using HECM data

Approximately two-thirds of the 533,894 terminated loans resulted in gains for FHA. Average gain per loan was estimated to be $10,129 for loans that terminated without claims. Average loss per loan was comparable for loans that terminated with Claim Types 21 and 23 to those that terminated with Claim Type 22 and were disposed in a note sale and was approximately double for loans that were disposed in a Secretary-held REO sale at $141,905 per loan.

Tables 2 and 3 show cash inflows and outflows for the 533,894 terminated loans. MIP payments contributed to approximately $5.5 billion of $7.6 billion of cash inflows, whereas claim payments under Claim Types 21 and 23 made up $14 billion of the approximately $18 billion of cash outflows.[18]

Table 2. Home Equity Conversion Mortgage Loan Estimate of Cash Inflows

Cash Inflows	Sum of MIP	Net Recoveries from Note Sales*	Net Recoveries from REO Sales†
Terminated Without Claim	$3,554,816,684	N/A	N/A
Terminated with Claim Type 21 and 23	$1,769,511,717	N/A	N/A
Terminated with Claim Type 22 and Disposed as REO Sale	$141,986,449	N/A	$1,530,403,043
Terminated with Claim Type 22 and Disposed Through Note Sales	$75,127,393	$499,979,732	N/A

MIP = mortgage insurance premium. N/A = not available. REO = real estate owned.
* Sum of the sale price of the property entries in Claims 601 Table.
† Sum of Bid Amounts in the Single Family Acquired Asset Management System.
Source: Authors' own calculations using HECM data

Table 3. Home Equity Conversion Mortgage Loan Estimate of Cash Outflows

Cash Outflows	Sum of Claims Paid	Post-Assignment Disbursements	Holding Expenses*
Terminated Without Claim	N/A	N/A	N/A
Terminated with Claim Type 21 and 23	$13,945,861,131	N/A	N/A
Terminated with Claim Type 22 and Disposed as REO Sale	$2,014,816,158	$80,699,093	$994,927,604
Terminated with Claim Type 22 and Disposed Through Note Sales	$930,883,053	$46,047,483	-$542,816

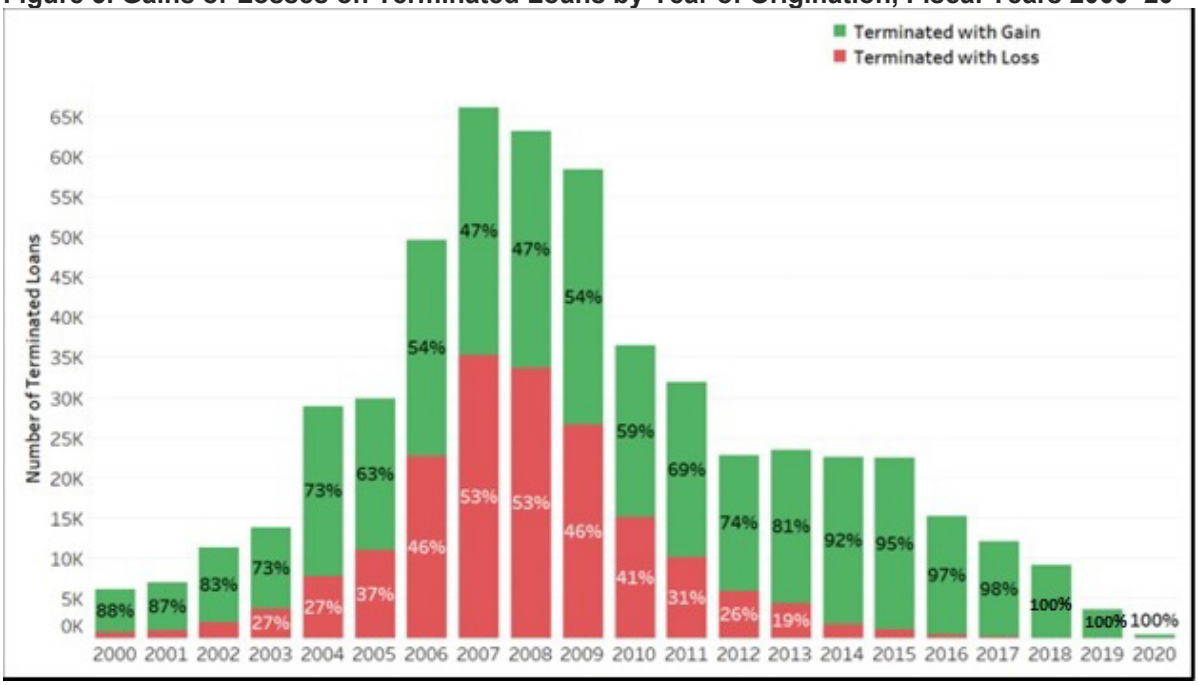
N/A = not available. REO = real estate owned.
* Sum of capitalized income and expenses in the Single Family Acquired Asset Management System for REO sales and sum of the capitalized expense post termination entries in Claims 601 Table for note sales.
Source: Authors' own calculations using HECM data

The research team further investigated the financial performance on a year-by-year basis (Figure 7). Aside from the years 2007 and 2008, the program incurred gains on most of the loans endorsed in each of the other fiscal years. For loans that originated in 2007, the average loss per loan was estimated to be approximately $37,300, resulting in a total loss of approximately $2.5 billion for that cohort of loans. Figure 5 shows the gains and losses on terminated loans by year

[18] To facilitate the comparative analysis, all cashflows were future valued to September 30, 2020, using the daily Treasury 1-Year Yield Curve Rates. Each MIP payment, post-assignment distribution, paid claim, and so on, were assigned a 1-Year Yield Curve Rate from the date that the transaction occurred. That rate was used to calculate interest on the transaction from the transaction date to September 30, 2020. It allowed the research team to estimate the amount HUD earned through investment of cash inflows, such as MIP payments, and the opportunity cost that HUD incurred by not being able to invest the funds used in cash outflows such as claim payments.

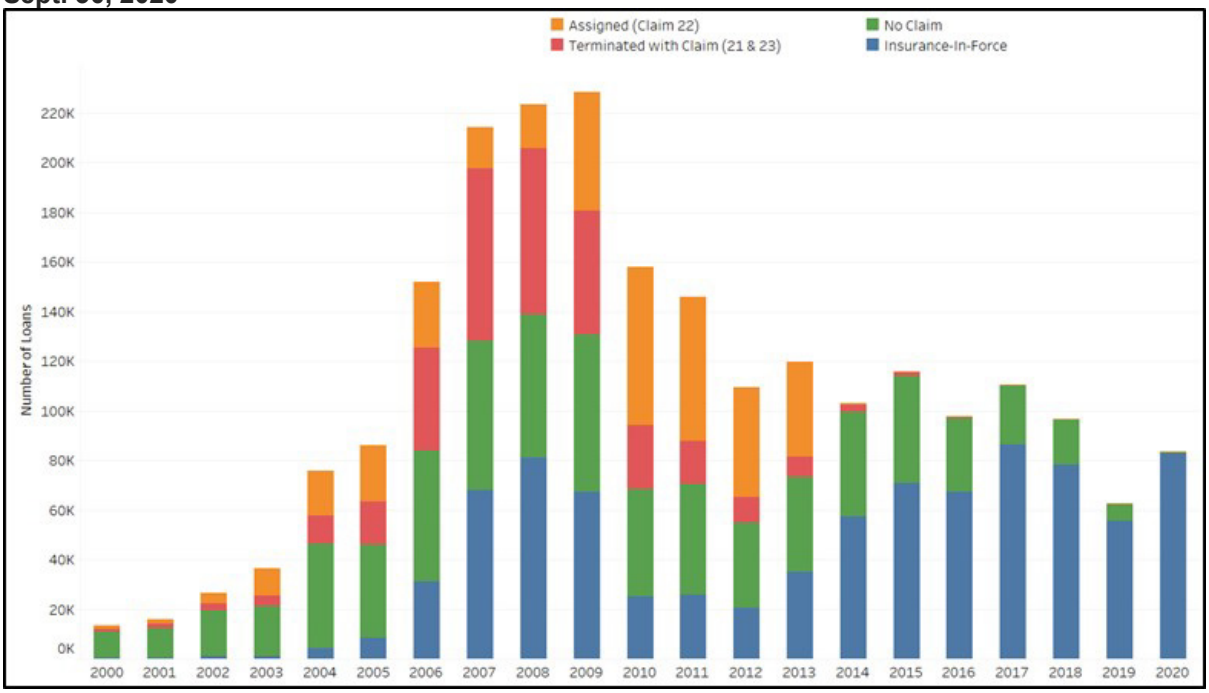
of endorsement and Figure 6 shows the remaining portion of each cohort that has not yet terminated as of September 30, 2020.

Figure 5. Gains or Losses on Terminated Loans by Year of Origination, Fiscal Years 2000–20



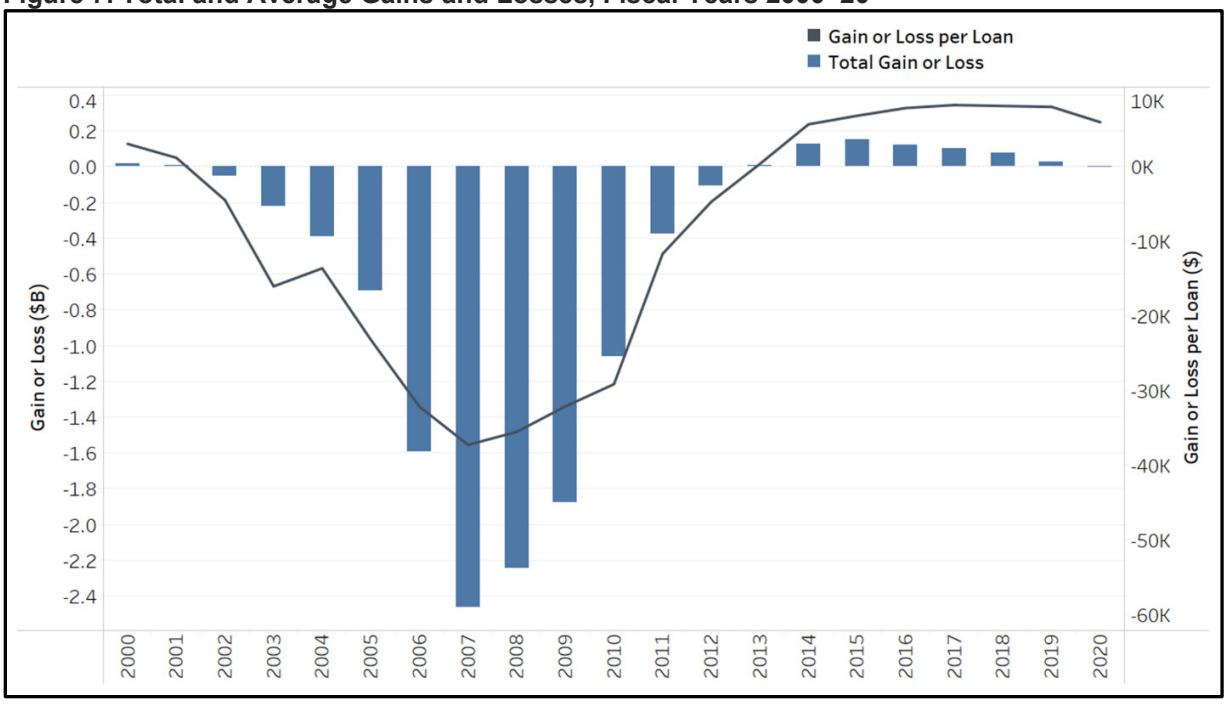
K = thousand.
Source: Authors' own calculations using HECM data

Figure 6: Status of Home Equity Conversion Mortgage Loans by Year of Endorsement as of Sept. 30, 2020



K = thousand.
Source: Authors' own calculations using HECM data

Figure 7. Total and Average Gains and Losses, Fiscal Years 2000–20



B = billion. K = thousand.
Source: Authors' own calculations using HECM data

Financial Analysis of Various Disposition Options

As part of this study, the research team reviewed the effect of alternative termination and disposition options HUD used for assigned HECM loans. The two most commonly used disposition options include (1) the conveyance program, used for those HECM loans that are assigned to and foreclosed by HUD and for which the underlying REO is sold through the traditional conveyance program, and (2) the note sale program, used for assigned HECM loans with vacant collateral (that is, the borrower and the co-borrower, if any, are deceased); under which, HUD sells the loan to a third party through the HUD-held vacant note sale program.

The approach for evaluating the termination and disposition options primarily examined two metrics: The loss severity associated with each option, and the timeline of liquidation for each option. The REO channel and HUD-held vacant note sale channel were evaluated based on these two metrics. Also, other pre-foreclosure options exist, such as deed-in-lieu; the data available do not identify when these other options are used, however.

The research team identified 15,380 HECM loans that were (1) endorsed on or after October 1, 1999, and terminated on or before September 30, 2020, with no recorded transactions after September 30, 2020, and (2) disposed of through the conveyance program or a note sale program. Table 4 demonstrates the cash inflows and outflows on a per loan basis for the two disposition options.

Table 4. Average Cash Inflows, Outflows, and Losses by Type of Disposition

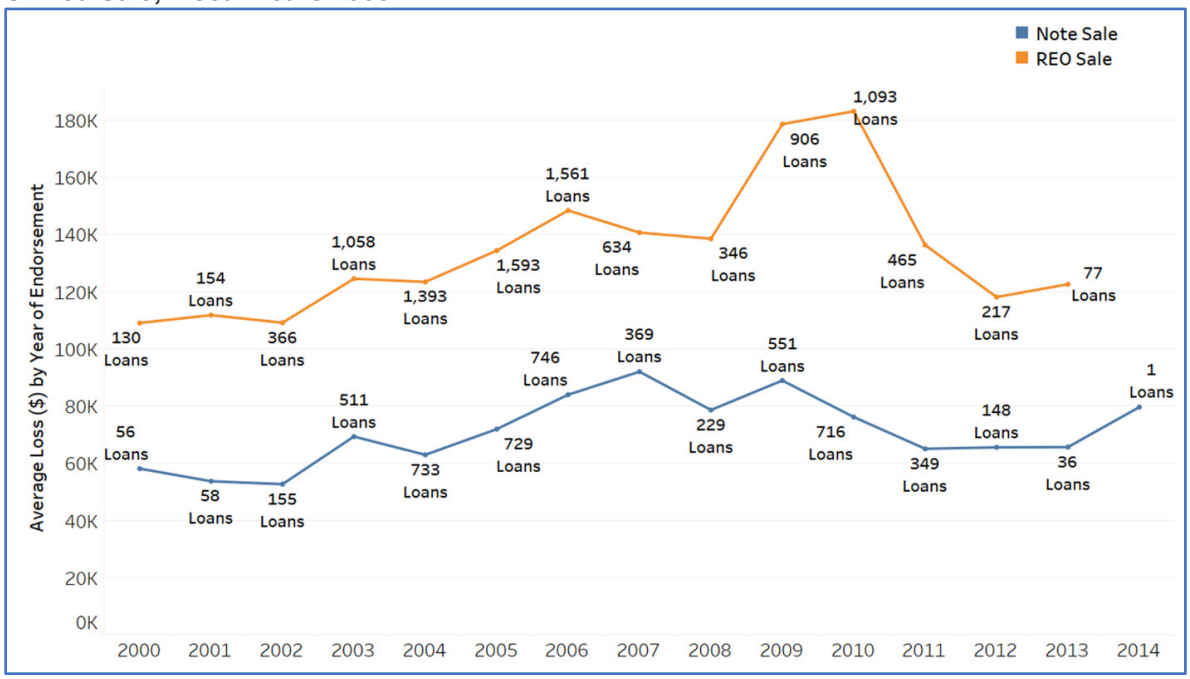
Type of Disposition	Total HECM Loans	Cash Inflow (Per Loan Basis)[a]	Cash Outflow (Per Loan Basis)[b]	Average Loss (Per Loan Basis)
Loans disposed through the conveyance program	9,993	$167,356	-$309,261	-$141,905
Loans disposed through the note sale program	5,387	$106,758	-$181,249	-$74,491

HECM = Home Equity Conversion Mortgage.
[a] Total Cash Inflows are provided in Figure 6 of this report. Cash inflow per loan is computed by adding the total cash inflows and dividing it by the number of loans.
[b] Total Cash Outflows are provided in Figure 7 of this report. Cash outflow per loan is computed by adding the total cash outflows and dividing it by the number of loans.
Source: Authors' own calculations using HECM data

On a per loan basis, the conveyance program generates a higher cash inflow, but the outflows in that program are almost twice as high as those under the note sale program, resulting in a loss of approximately $142,000 per loan.

The research team analyzed the average loss per loan by the fiscal year of loan endorsement. Figure 8 shows the disparities in losses for the two disposition channels. Average loss per loan was consistently lower for those disposed through the note sale program. The difference in average loss per year was largest for loans endorsed in fiscal years 2009 and 2010, when losses generated by the loans disposed through the conveyance program were more than twice as high as those generated by the loans disposed through the note sale program ($180,000 versus $80,000).[19]

Figure 8. Number of Home Equity Conversion Mortgage Loans by Note Sale and Real Estate Owned Sale, Fiscal Years 2000–14

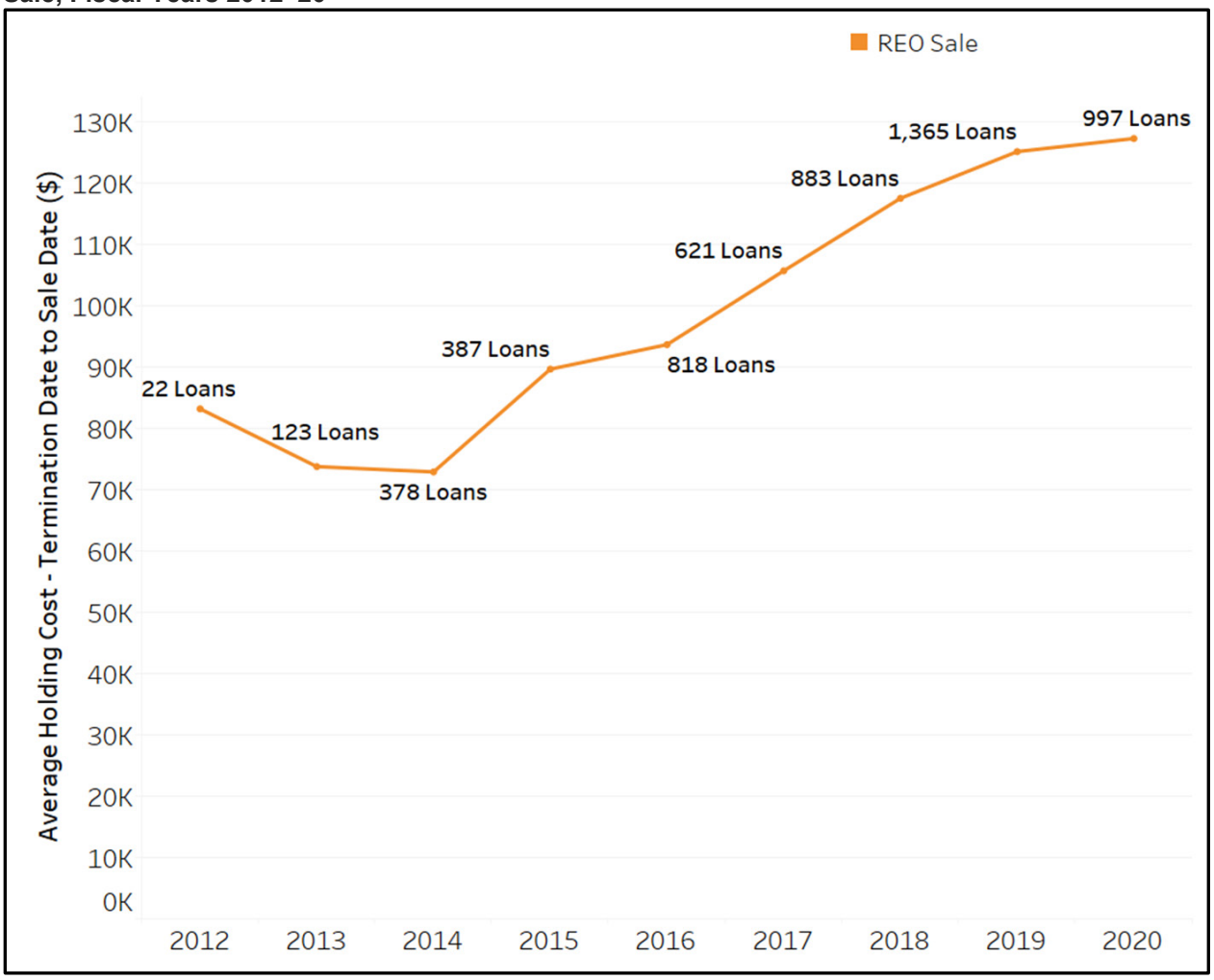


K = thousand. REO = real estate owned.
Source: Authors' own calculations using HECM data

[19] This analysis observes that note sales and REO sales have similar distributions over time, and therefore, housing market conditions are less likely to influence these findings.

Given that HECM loans disposed through the conveyance program resulted in higher average losses, the research team further investigated the components of cash outflows associated with this disposition channel. The average holding cost for REOs has increased 50 percent since 2012 (Figure 9).[20] The average holding cost in 2012 was estimated to be approximately $83,000 per loan; that is, it cost HUD approximately $83,000 to hold the collateral property from loan termination to the date of REO sale. By fiscal year 2020, this cost was estimated to be $127,000 per loan.

Figure 9. Average Holding Cost of Home Equity Conversion Mortgage Loans of Real Estate Owned Sale, Fiscal Years 2012–20



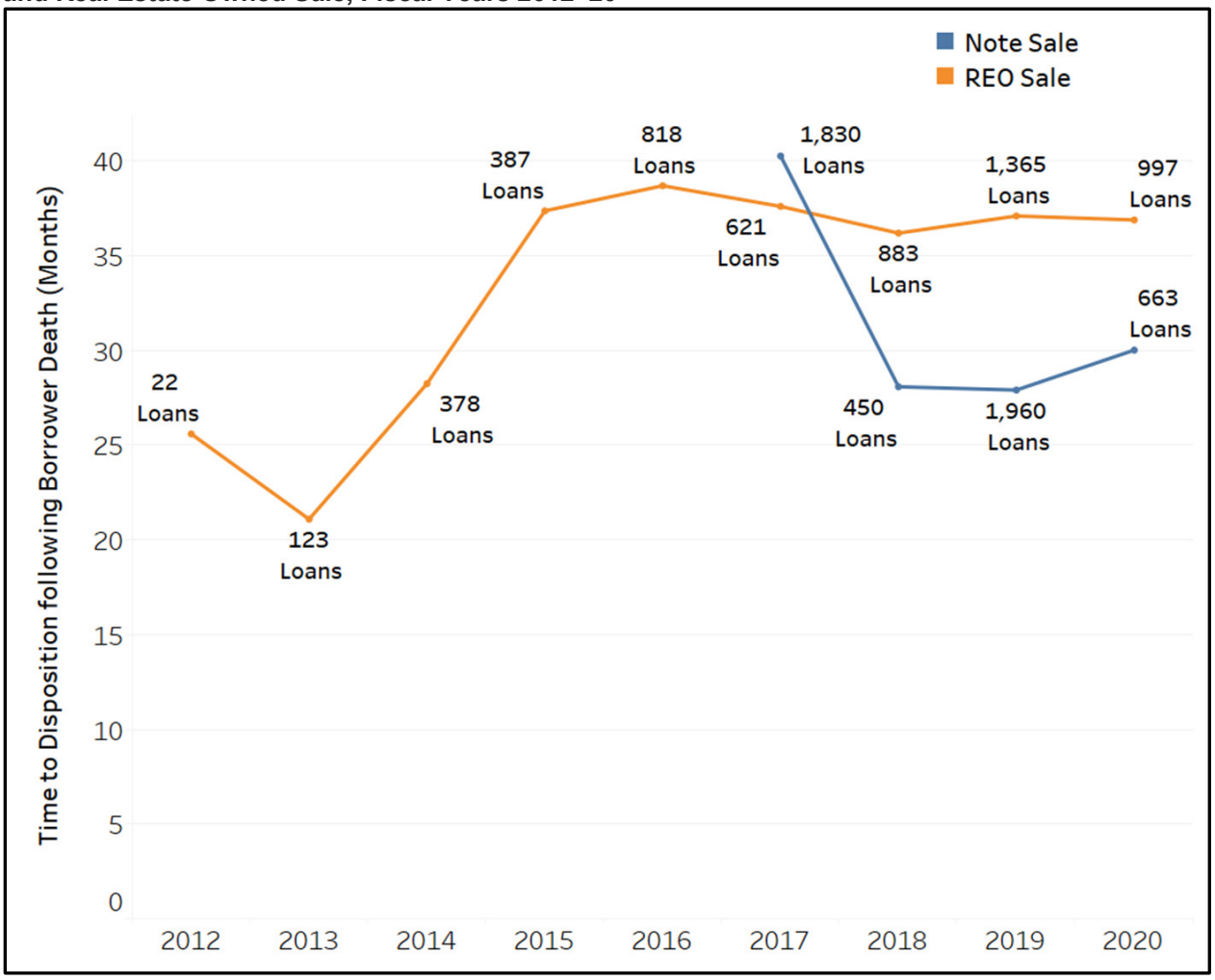
K = thousand. REO = real estate owned.
Source: Authors' own calculations using HECM data

The research team identified approximately 4,900 HECMs sold through note sale and approximately 5,600 HECM collateral property sold through REO sale for which borrowers' dates of death could be confirmed in the Home Equity Reverse Mortgage Information

[20] HUD started recording REO sale-related holding costs in the HECM program in 2012.

Technology database.[21] Figure 10 shows the length of time in number of months for each liquidation to be completed by the fiscal year of loan termination.

Figure 10. Average Time to Disposition of Home Equity Conversion Mortgage Loans by Note Sale and Real Estate Owned Sale, Fiscal Years 2012–20



REO = real estate owned.
Source: Authors' own calculations using HECM data

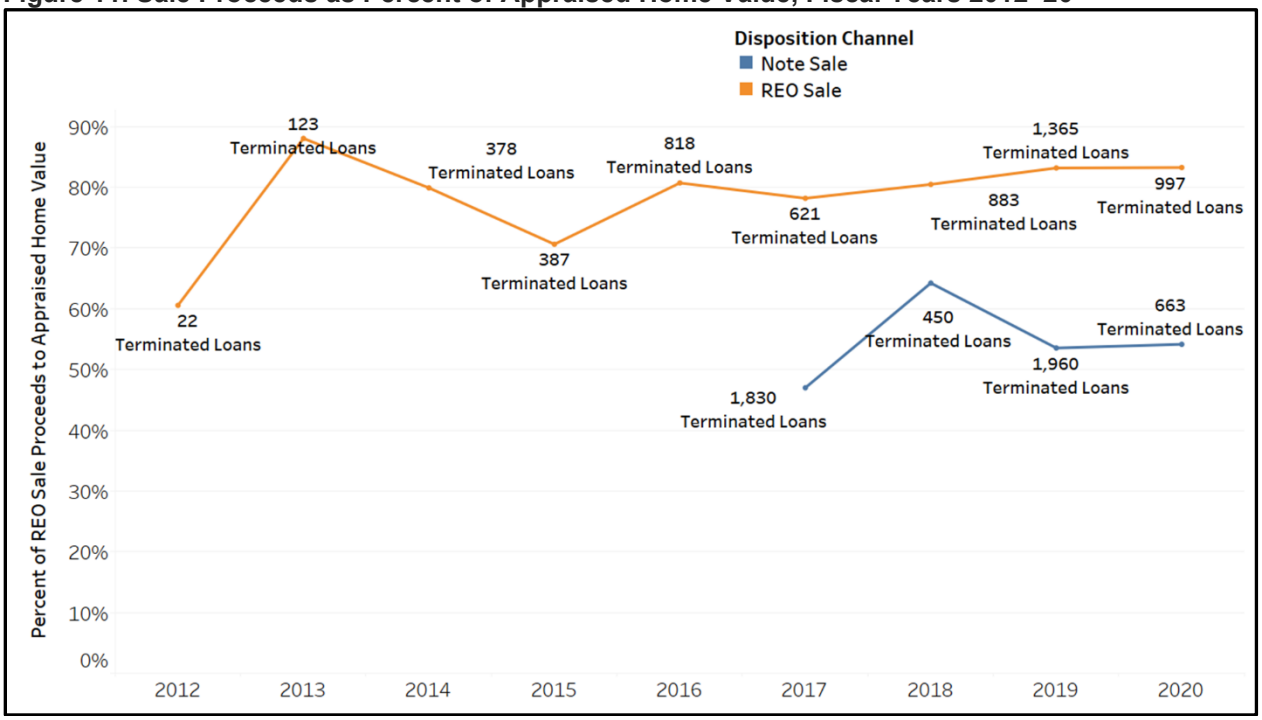
For loans sold through the conveyance program from fiscal years 2012 to 2014, it took approximately 2 years on average for REOs to be disposed from the date of borrower's death. Since then, the average number of months for REO sales stabilized at approximately 37 months. HECM loans sold through the note sale program consistently took less time to complete than the REO sale channel, except for loans that terminated in fiscal year 2017. It does not appear that time to disposition is the primary driver of holding costs, because average holding costs rose from fiscal years 2014 to 2020, whereas the average time to disposition did not fluctuate.

The research team further analyzed the recovery rates on REO sales as a percentage of the appraised home value. For this analysis, the research team future valued the appraised home

[21] The start date for this analysis is the death date of the last surviving HECM borrower. For HECM loans that terminated due to the death of the borrower, it is likely that foreclosure and REO sales or note sales are viable options from that day forward.

value at the time of origination and the REO sale proceeds to 2019 dollars. As Figure 11 shows, the average REO sale recovery percentage for the 9-year period was approximately 78 percent of appraised home value. The average note sale recovery percentage for the 9-year period was approximately 55 percent of appraised home value. The percentage of sales proceeds to appraised home value is consistently higher for REO sales; REO sales generate more losses to FHA due to higher holding costs, however.

Figure 11. Sale Proceeds as Percent of Appraised Home Value, Fiscal Years 2012–20



REO = real estate owned.
Source: Authors' own calculations using HECM data

Effects of Policy Changes

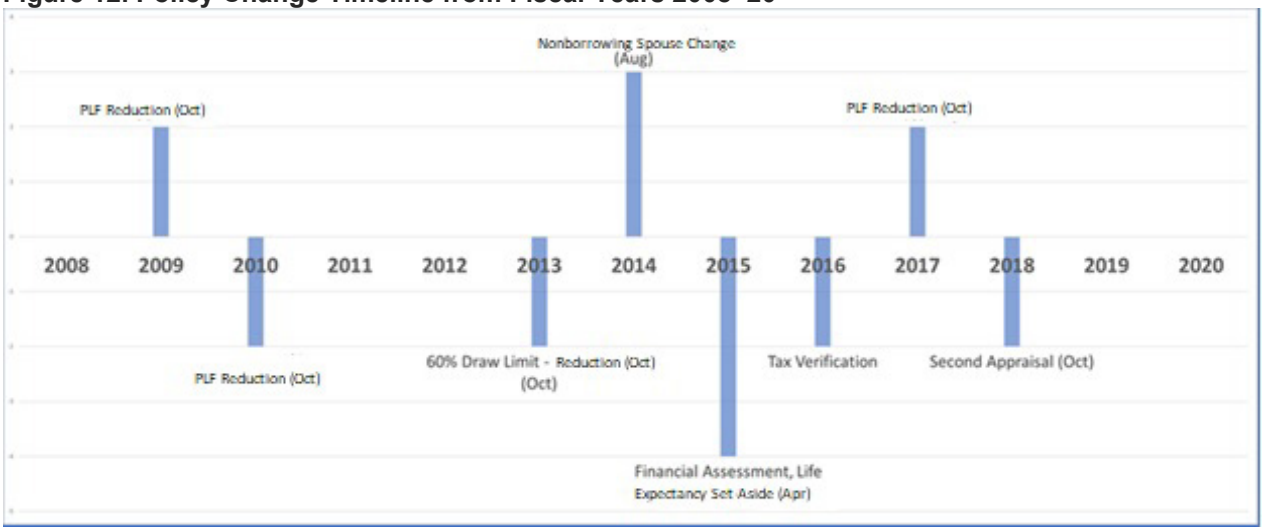
This section considers whether a series of policy changes that HUD undertook during the past 10 years have had any effect on the HECM program and HUD, with respect to net losses per loan, likelihood of defaults, frequency of unscheduled draws (which increase defaults), and demand for HECM loans. This analysis enables HUD policymakers to assess the relative success of past HECM reforms, while providing insights into whether and how to make additional reforms.

This analysis focuses on the following policy changes, explained below and shown in Figure 12.

- Reduction of the PLF with and without coincidental restrictions on first-year draws. HUD reduced the PLF four times from 2009 to 2017 and, in 2013, imposed a 60-percent limit on the amount of principal a borrower could draw down in the first year of the loan. The objective of the PLF reductions and the restriction on first-year draws was to reduce net losses to the program. It was hypothesized that loss reduction could be achieved by reducing the number of loans (by reducing loans with high PLFs). Consequently, these models concentrate on informing on the outcomes related to loan demand, unscheduled draws, and net losses (gains).

- Requirement to perform underwriting to evaluate the ability to pay taxes, insurance, maintenance, and repairs, and the introduction of a Life Expectancy Set-Aside (LESA) to provide funds for taxes, insurance, maintenance, and repairs. In 2015, HUD began requiring lenders to evaluate each borrower's financial capacity for paying taxes, insurance, maintenance, and repairs and to use loan proceeds to fund borrower LESA accounts, if needed.
- Changes to the treatment of loans with nonborrowing spouses starting in 2014 to reduce the effect of undisclosed spouses who survived the death of the borrower.
- Requirement of a collateral risk assessment in 2018 to deter overappraisals. Under this policy change, FHA performs a collateral risk assessment of the appraisal submitted in the HECM loan application. Based on the assessment, FHA may require a second appraisal before approving the HECM. When a second appraisal provides a lower value, the lender is required to use the lower value of the two appraisals in underwriting the HECM loan.
- Establishment of incentives for servicers to acquire tax verification services in 2016 to reduce the impact of delinquent taxes.

Figure 12. Policy Change Timeline from Fiscal Years 2008–20



PLF = Principal Limit Factor.
Source: Authors' own calculations using HECM data

To assess the effect of these policy changes, the research team conducted a literature review and interviewed a small sample of stakeholders from the mortgage industry and academia about the HECM program and their assessment of how HUD's policy changes could have affected the program. Based on insights from these interviews, the research team developed a series of regression models using HECM loan-level data from HUD that attempted to isolate the effect of each policy on losses and gains to FHA, the demand for HECM loans, and other program outcomes while controlling for confounding factors.

In general, this approach measures and compares program performance before and after the policy changes using program data from HUD, supplemented as needed with information from secondary sources. The research team employed direct observation of program characteristics

and loan data before and after policy changes and linear regression to estimate the statistical correlations associated with the timing of the policy change while controlling for other factors likely to affect program outcomes. Interviews with HUD staff and stakeholders provided broader context for this analysis.

Determining whether policy changes are achieving their objectives was the main focus of the analysis, but changes can have outcomes that may not have been anticipated. This study, therefore, attempted to estimate whether outcomes occurred that the policy did not suggest and whether the balance of outcomes had been productive overall. The analysis additionally showed whether a longer timeframe or additional data were needed to evaluate the effect of the change.

Appendix B of this report presents a detailed discussion of the methodology and findings. Overall, the first and second PLF reductions were associated with reducing net losses to the program; they also are associated with reducing the demand for HECM loans and unscheduled draws. The third PLF reduction did not have a measurable effect on net losses, loan demand, or unscheduled draws. The fourth PLF reduction, however, was associated with reducing net losses to the program and unscheduled draws but had no discernible effect on HECM loan demand.

The first and second PLF reductions are estimated to have reduced *net losses* to the program by $14,657 per loan, the fourth PLF reduction by $1,730 per loan, and the requirement for a second appraisal by $991 per loan. No effect could be detected for the third PLF reduction (coupled with the first-year drawdown limit) or the financial assessment-LESA requirement.

The first and second PLF reductions are associated with a reduction in the average *chance of an unscheduled draw* by 54 percent, the fourth PLF reduction by 59 percent, and the financial assessment-LESA requirement by 26 percent. Unscheduled draws increased the risk of default by more than five times. No effect could be detected in this regard for the third PLF reduction (coupled with the drawdown limit).

The first and second PLF reductions are also associated with a decrease in *demand for HECM loans*. No effect could be detected for the third PLF reduction (coupled with the drawdown limit) or the fourth PLF reduction.

HUD's policy change requiring lenders to assess borrowers' financial capacity and, where needed, fund set-asides to cover property charges out of the loan proceeds was successful in reducing the likelihood of loan defaults and unscheduled draws. The analysis could not establish if that policy change resulted in a reduction in net losses to FHA. The financial assessment-LESA requirement is estimated to reduce the average *risk of default* by 18 percent, and the implementation of incentives to secure tax services is estimated to reduce that risk by 10 percent.

This analysis found that the requirement for a collateral risk assessment was successful in reducing net losses to FHA, loan duration, and appraised home value. The second appraisal requirement appears to have decreased appraised value by $7.85 per square foot—a 3.5-percent reduction to the $223 per square foot average for appraised value. Because of this impact, this policy change seems to have reduced appraisal *bias*, that is, the overstatement of the appraised value of the home, which is associated with a reduction in net losses.

This analysis of HUD's policy change for the treatment of nonborrowing spouses found that it increased the proportion of loans with a co-borrower and more than doubled the percentage of refinanced loans but had no effect on loan duration. The nonborrowing spouse policy changes are associated with a 1-percent increase in the proportion of co-borrowers. These changes are

also associated with a doubling of the *likelihood of a refinance*. Refinances were estimated to increase net losses by $14,529 per loan.

These results in aggregate indicate that policy changes enacted since 2009 have been successful in reducing net losses to the program in addition to other effects. Table 5 presents a summary of the results.

Table 5. Summary of Study 3 Findings

Policy Change	Outcome	Loan Population	Range of Loan Originations	Estimated Effect of Policy Change	Sample Size	Adj R^2
First and second reductions of the PLF	Demand	All endorsed	October 2007 to September 2012	Reduction of 4,781 loans per month (average of 9,274 loans per month prior)	88 months	0.72
	Unscheduled draw or not	All endorsed		Chance of unscheduled draw reduced by 54% on average	390,125	Logit
	Net gain	Terminated		Net gain of $14,657 per loan	184,182	0.32
Third reduction of the PLF and the restriction on first year draws	Demand	All endorsed	October 2011 to September 2015	Insignificant effect on demand	88 months	0.77
	Unscheduled draw or not	All endorsed		Incorrect sign—average chance of unscheduled draw increased by 44%	170,257	Logit
	Net gain	Terminated		Incorrect sign—estimated as a net loss of $3,406 per loan	61,114	0.21
Fourth reduction of the PLF	Demand	All endorsed	October 2015 to September 2019	Insignificant effect on demand	76 months	0.56
	Unscheduled draw or not	All endorsed		Chance of unscheduled draw reduced by 59% on average	132,696	Logit
	Net gain	Terminated		Net gain of $1,730 per loan	27,721	0.30
Introduction of financial assessment, Life Expectancy Set-Asides, and underwriting requirement	Default or not	All endorsed	April 2013 to March 2017	Average risk of default reduced by 18%	134,779	Logit
	Unscheduled draw or not	All endorsed		Chance of unscheduled draw reduced by 26% on average	134,779	Logit
	Net gain	Terminated		Insignificant effect on net gain	41,956	0.21
Change in treatment of loans with nonborrowing spouses	Duration	Terminated	August 2012 to July 2016	Incorrect sign—estimated as a 4-month reduction in duration	55,345	0.56
	Proportion with co-borrower	All endorsed		Proportion with a co-borrower increased by 1%	88 months	0.72
	Refinance or not	All endorsed		Average chance of refinancing is increased by 211%	164,305	Logit
Requirement for a second appraisal to deter overappraisals	Net gain	Terminated	October 2016 to September 2020	Net gain of $991 per loan	18,042	0.30
	Duration	Terminated		A ¾-month reduction in duration (analyzing loans < = 6 months in duration)	1,216	0.07

Policy Change	Outcome	Loan Population	Range of Loan Originations	Estimated Effect of Policy Change	Sample Size	Adj R^2
	Estimate of overappraisal	All endorsed		A $7.85 reduction per square foot, given a $223 per square foot average (3.5%)	144,638	0.26
Incentives to procure tax services	Default or not	All endorsed	October 2014 to September 2018	Average risk of default reduced by 10%	167,682	Logit
Additional Analysis Not Involving a Policy Change	**Outcome**	**Loan Population**	**Range of Loan Originations**	**Estimated Effect**	**Sample Size**	**Adj R^2**
Loan is a refinance	Net gain	Terminated	2005–20	Net loss of $14,529 per loan if refinance	405,446	0.33
Appraisal bias	Net gain	Terminated	2005–20	Each 1% reduction in bias is estimated to result in net gain of $41 per loan	322,099	0.35
Unscheduled draw or not	Default or not	All endorsed	2005–20	Average risk of a default increased by 511% with an unscheduled draw	1,027,265	Logit

PLF = Principal Limit Factor.
Source: Authors' own calculations using HECM data

SECTION 3. DATA SOURCES AND METHODOLOGY

DATA SOURCES

In general, the approach for this study used program data from HUD, supplemented as needed with information from secondary sources. Review of recent literature and interviews with HUD staff and stakeholders provided broader context for the analysis. To analyze policy effects, the research team employed direct observation of program characteristics and loan data before and after policy changes and linear regression to isolate the effect of the policy change, while controlling for other factors that likely affected program outcomes. This section provides a detailed discussion of the data sources used in the methodology and approach (Tables 6 and 7).

Table 6. Administrative Data

Data Sources	Description	Use
HERMIT system	Online system for the HECM program.	HERMIT was the primary source of data on HECM borrowers for this study. Researchers used this source for Borrower Birthdate, Appraised Value of Home, Family Size, Borrower Income, Reported Use of Loan Proceeds, Selected Loan Type, Borrower Race, Borrower Ethnicity, Endorsement Date of Loans, Claim Status of Loans, Initial Principal Limit, and Amount of Principal Withdrawals. The HERMIT system also included tables that recorded all transactions related to HECM loans, which were used in analysis regarding gains and losses of loans.
Integrated Database (idb_1 and idb_2)	A composite HUD database that provides loan-level data for every HUD-insured loan.	Researchers used this data source for any loan-level data point that was not found in the HERMIT system. Researchers used this source for data on Borrower Gender, Borrower Income, Property Location, and Building Type of Collateral Property.

Data Sources	Description	Use
HECM Financial Assessment Table	Data compiled at HECM origination to evaluate the need for a Life Expectancy Set-Aside for the HECM borrower. Data collection began in April 2015.	Researchers used these data to determine Family Size for loans endorsed from April 2015 and onward.

HECM = Home Equity Conversion Mortgage. HERMIT = Home Equity Reverse Mortgage Information Technology.

Table 7. Other Publicly Available Data Sources

Data Sources	Description	Use
ACS	A dataset from the U.S. Census Bureau that provides annual estimates on various aspects of the United States and its population. Estimates that are relevant to this study include home value, population breakdown by age, and income characteristics.	Researchers used this source to compare HECM borrowers with an otherwise alike group and to measure the market penetration of HECMs among the eligible population. Researchers used county-level data from the ACS to compare homes at the county level. Researchers also used ACS data to validate the median income of senior homeowners.
Actuarial review of the MMI Fund, various years	An annual independent actuarial analysis of the economic net worth and soundness of the Federal Housing Administration's MMI Fund.	Researchers used this source for reference purposes.
Federal Reserve Bank of St. Louis—Federal Reserve Economic Data	Federal Reserve Economic Data is an online database consisting of economic data time series that the Research Department at the Federal Reserve Bank of St. Louis created and maintains.	Researchers used this source for data on the historical national unemployment rate, LIBOR, the 30-year mortgage interest rate, and the Case-Schiller home price index.
U.S. Bureau of Labor Statistics	The Bureau maintains a Consumer Price Index inflation calculator.	Researchers used this source to adjusted dollar amounts (for example, property appraisals and transactions) to 2019 dollars.

ACS = American Community Survey. HECM = Home Equity Conversion Mortgage. LIBOR = London Interbank Offered Rate. MMI = Mutual Mortgage Insurance.

Literature Review

At the start of this study, the research team performed a review of HUD's published studies and other independent studies of the Home Equity Conversion Mortgage (HECM) program conducted during the past 2 decades. The review focused on understanding their approach and summarizing any findings that would be relevant to the research questions under this study. These sources filled in some of the gaps in HUD's program data and allowed the analysis to take advantage of findings from prior studies of the same or related topics.

Interviews

To better understand the series of HUD policy changes discussed in this report, their possible effect on HECM program size, composition and performance, and methodological issues related to analyzing HECM program data, the study team conducted several interviews with selected external stakeholders during October and November 2021. All interviews were held via phone or videoconference due to COVID-19 restrictions on travel and budget constraints.

The stakeholders interviewed consisted of industry participants, including four senior executives from two of the largest lending institutions active in the HECM program; two senior executives from the National Reverse Mortgage Lenders Association, the trade association that represents the reverse mortgage industry; and three professor-cum-researchers from Ohio State University,

all who have studied the HECM program for many years. Both lenders have been in existence for about 20 years. They specialize in reverse mortgages, provide their own in-house subservicing, and have proprietary reverse mortgage products in addition to HECMs.

METHODOLOGY

Once the appropriate data sources were identified and relevant data collected, the study team engaged in data cleaning and processing to conduct the analysis required for addressing the research questions. This section describes the different aspects of the data assembly and analysis of the study.

DATA CLEANING AND PROCESSING

Considerable effort was expended to clean and process the data. The research team performed this task using advanced data analytics software to connect and process disparate data sources. First, the research team used a connection to HUD's Single-Family Data Warehouse to produce a partial copy of HUD data tables (identified previously as administrative data) that related to the HECM loans in this sample. The primary data table used to identify the sample loans was hermit_case_detail. This table records the endorsement and termination data of all HECM loans, which was the primary filter used to determine which loans to include in each analysis.

Next, the research team sought to include data fields from the two relevant claims tables. Prior to implementation of the Home Equity Reverse Mortgage Information Technology (HERMIT) system, HECM data were recorded in data tables with the prefix "hecm." Most data from "hecm" data tables were transferred to the HERMIT system, but the research team used the "hecm" data tables to ensure the capture of all relevant records. The research team connected both the "hermit_claim_detail" and the "hecm_claim_detail" table to the base HERMIT data, then processed the data to determine when a HECM claim was approved and what type of claim was made. In situations where multiple claims appeared, the research team used the approval data of the most recent claim to determine the type of claim. The research team documented any supplemental claims in this process.

The research team then connected and processed any data relevant to each piece of analysis. For example, when analyzing borrower characteristics, information such as the age, race, and ethnicity of the HECM borrower was needed. These data are captured in HUD's Integrated Database data tables, which record information on every HUD borrower and collateral property of HUD-insured mortgages. The research team joined the relevant data to the HECM-specific data table, a process which also involved transformation, such as producing a borrower race field using the indicators that exist in the Integrated Database data mart. Other calculated fields included determining the status of the loan as of the end of fiscal year 2020, the age of the borrower, and loan duration.

Finally, the research team connected outside data, such as the inflation rate between loan origination and 2019, to adjust appraisal value and income to 2019 dollars. The resulting data table was stored on a Statistical Analysis Software dataset file and an outside database file to use for the analysis.

In December 2021, HUD discovered and fixed a problem with the recorded termination dates of HECM loans during this analysis. To ensure the accuracy of the analysis, the research team pulled the updated termination date field from "hermit_case_detail" and included it in the processed data table.

METHODOLOGY FOR ANALYZING BORROWER CHARACTERISTICS

For the borrower characteristics study, the research team analyzed HUD's HECM loan data to generate frequency counts of HECM borrowers and loans for selected borrower characteristics, use of loan proceeds, and choice of loan disbursement options. These frequencies were then presented in graphic form for the entire population of the approximately 1.1 million loans originated from fiscal years 2000 through 2020.

Loans were grouped by four performance categories for each of the 20 years, and the differences in borrower characteristics at endorsement for each of those 20 years were reviewed across the four loan performance groups. The purpose of this approach is to review if characteristics by the loan performance groups vary significantly.

Appendix C includes the specific field names used in the borrower characteristics analysis.

METHODOLOGY FOR EVALUATING POLICY IMPACT

Appendix B of this report presents a detailed discussion of the methodology and findings for policy impact evaluation.

For assessing the extent of overappraisal in the HECM program, the research team conducted a comparative analysis using data from the Federal Housing Administration (FHA)-insured forward mortgages. The underlying assumption behind the methodology was that the FHA-insured forward mortgages were less likely to be subjected to an overappraisal bias.[22] To conduct the analysis, the research team collected data on appraisal values, geographic location, and the underlying collateral's characteristic data for both the FHA-insured forward mortgages and the HECM loans. The sample included data on 940,000 HECM loans originated during the 20-year period and 17.5 million FHA-insured forward mortgages.

To compare the appraisal values across the two program types, the research team computed the appraisal value per square foot. It was accomplished by extracting the total square footage of each collateral property as recorded under HUD's administrative database. The research team divided the appraised value by the reported square footage and computed the appraised value per square foot for each loan under the two programs. Then, the research team compared the appraised value per square foot by year of origination for the two programs to identify the differences, if any. The research team also compared the appraised value per square foot by the location of the collateral property.

LIMITATIONS OF STUDY

Data Limitations. Although HUD's administrative data files were the foundation for this analysis, the data files are not without limitations. For instance, all data fields involving HECM borrowers are self-reported by borrowers to mortgage originators at the time of HECM origination. This process led to limitations that can be summarized into the following categories.

- **Nonresponse.** Data fields without a response had a minor effect on every borrower characteristic analyzed in this study. For example, approximately 1 percent of HECM borrowers during a 20-year period did not have a response for their gender. This small number of missing responses do not change the trends that this study analyzed. On the

[22] This assumption stems from those who have compared the valuations of properties with FHA-insured forward mortgages and HECM loans (Park, 2017).

other hand, the nonresponse for "borrower income" had more than a minor effect. One in five loans showed a borrower income of $0. The borrower income data improved for newer loans subject to a financial assessment requirement starting in 2015; however, loans endorsed before 2015 still affected the analysis for this study. Any loan with the borrower income reported as $0 was excluded from the analysis of borrower income.

- **Static Data.** The HUD data fields are static and are not updated after loan origination. For example, if the number of people in a household change after loan origination, the HUD data tables do not capture this change in the data files. The same is true of other characteristics that may change over time, such as borrower income, appraisal value of the collateral property, or the borrower's intended use of loan proceeds.
- **Missing Data.** No defined data fields exist for certain variables such as borrower wealth, borrower marital status, and family size. The data for these characteristics are currently not captured in the HERMIT system and were not captured in the data system that preceded HERMIT. To address HUD requirements under this study, the research team worked with the data available and made postulations for these characteristics where appropriate. For example, multiple data fields that involved the assets of HECM borrowers were examined, and ultimately the appraised value of the HECM's collateral property was used as a surrogate for borrower wealth. Another issue encountered with missing data was that for some characteristics, such as "use of proceeds," borrower responses were not recorded prior to 2011. As such, data on this characteristic are only available post 2011.
- **Unclear Borrower Reference.** When multiple HECM borrowers exist, the birth date for the "borrower" and up to four "co-borrowers" are recorded. The individual recorded as the "borrower," opposed to a "co-borrower," is the youngest individual. For most other borrower characteristics, there is only one field; although presumably it is referencing the individual recorded as "borrower," which cannot be guaranteed. For example, it is unclear whether the data field capturing "gender" is referring to the gender of "borrower" or to the gender of any of the older "co-borrowers." It is also unclear if all borrower characteristic fields are referring to the same "borrower" or if any information regarding "co-borrower" is also being included. For the purposes of our study, the research team considered all borrower characteristics to be referencing the same individual—that is, the youngest individual, who would be the "borrower."
- **Focus on Terminated Loans.** Finally, limiting the analysis to the terminated loan population was a practical limitation of this approach, which focuses on measuring actual effects rather than modeling future impacts. The downside of this approach is that it provides only a partial assessment of policy impacts, because these outcomes are expected to affect active loans in the future. The analysis addresses the limitation of truncated data by discussing and presenting evidence to support the case for longer term effects.

CONCLUSION AND RECOMMENDATIONS

In the past 2 decades, the Home Equity Conversion Mortgage (HECM) program has developed from a small pilot serving a handful of senior homeowners into a mature program serving more than 1.1 million borrowers nationally, or an average of 50,000–60,000 loans endorsed per year.

Looking at the 1.1 million HECM loans issued between fiscal years 2000 and 2020, one sees a clear picture of the type of borrower who is drawn to this program and eligible to take advantage of it. These individuals tend to have homes with sufficient equity against which they can borrow, and the value of their homes tends to be higher on average than the value of senior-owned homes in general. Second, they show signs of living with constrained incomes. Their household incomes are lower on average than peers with few prospects for raising them due to their age and marital status. The HECM program provides extra income security and may help many of them meet an immediate expense; that is, the high proportion of borrowers who draw down large amounts of their HECM line of credit within the first month. Third, HECM borrowers are poised to continue living where they are without the need to sell their home to finance living expenses.

The rapid growth of the HECM program in the first decade coincided with a housing bubble during which average home prices appreciated by double digits in some years. When that bubble burst in 2008, the volume of HECM loans collapsed. The collapse of the housing bubble affected the program in another way; loans endorsed before and during the housing collapse account for the bulk of foreclosure and short sales claims. A financial analysis of the gains and losses from loans that originated and terminated during the 20-year period shows that losses peaked during 2007 and 2008 when the housing bubble burst. Since then, changes in the program and the trends in the economy have led to a smaller and more stable program. Approximately 80 to 90 percent of loans that originated in later years (that is, 2013 and beyond) result in gains, rather than losses. Overall, the research team estimated that the Federal Housing Administration (FHA) incurred a total loss of approximately $10.4 billion during the 20-year period, or an average loss of approximately $19,556 per HECM loan. The average loss per loan is lower for loans disposed through the note sales program compared with those disposed through the conveyance program, largely due to the higher holding costs associated with real estate owned sales.

Although market forces were behind the growth and collapse of the HECM program, government policies played a role as well. Increasing secondary market liquidity likely accelerated the expansion of the program, whereas stricter borrowing limits likely contributed to the program's retrenchment and supported its stabilization. In the latter case, government policies were designed to reduce losses to the FHA from future loans to help offset losses on the high volume of claims from prior loans.

The evaluation of policy changes in the HECM loan program since 2009 suggests that the policy changes have been successful in reducing FHA's net losses from the program. The policy changes that appear to be most impactful have been those that limited the amount that could be borrowed or used and those that required lenders to verify appraised home values more regularly and consistently. These policy changes had other effects, intended or not, such as the first and second principal limit factor reductions being associated with a decrease in demand for HECM loans.

Going forward, the research team recommends that HUD continue to study the financial performance of the cohort of loans subjected to the rigorous policy changes implemented since 2009. Barring any unexpected economic shocks hitting the housing market, this cohort of HECM

loans will likely have reduced adverse outcomes that were associated with the HECM loans that originated prior to 2009 contributing to higher losses, higher defaults, unscheduled draws, overappraisals, and excess demand.

The research team also recommends that HUD consider disposing more HECM loans with vacant collateral through the note sales program, given the opportunity to reduce default servicing costs, minimize adverse neighborhood impact from vacant properties, and maximize recovery potential by lowering the holding costs typically associated with the conveyance program.

APPENDIX A. NUMBER OF HECM LOANS BY BORROWER CHARACTERISTICS

Exhibit A-1. Number of Home Equity Conversion Mortgage Loans by Borrower Age at Endorsement

Fiscal Year of Endorsement	Borrowers 62-70	Borrowers 71-80	Borrowers 81 and Older
2000	1,677	3,375	1,684
2001	2,136	3,931	1,914
2002	3,840	6,518	2,915
2003	6,151	8,734	3,360
2004	13,189	17,740	6,942
2005	16,448	19,281	7,312
2006	28,778	34,141	13,170
2007	42,908	46,166	18,345
2008	49,270	44,629	18,147
2009	51,921	43,734	18,768
2010	36,469	29,332	13,257
2011	36,805	25,347	10,958
2012	28,755	18,080	7,978
2013	32,290	19,687	7,947
2014	27,211	17,297	7,107
2015	28,985	20,541	8,462
2016	22,672	18,341	7,855
2017	25,187	21,184	8,918
2018	21,441	18,861	8,027
2019	13,381	12,464	5,427
2020	17,453	17,710	6,658
Grand Total	506,967	447,093	185,151

Source: Authors' own calculations using HECM data

Exhibit A-2. Number of Home Equity Conversion Mortgage Loans by Borrower Gender

Fiscal Year of Endorsement	Female	Male
2000	3,821	896
2001	4,352	1,096
2002	6,840	1,851
2003	8,873	2,593
2004	18,362	5,721
2005	19,720	6,884
2006	33,530	12,560
2007	47,547	19,372
2008	48,705	22,887
2009	46,645	24,694
2010	33,034	16,919
2011	29,367	15,205
2012	21,410	11,583
2013	22,399	12,551
2014	19,881	10,532
2015	22,299	12,620
2016	17,969	10,547
2017	20,491	11,524
2018	17,683	9,925
2019	11,885	6,563
2020	14,708	8,320
Grand Total	469,521	224,843

Source: Authors' own calculations using HECM data

Exhibit A-3. Number of Home Equity Conversion Mortgage Loans by Marital Status

Fiscal Year of Endorsement	Unmarried	Married
2000	4,730	2,001
2001	5,456	2,514
2002	8,705	4,561
2003	11,495	6,736
2004	24,199	13,649
2005	26,751	16,225
2006	46,503	29,412
2007	67,355	39,635
2008	72,034	39,522
2009	72,002	42,008
2010	50,903	28,012
2011	45,654	27,346
2012	33,962	20,761
2013	36,069	23,756
2014	31,350	20,222
2015	35,398	22,548
2016	28,787	20,064
2017	32,518	22,757
2018	28,525	19,799
2019	18,948	12,324
2020	24,461	17,360
Grand Total	705,805	431,212

Source: Authors' own calculations using HECM data

Exhibit A-4. Number of Home Equity Conversion Mortgage Loans by Household Size

Fiscal Year of Endorsement	1-Person Household	2-Person Household	3-Person Household	4-Person Household
2000	4,720	2,011		
2001	5,452	2,518		
2002	8,692	4,574		
2003	11,468	6,763		
2004	24,147	13,701		
2005	26,683	16,292	1	
2006	46,386	29,526	3	
2007	67,175	39,810	5	
2008	71,816	39,730	10	
2009	71,797	42,176	36	1
2010	50,743	28,122	48	2
2011	45,462	27,508	29	1
2012	33,812	20,875	36	
2013	35,881	23,902	41	1
2014	31,168	20,363	38	3
2015	35,006	22,832	92	16
2016	25,995	21,869	749	238
2017	29,229	24,927	849	270
2018	25,434	21,829	789	272
2019	16,740	13,687	637	208
2020	22,446	18,628	565	182
Grand Total	690,252	441,643	3,928	1,194

Source: Authors' own calculations using HECM data

Exhibit A-5. Number of Home Equity Conversion Mortgage Loans by Borrower Race

Fiscal Year of Endorsement	White	Black	Asian	American Indian	Hawaiian	More than 1 Race
2000	1,659	206	18	5		
2001	2,136	276	26	4		
2002	3,981	538	34	14		
2003	14,171	2,153	152	42		
2004	30,414	5,282	381	382	155	69
2005	34,608	7,005	410	256	245	68
2006	62,485	10,948	780	394	404	102
2007	85,312	18,784	988	489	424	125
2008	86,881	20,181	1,024	465	422	126
2009	89,548	17,389	1,100	467	371	112
2010	63,335	12,021	939	345	294	81
2011	59,727	9,642	882	245	200	78
2012	44,611	6,915	633	195	151	60
2013	49,189	7,163	683	222	203	83
2014	43,083	5,675	621	176	226	86
2015	48,802	6,153	774	188	206	97
2016	42,021	4,208	549	160	187	83
2017	46,614	4,500	573	148	180	101
2018	37,894	3,272	495	133	118	112
2019	23,757	2,040	336	72	38	88
2020	33,116	2,721	500	91	76	88
Grand Total	903,344	147,072	11,898	4,493	3,900	1,559

Source: Authors' own calculations using HECM data

Exhibit A-6. Number of Home Equity Conversion Mortgage Loans by Ethnicity

Fiscal Year of Endorsement	Not Hispanic or Latino	Hispanic or Latino
2000	6,684	47
2001	7,918	52
2002	13,149	117
2003	17,701	530
2004	36,261	1,587
2005	40,807	2,169
2006	72,012	3,903
2007	100,942	6,048
2008	102,398	9,158
2009	104,351	9,659
2010	72,640	6,275
2011	67,655	5,345
2012	50,654	4,069
2013	55,666	4,159
2014	48,098	3,474
2015	54,114	3,832
2016	45,904	2,947
2017	52,151	3,124
2018	45,966	2,358
2019	29,650	1,622
2020	39,386	2,435
Grand Total	1,064,107	72,910

Source: Authors' own calculations using HECM data

Exhibit A-7. Number of Home Equity Conversion Mortgage Loans by Borrower Annual Income

Fiscal Year of Endorsement	$30,000/Yr or More	Less than $30,000/Yr
2000	1,340	4,818
2001	1,833	5,451
2002	3,387	8,602
2003	3,795	12,394
2004	7,106	25,958
2005	6,451	17,138
2006	9,548	22,023
2007	17,213	41,311
2008	22,351	53,370
2009	32,004	57,984
2010	25,260	44,546
2011	25,994	42,876
2012	18,187	25,978
2013	19,552	25,309
2014	17,707	22,968
2015	20,575	23,752
2016	21,413	25,928
2017	24,457	30,743
2018	20,522	27,703
2019	13,296	17,921
2020	18,956	22,790
Grand Total	330,947	559,563

Source: Authors' own calculations using HECM data

Exhibit A-8. Number of Home Equity Conversion Mortgage Loans by Borrower Wealth (Collateral Appraisal Value)

Fiscal Year of Endorsement	Appraisals Less Than $150k	Appraisals $150k to $300k	Appraisals Greater Than $300k
2000	2,485	3,153	1,089
2001	2,352	3,750	1,867
2002	3,552	6,063	3,642
2003	4,029	7,943	6,242
2004	7,654	15,135	15,049
2005	7,308	15,202	20,447
2006	9,432	24,917	41,552
2007	15,846	41,477	49,655
2008	20,930	49,415	41,152
2009	19,965	42,265	51,715
2010	16,768	28,361	33,734
2011	19,791	26,472	26,734
2012	16,511	19,828	18,374
2013	18,116	21,390	20,316
2014	14,116	18,534	18,920
2015	13,557	20,875	23,508
2016	9,406	17,496	21,944
2017	8,362	19,689	27,216
2018	6,697	16,905	24,720
2019	3,717	11,715	15,838
2020	3,317	13,908	24,595
Grand Total	223,911	424,493	488,309

k = one thousand.
Source: Authors' own calculations using HECM data

Exhibit A-9. Number of Home Equity Conversion Mortgage Loans by Property Type

Fiscal Year of Endorsement	Single-Family	Condo-minium	Multifamily
2000	6,088	435	
2001	7,214	550	
2002	11,962	1,098	
2003	16,464	1,641	
2004	34,648	3,112	
2005	39,625	3,335	
2006	69,459	6,441	3
2007	98,545	8,410	13
2008	103,889	7,632	19
2009	106,900	7,098	9
2010	75,020	3,886	7
2011	70,634	2,357	8
2012	53,174	1,547	1
2013	58,222	1,602	1
2014	50,133	1,439	
2015	56,298	1,648	
2016	47,334	1,516	1
2017	53,265	2,006	3
2018	46,647	1,677	
2019	30,164	1,108	
2020	40,315	1,506	
Grand Total	1,076,000	60,044	65

Source: Authors' own calculations using HECM data

Exhibit A-10. Number of Home Equity Conversion Mortgage Loans by Property Location

Fiscal Year of Endorsement	Pacific	South Atlantic	Middle Atlantic	Mountain	West South Central	East North Central	New England	West North Central	East South Central
2000	1,512	1,221	1,156	756	250	1,008	406	249	161
2001	1,869	1,183	1,362	983	579	1,015	544	276	153
2002	3,029	1,974	1,927	1,709	1,075	1,915	780	569	286
2003	4,436	3,050	2,360	2,215	1,293	2,469	1,036	967	401
2004	11,892	6,012	4,145	3,753	3,219	4,164	2,108	1,837	684
2005	14,943	6,484	4,417	4,253	3,425	4,553	2,633	1,632	591
2006	26,425	14,342	7,689	7,789	5,007	6,226	4,898	2,544	976
2007	26,158	28,190	12,029	10,485	7,154	9,598	7,122	4,060	2,193
2008	22,102	33,219	11,894	11,233	8,852	10,406	6,110	4,119	3,002
2009	22,554	31,003	13,637	10,869	10,426	9,885	5,777	3,986	3,993
2010	15,747	19,453	10,560	6,306	8,735	6,423	4,092	2,749	3,101
2011	13,441	16,322	10,615	5,857	9,261	5,554	3,674	3,072	3,527
2012	9,424	11,209	8,786	4,400	7,143	4,296	2,726	2,062	3,157
2013	10,896	12,365	8,781	5,424	7,597	4,872	2,664	2,262	3,608
2014	11,138	10,243	7,137	5,074	5,664	4,372	2,467	1,979	2,691
2015	14,163	12,026	7,420	6,074	5,889	4,848	2,279	1,914	2,812
2016	13,124	9,934	5,022	6,176	5,179	3,439	1,781	1,677	2,115
2017	16,467	10,690	4,893	8,163	5,617	3,600	1,846	1,681	2,108
2018	14,506	9,032	4,057	7,901	4,734	3,112	1,597	1,522	1,798
2019	8,731	5,908	2,789	5,742	2,946	1,981	1,108	941	1,095
2020	13,687	7,285	2,709	8,837	3,441	2,195	1,260	1,143	1,250
Grand Total	276,244	251,145	133,385	123,999	107,486	95,931	56,908	41,241	39,702

Source: Authors' own calculations using HECM data

APPENDIX B. TECHNICAL NOTE ON ANALYSIS OF HECM POLICY CHANGES

This technical appendix provides a detailed discussion of the analysis for each policy change.

REGRESSION ANALYSIS

The key independent policy change variable affects the linear or logit regressions in the model performance outcomes—such as, loan balances and defaults as dependent variables—plus, additional independent variables—such as, sociodemographic and economic factors—also affect performance outcomes.[23] Including these other factors in the regression model serves to isolate the impact of the policy variable, which is the focus of this analysis, and reduces potential bias in the estimate of the effect. The general structure of the regression model is—

$$Y = \beta_0 + \beta_K X_K + \beta_{C1} X_{C1} + \beta_{C2} X_{C2} + \beta_{C3} X_{C3} + \ldots + \beta_{CJ} X_{CJ} + \beta_T T + \beta_{KT}(X_K * T) + \varepsilon,$$

Where—

- Y is the performance outcome dependent variable.
- β_0 is the intercept term.
- X_K is the key independent policy change variable.
- β_K is the effect of the key policy change variable on Y.
- The remaining X variables (X_{C1} to X_{CJ}) are the sociodemographic (that is, control) independent variables included to isolate the key policy change effect, β_K.
- The remaining β estimates (β_{C1} to β_{CJ}) are the effects of these control variables on Y.
- T represents a time trend variable, and β_T is the effect of the time trend on Y.
- X_K * T is an example of an interaction term—in this instance, the interaction of the key policy change variable with time.
- βKT is the effect of that interaction on Y.
- ε is the error term.

This standard regression model serves as the basis for the analysis of the effect of the policy changes by estimating the direction and magnitude of β_K separately from the effect of other factors. It also enables the researchers to evaluate the significance of the estimate of β_K using standard statistical tests.

Exhibit B-1 summarizes the performance outcomes (dependent variables), loan populations, and data ranges (time periods) for the linear regression models for each of the first five research questions that analyze the seven policy changes.

Exhibit B-1. Summary of Linear Regression Models for Research Questions

Policy Change	Outcome	Loan Population	Date Range of Loan Originations
Four reductions of principal limit factor and restriction on first year draws	Demand	All endorsed	October 2007 to September 2019
	Unscheduled draws	All endorsed	
	Net gain	Terminated	
	Default or not	All endorsed	April 2013 to March 2017
	Unscheduled draw or not	All endorsed	

[23] Linear regression is appropriate when the dependent variable is continuous (that is, has a wide range of possible values); logit regression is appropriate when the dependent variable is dichotomous (that is, has only two values). This approach follows in the footsteps of Lambie-Hanson and Moulton (2020).

Policy Change	Outcome	Loan Population	Date Range of Loan Originations
Introduction of Life Expectancy Set-Aside and underwriting requirement	Net gain	Terminated	
Change in treatment of loans with nonborrowing spouses	Net loss	Terminated	August 2012 to September 2016
	Proportion with co-borrower	All endorsed	
	Duration	Terminated	
Requirement for second appraisal to deter overappraisals	Net loss	Terminated	October 2016 to September 2020
	Duration	Terminated	
	Appraised value	All endorsed	
Incentives to procure tax services	Default rate	All endorsed	October 2014 to September 2018

For each rule change in exhibit B-1, the researchers selected date ranges for the sample population based on the following criteria.

Sufficient to gauge the effect of the policy change while reducing overlap with other policy changes.

Symmetrical around the date when the policy change went into effect. For example, the change in treatment of loans with nonborrowing spouses went into effect in August 2014, so the range is from July 2012 to August 2016. Given the timing between policy changes, the ranges cover the period from approximately 2 years before to 2 years after the policy change using the endorsement date of a loan.[24]

Apply to when the loans originated. Terminated loans are loans that were originated (that is, had Home Equity Conversion Mortgage [HECM] case numbers assigned) within the sample date range but then terminated any time up to fiscal year 2020. To control for "strategic borrowing," the researchers exclude loans made within several weeks before or after the policy change.[25]

The selection of performance outcomes for each study was based on the understanding of how the policy change affects borrower or lender behavior and, when relevant, the implications for the Federal Housing Administration's Mutual Mortgage Insurance Fund.

Limiting the analysis to terminated loans is a practical limitation of this approach, which focuses on measuring actual effects rather than modeling future effects.[26] The downside of this approach is that it provides only a partial assessment of policy effects, because these effects are expected

[24] Researchers chose the loan's endorsement date rather than the case assignment date due to data limitations for the latter. Although policy changes are applied to loans after assigning the case numbers, more than 600,000 of the 1.1 million new loans issued during the period that the analysis covered did not have case number assignment dates in the hermit case detail data table, whereas endorsement dates were populated for every loan. Using the case number assignment date reduces the population of loans in the analysis by about one-half. To adjust for the timing difference between case number assignment and loan endorsement, researchers excluded loans originated within 4 months of the policy change.

[25] "Through its mortgagee letters, HUD notifies the public weeks (and in some cases months) before policies take effect, making it possible for lenders and borrowers to "game" the changes, either being sure to secure a case number assignment before a policy takes effect or, if the policy change is advantageous to borrowers, delay receiving a case number until after the policy is effective" (Lambie-Hanson and Moulton, 2020: 13).

[26] This analysis treats a HECM loan that is refinanced as terminated. Secretary-held loans under claim type 22 are not counted as terminated in this analysis, unless they were disposed of through a note sale or a foreclosure and real estate owned sale.

to affect active loans in the future. This analysis addresses the limitation of truncated data by presenting and discussing evidence to support the case for longer-term effects.

MODEL CONSTRUCTION

This study presents seven distinct policy change analyses—the first and second principal limit factor (PLF) reductions, the third PLF reduction with the first year draw restriction, the fourth PLF reduction, the introduction of financial assessments with a Life Expectancy Set-Aside (LESA), the treatment of loans with nonborrowing spouses, the second appraisal requirement, and the tax-procurement incentives—which in total involve 19 separate models.[27] The outcomes that these policy changes affect are the dependent variables in these 19 models—specifically, net gain (5), duration (2), demand (3), default or not (2), unscheduled draw or not (4), refinanced or not (1), proportion with a co-borrower (1), and overappraisal (1).

These models have some common characteristics. All dollar values for dependent variables, like net gain and appraised value per square foot, and the controls are indexed to 2020 dollars. The three PLF demand models and the co-borrower model are month-level analyses, each with a *4-year* window on either side of the policy change, effectively doubling the sample size from that of a 2-year window. The other 15 models are analyzed at the loan level, each with the aforementioned *2-year* window on either side of the policy change.[28] To prevent estimates being distorted by adverse incentives at the time of the policy change, *all* models have 4 months to either side of the policy change removed. Consequently, for the 15 loan-level models, it means loans originating from 24 months to within 4 months *before* the policy change are compared with loans originating 4 months to 24 months *after* the policy change (for the month-level models, these parameters are 4 and 48).

The population for the 7 net-gain and duration models are *terminated* loans only, whereas the population for the other 12 models are all *endorsed* loans. The 7 models with a 0-1 outcome for the dependent variable—default or not, unscheduled draw or not, refinance or not—are logistic regressions, whereas the other 12—net gain, duration, demand, percentage co-borrower, and overappraisal—are run as ordinary least squares (OLS).

The sets of controls are common across models. The month-level demand and co-borrower models have the same set of 10 controls—the percentage of women (gender), Black (race),

[27] Exhibit B-1 presents these 19 models in that the demand, unscheduled-draw, and net-gain models for the three analyses involving PLF reductions comprise 9 of these models, and the remaining 10 rows of the table comprise the other 10.

[28] Researchers considered but opted not to use survival analysis for this study for several reasons. First, the models were designed to isolate policy changes by comparing results before and after the policy was implemented. For example, although duration models were the best candidate for using survival analysis, because the dependent variable was loan length, those models were designed to compare the before and after periods. Second, some of the outcomes of interest, such as the effect on actual net gains or losses as the dependent variable, limited the analysis to terminated loans, because actual net gains or losses could not be estimated for active loans. Third, the HECM demand models used an aggregate measure of monthly loan volume as the dependent variable. In lieu of using survival analysis, the models used to analyze the effects of policy changes included the age of each loan or the average age of loans issued in a given month as control variables. These "loan age" variables served to control for age-related attrition that might have occurred during the study period. In addition, the analysis excluded all loans issued before the policy change that exceeded the maximum duration of loans issued after the policy change.

Hispanic (ethnicity), and married for the month; the average borrower age, PLF, property value, and interest rate for the month; and the consumer sentiment index and a time trend.[29]

All loan-level models have 15 control variables—

- Gender (woman or not).
- Race (Black or not).
- Ethnicity (Hispanic or not).
- Marital status.
- Geography (for each of Florida, Texas, and California or not).
- Loan type (line-of-credit loan or not).
- Borrower's age.
- Loan's interest rate, which may include the lender's margin if the interest rate is adjustable.
- Loan's PLF.
- Property value.
- Square of the property value (to account for a possible nonlinear effect—for example, increasing but at a decreasing rate at higher property values).
- Consumer sentiment index each month (to account for the macroeconomic conditions).
- Time trend.

For the two types of loan-level models that use only terminated loans, the *duration* models include a control for home price appreciation, and the *net-gain* models include both that home price-appreciation control and one for duration (to control for loan length).

In addition to the key policy change variable, *all* loan-level equations include three interactions of the policy change with gender (policy change indicator times women-or-not indicator), race (policy change indicator times Black-or-not-indicator), and ethnicity (policy change indicator times Hispanic-or-not indicator). For each group, the policy change effect for the group will be the overall policy change effect of the key policy change variable plus the group's interaction-term effect, which could be negative, in which case it is effectively subtracted from the overall effect.

In addition to these 19 distinct analyses, three additional analyses do not directly involve a policy change indicator (and interactions) but instead include a factor that a policy change may affect as the key variable. These additional models are—

- A refinance affects net gain—where the change in treatment of loans of nonborrowing spouses may affect refinance.
- Appraisal bias affects net gain—where the second appraisal requirement may affect appraisal bias.
- An unscheduled draw affects default—through which PLF reductions and the introduction of financial assessment and LESA may affect unscheduled draws.

Three analyses have no windows. The two net-gain OLS models terminated loans originating from 2005 to 2020 and include the 15 controls, plus home price appreciation and duration. The

[29] Percentage of those married (percent married) is not included as a control in the co-borrower model, given it serves as the dependent variable.

default (or not) logistic model uses all endorsed loans originating from 2005 through 2020 and includes the 15 controls.

The following sections discuss modeling, rationale, and results of these 22 econometric models, which inform on the effect of each of the seven distinct policy change events.

SPILLOVER EFFECTS

Exhibit B-1 illustrates the close timing of many of the rule changes. Isolating the effect of individual policy changes can be challenging when multiple rule changes occur in quick succession due to possible spillover effects. From 2013 to 2018, one rule change was introduced each year. Possible spillover effects are most likely to affect the net gain or loss rule-change impact metric because that metric measures the effect of all rule changes. No other impact metrics in this analysis had significant rule-change overlaps.

To consider the possible impact of spillover effects on this analysis, this study examines three hypothetical rule changes (A, B, and C) that were introduced 1 year apart and used the same metric to measure impact based on comparing this metric 2 years before and 2 years after the rule change. In this example, the 2-year *after* period for rule change B overlaps by 1 year with the *before* period and by 1 year with the *after* period of rule change C. Rule change B's spillover effects on rule change C tend to cancel out if the effect is constant for 2 years. If rule change B's effect tends to dissipate over time, however, the net-gain benefits of rule change C tend to be underestimated due to the overlapping periods.[30]

The 2-year *after* period of rule change A overlaps with the 2-year *before* period of rule change C.[31] If the effect of rule change A spills over into the *before* period of rule change C, the analysis will not isolate the effect of rule change C. This outcome occurs because the effect of rule change A increases the net gain or loss measured in rule change C's *before* period more than in its *after* period. As a result, the net gain or loss effect of rule change C could be underestimated.

These two scenarios describe the most likely cases of spillover effects that complicate the analysis of the impact of individual rule changes. The conclusion is that any spillover effects will likely not result in an *over*estimation of net gains from rule changes in the aggregate, but they could result in *under*estimation of effects. The estimated effects of net gain or loss for rule changes in the HECM program should be viewed as lower bounds of the estimated impact.

ANALYSIS OF FIRST AND SECOND PLF REDUCTIONS WITHOUT RESTRICTIONS ON FIRST YEAR DRAWS

HUD reduced the PLF for HECM loans in several stages. Some PLF reductions coincided with restrictions on first year draws, whereas others did not. The first policy impact analysis estimated the effect of the first and second PLF reductions—which did not coincide with restrictions on first year draws—on the demand for HECM loans, the likelihood of unscheduled draws, and net gains to the program. The first PLF reduction occurred in October 2009 and the second in October 2010. June 2009 is 4 months before the first reduction, and January 2011 is 4 months after the second reduction, so the 20 months from June 2009 through January 2011 are removed from the analysis. Given the 4-year (to either side) window for the demand model, the 44 months

[30] The contrary case of the effect amplifying over time is possible but unlikely.

[31] The overlap does not include 4 months after rule change A is introduced and 4 months before rule change C is introduced, because those two 4-month periods are excluded from the analysis.

from October 2005 through May 2009 before the first reduction and the 44 months from February 2011 through September 2014 after the second reduction comprise the 88 months of observations for the demand model. Given the 2-year window for the unscheduled-draw and net-gain models, loans originating in the 20 months from October 2007 through May 2009 are compared with those originating in the 20 months from February 2011 through September 2012.

Demand Model

First, it is important to find whether the first and second PLF reductions had the effect of reducing the demand for HECM loans, even if that may not have been the stated intent of the policy. The model isolates the policy change effect on demand by controlling for demographic and economic factors.

The dependent variable in the demand model is the number of HECM loans originating in a month. The 10 controls are those monthly percentages for demographic factors (women, Black, Hispanic, married) and averages for economic and other factors (age, PLF, property value, interest rate) delineated previously. The demographic factors were selected based on the analysis of borrower characteristics, which revealed differences in the percentage of borrowers taking out HECM loans for these factors. Economic factors were selected based on the prior expectation that these factors directly affect the loan amount for which a borrower qualifies and, therefore, the borrower's calculation of the relative cost or benefit of taking out the loan.

The controls are meant to capture demographic effects (for example, gender, race, ethnicity, marriage, age) and macrolevel effects (for example, average property value, interest rates, consumer sentiment index) to isolate the policy change effects. A priori, it was not clear what the effects of some of these controls would be on demand, although it was important to control for them. This HECM loan demand model did not include other control factors that past analyses had used, such as lender fees, mobility considerations (moving costs versus gains from moving), liquidity preferences, and expected home price appreciation or depreciation) (Davidoff, 2012; Davidoff and Wetzel 2013; Nakajima, 2012). These data for the other control factors were not readily available for use in this loan demand model. However, it does not seem likely that these other factors that other researchers used would be correlated with the key independent (0-1 indicator) policy variable in this analysis. The key policy variable measures whether a HECM policy change was in effect at loan origination. Consequently, excluding these other control factors is not likely to bias the estimate of the potential effect of a policy change on loan demand, which is the purpose of the models used in this analysis.

The key (independent) variable in the loan demand model is a 0-1 indicator set equal to 1 if the month was 4 months after the second PLF reduction, or set equal to 0 if the month was 4 months before the first PLF reduction. Exhibit B-2 presents the result of the demand model for the first and second PLF reductions.

Exhibit B-2. Results of the Demand Model for the First and Second Principal Limit Factor Reductions (Ordinary Least Square)

Independent Variable	Estimate	p-Value
Intercept	– 36,890	0.59
% Women	10,955	0.12
% Black	65,567	< 0.00
% Hispanic	26,798	0.12
% Married	17,036	0.27
Average principal limit factor	– 45	0.76

Independent Variable	Estimate	p-Value
Average age	206	0.81
Average appraised property value for endorsed HECMs	2,030	0.10
Average interest rate	640	0.02
Consumer sentiment index	– 42	0.05
Time trend	85	< 0.00
Policy changes	– 4,781	0.00
Sample size	88 months	
Adjusted R-squared	0.72	
Dependent variable	Loans in a month	
Unit of the estimate	Loans per month	

HECM = Home Equity Conversion Mortgage.

Variables that are statistically significant at the 10-percent level are highlighted in yellow. Note that the percent-Women and percent-Hispanic variables are significant at the 12-percent level, which is just above the cutoff of 10 percent, so those two controls should be viewed in that context.

The key variable in the model is the policy change indicator, which is highly statistically significant (at the 1/100th of the 1-percent level), controlling for these demographic, economic, and loan-average factors. The estimated coefficient of -4,781 indicates a reduction in demand of 4,781 loans per month after the second PLF reduction went into effect compared with before the first one. To provide context for this estimate, the average number of loans per month in the 48 months prior to the first PLF reduction—October 2005 through September 2009—was 9,274. Consequently, 4,781 is a sizable reduction in demand associated with the first and second PLF reductions.

UNSCHEDULED-DRAW MODEL

It is next important to find whether the first and second PLF reductions had the intended effect of reducing unscheduled draws. This model isolates the policy change effect on unscheduled draws by controlling for demographic and economic factors.

The dependent variable in the loan-level logistic unscheduled-draw model is a 0-1 indicator variable, set equal to 1 if the borrower made unscheduled draws totaling at least $1,000 in the first 5 years of the loan. This scenario constituted approximately 2.1 percent of the population (8,137 of 390,129 loans) from October 2007 through September 2012, removing loans from the 20 months from June 2009 through January 2011.

The key (independent) variable is a 0-1 indicator for whether the loan originated 4 months after the second PLF reduction (equal to 1) or 4 months before the first PLF reduction (equal to 0). The interaction terms of this policy indicator with gender, race, and ethnicity are also key parameters. Exhibit B-3 presents the results of the unscheduled-draw model for the first and second PLF reductions. This model includes many of the same controls discussed about the prior model, plus selected states.[32] Variables that are statistically significant at the 10-percent level are highlighted in yellow.

[32] Separate variables for each state were deemed unnecessary, because most states would likely be similar to one another, and controlling for each state would reduce the model's degrees of freedom. The researchers chose to control for California (a high-home-value state) and Texas (a low-home-value state), because they are large states on opposite sides of the home-value spectrum, and for Florida, because it is a large state with a high proportion of

Exhibit B-3. Results of the Unscheduled-Draw Model for the First and Second Principal Limit Factor Reductions (Logistic)

Independent Variable	Estimate	p-Value	Odds Ratio
Intercept	– 4.864	< 0.0001	
Woman	– 0.130	< 0.0001	0.878
Black	0.863	< 0.0001	2.370
Hispanic	0.540	< 0.0001	1.716
Married	– 0.633	< 0.0001	0.531
California	– 0.482	< 0.0001	0.617
Florida	0.738	< 0.0001	2.092
Texas	0.178	0.0002	1.195
Line-of-credit loan	0.101	0.0337	1.106
Borrower age	0.004	0.1622	1.004
Interest rate	– 0.011	0.3774	0.989
Property value ($100,000s)	0.364	< 0.0001	1.438
Property value squared	– 0.022	< 0.0001	0.978
Time trend	0.484	< 0.0001	1.622
Consumer sentiment	– 0.011	< 0.0001	0.989
Principal limit factor for the loan	– 0.009	0.0043	0.991
Policy changes	– 0.778	< 0.0001	**0.459**
Woman * Policy	0.034	0.4692	1.034
Black * Policy	– 0.251	< 0.0001	0.778
Hispanic * Policy	0.156	0.0303	1.168
Sample size	390,125		
Dependent variable	Unscheduled draw or not		

Note: Significant variables are bolded.

The estimate indicates the direction of the effect, the p-value its statistical significance, and the odds-ratio its magnitude. The statistically significant positive signs for women, Black, and Hispanic borrowers mean that with all else controlled for, including the policy change, these groups are more likely to make unscheduled draws of at least $1,000 within 5 years.[33] The negative sign for the policy change variable means unscheduled draws became less likely after the policy change. The odds ratios provide estimates of the magnitude of these effects.

The interpretation of the odds-ratio estimate is that for the average loan,[34] a one-unit increase in the independent variable (or, for indicator variables, the increase from 0 to 1) changes the probability of an unscheduled draw *by a percentage* that is equal to the difference between the odds ratio and 1 (that is, the odds ratio minus 1).[35]

Specifically, the first and second PLF reduction policy change odds-ratio estimate of 0.459, which is highly statistically significant, means that average likelihood of an unscheduled draw is reduced an estimated 54 percent (-54.1 = 0.459 – 1.000) after the policy went into effect. It means that if the likelihood of an unscheduled draw was originally 10 percent, it would be

retirees, which is the target market for reverse mortgages. In general, the researchers tried to keep the controls consistent across all various models.

[33] The researchers included these borrower race or ethnicity variables to estimate whether the policy change had any social equity effects.

[34] That is, a loan with the average borrower age average property value, percent women, percent Black, percent Hispanic, percent from California, and so on.

[35] Consequently, increases in likelihood (positive effects) are associated with odds-ratio estimates greater than 1 and reductions in likelihood (negative effects) with ones less than 1 (odds-ratio estimates close to 1 tend to be statistically insignificant).

approximately 4.59 percent after the policy change, which can be viewed as either 46 percent of the original 10 percent or a 54-percent reduction from 10 percent. If the likelihood were 2 percent, then after the policy change, it would be 0.92 percent (46 percent of the original 2 percent, or a 54-percent reduction from 2 percent).

The interpretation of the odds-ratio estimate for the policy interaction with race (Black times Policy) of 0.778 is that, in addition to the policy change effect of 53 percent on the likelihood of an unscheduled draw, the likelihood for a Black borrower is reduced an additional 22 percent (0.222 = 0.778 – 1.000) after the policy change. That further reduces the 10- to 4.59-percent example to 3.55 percent, which is 78 percent of 4.59 percent. The odds ratio for the policy interaction with ethnicity (Hispanic * Policy) of 1.168 means that on top of the straight policy change, Hispanic borrowers see the likelihood of an unscheduled draw *increase* almost 17 percent (16.8). Here, the 10- to 4.59-percent example then increases to 5.36 percent, which is 16.8 percent more than 4.59 percent. The policy interaction with gender did *not* result in a statistically significant estimate.

NET-GAIN MODEL

Finally, the bottom line is to estimate whether these PLF reductions acted to reduce net losses (increase net gains) to the program. The model isolates the policy change effect on net gains by controlling for demographic and economic factors.

The loan population for this analysis consists of terminated loans only, because net gain can only be determined after loan termination. In addition to the 15 controls delineated previously and applied in the unscheduled-draw model using all endorsed loans, the terminated loan population for this model means that duration and home price appreciation can only be included as controls. Given that duration has a negative effect on net gains, it is an important control in a model isolating the effect of the policy change on net gains.

The dependent variable in this loan-level OLS model is a dollar value of the net gain from each loan. As with the unscheduled draw model, the key (independent) variable is a 0-1 indicator for whether the loan originated 4 months before the first PLF reduction (equal to 0) or 4 months after the second PLF reduction (equal to 1). The interaction terms of this policy indicator—with gender, race, and ethnicity—are also key parameters. Exhibit B-4 presents the results of the net-gain model for the first and second PLF reductions. Variables that are statistically significant at the 10-percent level are highlighted in yellow.

Exhibit B-4. Results of the Net-Gain Model for the First and Second Principal Limit Factor Reductions (Ordinary Least Square)

Independent Variable	Estimate	p-Value
Intercept	30,682.00	< 0.0001
Woman	4,744.46	< 0.0001
Black	– 23,465.00	< 0.0001
Hispanic	– 8,320.50	< 0.0001
Married	10,590.00	< 0.0001
California	– 3,885.71	< 0.0001
Florida	– 16,965.00	< 0.0001
Texas	3,683.26	< 0.0001
Line-of-credit loan	– 21,651.00	< 0.0001
Borrower age	– 733.33	< 0.0001
Interest rate	– 4,426.60	< 0.0001
Property value ($100,000s)	3,899.46	< 0.0001

Independent Variable	Estimate	p-Value
Property value squared	– 36.96	< 0.0001
Home price appreciation	1,081.22	< 0.0001
Time trend	– 10,626.00	< 0.0001
Consumer sentiment	475.47	< 0.0001
Principal limit factor for the loan	– 725.72	< 0.0001
Duration	– 656.64	< 0.0001
Policy changes	14,657.00	< 0.0001
Woman * Policy	413.06	0.4701
Black * Policy	19,522.00	< 0.0001
Hispanic * Policy	8,744.77	< 0.0001
Sample size	184,182	
Adjusted R-squared	0.32	
Dependent variable	$ net gain for a loan	
Unit of the estimate	$ per loan	

The key variable (the policy change indicator) is highly statistically significant, controlling for demographic and economic factors. The estimated coefficient of 14,657 indicates that net losses after the second PLF reduction went into effect (compared with before the first one did) were reduced by $14,657 per loan.

Further, this estimated reduction in losses due to the policy change was highest for loans of Black and Hispanic borrowers. After the policy change, losses per loan were reduced by an additional $19,522 for Black borrowers and $8,745 for Hispanic borrowers. The gender and policy interactions were insignificant.

Summary

These models suggest that the first and second PLF reductions were associated with reduced demand for HECM loans, lower likelihood of an unscheduled draw, and lower net losses to the program.

Analysis of Third PLF Reduction With Restriction on First Year Draws

The second analysis estimated the effect of the third PLF reduction and the coincidental restriction on first year draws—which occurred simultaneously in October of 2013—on the demand for HECM loans, the likelihood of unscheduled draws, and net gains to the program. June 2013 is 4 months before this particular reduction and restriction went into effect, and January 2014 is 4 months after it, so the 8 months from June 2013 to January 2014 are removed from the analysis. Given the 4-year window for the demand model, the 44 months from October 2009 through May 2013 before the reduction and restriction and the 44 months from February 2014 through September 2018 comprise the 88 months of observations for the demand model. Given the 2-year window for the unscheduled-draw and net-gain models, loans originating in the 20 months from October 2011 through May 2013 are compared with those originating in the 20 months from February 2014 through September 2015. Exhibits B-5, B-6, and B-7 consecutively present the results of the three models. Variables that are statistically significant at the 10-percent level are highlighted in yellow.

Exhibit B-5. Results of the Demand Model for the Third Principal Limit Factor Reduction With the Restriction on First Year Draws (Ordinary Least Square)

Independent Variable	Estimate	p-Value
Intercept	51,739.00	0.0118
% Women	8,040.85	0.0267

Independent Variable	Estimate	p-Value
% Black	5,562.51	0.5027
% Hispanic	– 22,816.00	0.0364
% Married	8,079.88	0.2134
Average principal limit factor	19.37	0.7584
Average age	– 928.04	0.0023
Average property value	5,491.83	< 0.0001
Average interest rate	– 564.58	0.0833
Consumer sentiment index	31.13	0.0279
Time trend	– 62.55	< 0.0001
Policy changes	– 945.55	0.3678
Sample size	88 months	
Adjusted R-squared	0.77	
Dependent variable	Loans in a month	
Unit of the estimate	Loans per month	

Exhibit B-6. Results of the Unscheduled-Draw Model for the Third Principal Limit Factor Reduction With the Restriction on First Year Draws (Logistic)

Independent Variable	Estimate	p-Value	Odds Ratio
Intercept	– 3.240	< 0.0001	
Woman	– 0.060	0.134	0.942
Black	0.580	< 0.0001	1.787
Hispanic	0.917	< 0.0001	2.502
Married	– 0.534	< 0.0001	0.586
California	– 0.243	< 0.0001	0.785
Florida	0.560	< 0.0001	1.751
Texas	0.136	0.0014	1.146
Line-of-credit loan	0.274	< 0.0001	1.315
Borrower age	– 0.000	0.8526	1.000
Interest rate	– 0.379	< 0.0001	0.684
Property value ($100,000s)	0.152	< 0.0001	1.164
Property value squared	– 0.004	< 0.0001	0.996
Time trend	– 0.156	< 0.0001	0.856
Consumer sentiment	0.026	< 0.0001	1.026
Principal limit factor for the loan	– 0.013	< 0.0001	0.987
Policy changes	0.367	< 0.0001	1.444
Woman * Policy	0.123	0.0099	1.131
Black * Policy	– 0.127	0.0504	0.881
Hispanic * Policy	– 0.393	< 0.0001	0.675
Sample size	170,257		
Dependent variable	Unscheduled draw or not		

Exhibit B-7. Results of the Net Gain Model for the Third Principal Limit Factor Reduction with the Restriction on First Year Draws (Ordinary Least Square)

Independent Variable	Estimate	p-Value
Intercept	– 30,858.00	< 0.0001
Woman	1,626.39	< 0.0001
Black	– 7,633.63	< 0.0001
Hispanic	1,339.34	0.0252
Married	1,694.73	< 0.0001
California	2,025.82	< 0.0001
Florida	– 2,936.73	< 0.0001
Texas	1,106.28	0.0028

Independent Variable	Estimate	p-Value
Line-of-credit loan	– 808.83	0.0282
Borrower age	– 262.01	< 0.0001
Interest rate	– 2,222.76	< 0.0001
Property value ($100,000s)	2,740.39	< 0.0001
Property value squared	– 45.45	< 0.0001
Home price appreciation	532.47	< 0.0001
Time trend	2,464.21	< 0.0001
Consumer sentiment	– 3.51	0.8748
Principal limit factor for the loan	9.66	0.6861
Duration	– 391.31	< 0.0001
Policy changes	– 3,406.03	< 0.0001
Woman * Policy	– 849.31	0.0209
Black * Policy	7,672.90	< 0.0001
Hispanic * Policy	– 666.69	0.4024
Sample size	61,114	
Adjusted R-squared	0.21	
Dependent variable	$ net gain for a loan	
Unit of the estimate	$ per loan	

SUMMARY

Unlike the analyses of the first and second PLF reductions, the demand, unscheduled draw, and net-gain models were unable to detect any beneficial effect that could be attributed to this simultaneous reduction and restriction. These statistically *in*significant results, or results that are significant but in the opposite direction from what was expected, should be interpreted in the context of the relative success of the first and second PLF reductions in reducing demand, unscheduled draws, and net losses.

The sample sizes (population) for the loan-level models were 390,125 (endorsed loans for the unscheduled-draw model) and 184,182 (terminated loans for the net-gain model) for the first and second PLF reductions compared with 170,257 and 61,114 for the third PLF reduction and the first year draw restriction—although both encompassed 20 months to either side of their respective policy changes and further overlapped for the 12 months from October 2011, when the before window for the third reduction and restriction began, through September 2012, when the after window for the first and second reductions ended. Specifically, the first and second reductions may have helped remove so many potentially marginal loans from the population that models could not detect any beneficial effects due to the third reduction and drawdown restriction.

ANALYSIS OF FOURTH PLF REDUCTION WITHOUT RESTRICTIONS ON FIRST YEAR DRAWS

The third analysis estimated the effect of the fourth and final PLF reduction, which occurred in October of 2017 and did not coincide on restrictions on first year draws, on the demand for HECM loans, the likelihood of unscheduled draws, and on net gains to the program. June 2017 is 4 months before this reduction went into effect, and January 2018 is 4 months after it; the 8 months from June 2017 to January 2018 are removed from the analysis. The 44 months from October 2013 to May 2017 before the fourth reduction and the 32 months from February 2018 to September 2020 after it comprise the 76 months of observations for the demand model.[36] Given

[36] The after window ends after 3 years, given that the policy change was in October 2017 and the most recent available data are from September 2020.

the 2-year window for the unscheduled-draw and net-gain models, loans originating in the 20 months from October 2015 to May 2017 are compared with those originating in the 20 months from February 2018 to September 2019.

Given that no PLF reductions were in the 4 years prior to this one (the previous reduction was in October 2013) and only one other in the previous 7 years (October 2010), the models for the unscheduled draws and net gain were able to detect statistically significant beneficial effects associated with this fourth reduction.

However, the demand model detected no effects, possibly because its after window was limited to 3 years. Exhibit B-8 presents the results of the demand model. Variables that are statistically significant at the 10-percent level are highlighted in yellow.

Exhibit B-8. Results of the Demand Model for the Fourth Principal Limit Factor Reduction (Ordinary Least Square)

Independent Variable	Estimate	p-Value
Intercept	22,966	0.3698
% Women	– 2,401	0.6759
% Black	– 10,538	0.4279
% Hispanic	– 5,067	0.7343
% Married	– 11,956	0.1261
Average principal limit factor	80	0.1825
Average age	– 321	0.3611
Average property value	2,041	0.0240
Average interest rate	– 304	0.2569
Consumer sentiment index	32	0.0278
Time trend	– 39	0.0371
Policy changes	– 517	0.3993
Sample size	76 months	
Adjusted R-squared	0.56	
Dependent variable	Loans in a month	
Unit of the estimate	Loans per month	

Few of the controls are statistically significant, and neither is the key policy change variable. It is probably a case in which the sample size was insufficient to detect a significant effect.

UNSCHEDULED-DRAW MODEL

It is important to find whether the fourth PLF reduction had the intended effect of reducing unscheduled draws. The model isolates the policy change effect on unscheduled draws by controlling for demographic and economic factors.

The dependent variable in the loan-level logistic unscheduled-draw model is a 0-1 indicator variable, set equal to 1 if the borrower made unscheduled draws totaling at least $1,000 in the first 5 years of the loan. This scenario constituted approximately 4.2 percent of the population (5,547 of 132,696 loans) from October 2015 through September 2019, removing loans from the 8 months between June 2017 and January 2018.

The key (independent) variable is a 0-1 indicator for whether the loan originated 4 months after the second PLF reduction (equal to 1) or 4 months before the first PLF reduction (equal to 0). The interaction terms of this policy indicator with gender, race, and ethnicity are also key parameters. Exhibit B-9 presents the results of the unscheduled-draw model for the fourth PLF

reduction. Variables that are statistically significant at the 10-percent level are highlighted in yellow.

Exhibit B-9. Results of the Unscheduled-Draw Model for the Fourth Principal Limit Factor Reduction (Logistic)

Independent Variable	Estimate	p-Value	Odds Ratio
Intercept	– 4.4645	< 0.0001	
Woman	0.0048	0.8864	1.005
Black	0.4273	< 0.0001	1.533
Hispanic	0.2661	< 0.0001	1.305
Married	– 0.4083	< 0.0001	0.665
California	– 0.0037	0.9231	0.996
Florida	0.5643	< 0.0001	1.758
Texas	0.3721	< 0.0001	1.451
Line-of-credit loan	0.5042	< 0.0001	1.656
Borrower age	0.0303	< 0.0001	1.031
Interest rate	– 0.1696	< 0.0001	0.844
Property value ($100,000s)	0.1423	< 0.0001	1.153
Property value squared	– 0.0062	< 0.0001	0.994
Time trend	– 0.1883	< 0.0001	0.828
Consumer sentiment	0.0129	0.0124	1.013
Principal limit factor for the loan	– 0.0276	< 0.0001	0.973
Policy changes	– 0.9007	< 0.0001	0.406
Woman * Policy	0.0846	0.2191	1.088
Black * Policy	– 0.0307	0.7832	0.970
Hispanic * Policy	0.2780	0.0227	1.321
Sample size	132,696		
Dependent variable	Unscheduled draw or not		

As discussed, the estimate indicates the direction of the effect, the p-value its statistical significance, and the odds-ratio its magnitude. The odds-ratio interpretation being that for the average loan, a one-unit increase in the independent variable (or, for indicator variables, the increase from 0 to 1) changes the probability of an unscheduled draw *by a percentage* that equals the odds ratio minus 1.

Specifically, the fourth PLF reduction policy change odds-ratio estimate of 0.382, which is highly statistically significant, means that the average likelihood of an unscheduled draw is estimated to be reduced 59 percent (-0.594 = 0.406 – 1.000) after the policy went into effect. It means that if the likelihood of an unscheduled draw were 10 percent, then after the policy change it would be 4.06 percent, which can be viewed as either 41 percent of the original 10 percent, or a 59-percent reduction from 10 percent. If the original likelihood were 4 percent, then after the policy change, it would be 1.6 percent, which is 41 percent of 4 percent, or a 59-percent reduction from 4 percent.

The gender and race interaction terms were insignificant, whereas the ethnicity interaction was significant at the 5-percent level—meaning that on top of the straight policy change reduction, Hispanic borrowers see the likelihood of an unscheduled draw *increase* 32 percent (1.321). Here, the original 10 to 4.06 percent increases to 5.36 percent, which is 32.1 percent more than 4.06.

NET-GAIN MODEL

Ultimate interest is in whether the fourth PLF reduction acted to reduce net losses (increase net gains) to the program. The model isolates the policy change effect on net gains by controlling for demographic and economic factors.

The loan population for this analysis are terminated loans only, because the net gain for a loan can only be determined after termination. In addition to the 15 controls delineated previously and applied in the unscheduled-draw model using all endorsed loans, the terminated loan population for this model means that duration and home price appreciation can only be included as controls. Given that duration has a negative effect on net gains, it is an important control in a model that is isolating the effect of the policy change on net gains.

The dependent variable in this loan-level OLS model is the dollar value of the net gain from each loan. Exhibit B-10 presents the results of model for the fourth reductions. Variables that are statistically significant at the 10-percent level are highlighted in yellow.

Exhibit B-10. Results of the Net-Gain Model for the Fourth Principal Limit Factor Reductions (Ordinary Least Square)

Independent Variable	Estimate	p-Value
Intercept	– 5,982	0.0006
Woman	– 140	0.1863
Black	453	0.0123
Hispanic	980	< 0.0001
Married	709	< 0.0001
California	2,399	< 0.0001
Florida	– 687	< 0.0001
Texas	– 714	0.0001
Line-of-credit loan	82	0.5349
Borrower age	– 169	< 0.0001
Interest rate	1,065	< 0.0001
Property value ($100,000s)	1,547	< 0.0001
Property value squared	– 25	< 0.0001
Home price appreciation	64	< 0.0001
Time trend	21	0.8431
Consumer sentiment	– 31	0.0504
Principal limit factor for the loan	138	< 0.0001
Duration	131	< 0.0001
Policy changes	1,730	< 0.0001
Woman * Policy	33	0.8619
Black * Policy	– 1,178	0.0012
Hispanic * Policy	– 1,602	< 0.0001
Sample size	27,721	
Adjusted R-squared	0.30	
Dependent variable	$ net gain for a loan	
Unit of the estimate	$ per loan	

The policy change indicator is highly statistically significant with an estimated coefficient of 1,730, which indicates that net losses after this PLF reduction went into effect were reduced by $1,730 per loan.

With regard to ethnicity and policy interaction term, in total, loans for Hispanic borrowers ended up with almost no change in net gains or losses, as the interaction estimate of -1,603 per loan nearly canceled the policy effect of 1,730. For Black borrowers, the reduction in net losses netted

approximately $500, as the race and policy interaction estimate of -1,178 per loan brought the net gain to $552 ($1,730 – $1,178). The gender and policy interactions were statistically *in*significant.

SUMMARY

Despite the limited timeframe, these models detected that the fourth PLF reduction was associated with a reduced likelihood of an unscheduled draw and lower net losses to the program.[37]

ANALYSIS OF FINANCIAL ASSESSMENT AND LESA

According to discussions with HUD staff, two objectives of the introduction of requirements for financial assessment, LESAs, and underwriting were the same as those for the PLF reductions—to reduce the likelihood of unscheduled draws and net losses to the program—whereas a third was to reduce the likelihood of default. Consequently, the three loan-level models in this section inform on outcomes related to defaults, unscheduled draws, and net losses (gains). The 0-1 aspect of the outcomes for defaults (or not) and unscheduled draws (or not) are suitable for logistic models, whereas the net gain model is OLS.

The introduction of the requirement of financial assessment, LESAs, and underwriting occurred in April 2015. December 2014 is 4 months before this requirement went into effect, and July 2015 is 4 months after it, so the 8 months from December 2014 to July 2015 are removed from the analysis. Given the 2-year window on either side of the policy change, loans originating in the 20 months from April 2013 through November 2014 are compared with those originating in the 20 months from August 2015 through March 2017.

DEFAULT MODEL

First, it is important to find whether the introduction of the requirement for financial assessments, LESAs, and underwriting had the intended effect of reducing the likelihood of a loan default. The model isolates the policy change effect on demand by controlling for demographic and economic factors.

The dependent variable in this loan-level logistic model is a 0-1 indicator variable, set equal to 1 if the borrower defaulted on the loan (equal to 0 if not). This situation constituted approximately 10.9 percent of the population (14,661 of 134,779 loans) in the April 2013 to March 2017 window, removing loans from the 8 months from December 2014 to July 2015.

The key (independent) variable is a 0-1 indicator for whether the loan originated 4 months after the introduction of the requirement (equal to 1 if August 2015 or later) or 4 months before the introduction (equal to 0 if November 2014 or earlier). The interaction terms of this policy indicator, with gender, race, and ethnicity, are also key parameters. Exhibit B-11 presents the results of the default model, with variables that are statistically significant at the 10-percent level highlighted in yellow.

[37] According to a conversation with Stephanie Moulton and other researchers at Ohio State University, an unscheduled draw is likely to be associated with greater probability of loan default, probably because it indicates increased financial stress. Lowering the probability of taking an unscheduled draw lowers the probability of a default.

Exhibit B-11. Results of the Default Model for the Financial Assessment-LESA-Underwriting Requirement (Logistic)

Independent Variable	Estimate	p-Value	Odds Ratio
Intercept	– 2.4068	< 0.0001	
Woman	– 0.0057	0.8193	0.994
Black	0.5756	< 0.0001	1.778
Hispanic	0.5400	< 0.0001	1.716
Married	– 0.5313	< 0.0001	0.588
California	– 0.2611	< 0.0001	0.770
Florida	0.0664	0.0402	1.069
Texas	– 0.2707	< 0.0001	0.763
Line-of-credit loan	0.4803	< 0.0001	1.617
Borrower age	– 0.0081	< 0.0001	0.992
Interest rate	0.1066	< 0.0001	1.112
Property value ($100,000s)	– 0.0334	< 0.0001	0.967
Property value squared	0.0008	< 0.0001	1.001
Time trend	0.1069	0.0064	1.113
Time trend squared	– 0.0256	< 0.0001	0.975
Consumer sentiment	– 0.0054	0.1226	0.995
Principal limit factor for the loan	0.0178	< 0.0001	1.018
Policy changes	– 0.1986	0.0008	0.820
Woman * Policy	0.0733	0.0422	1.076
Black * Policy	– 0.0451	0.3765	0.956
Hispanic * Policy	– 0.1415	0.0317	0.868
Sample size	134,779		
Dependent variable	Default or not		

LESA = Life Expectancy Set-Aside.

As previously discussed, the estimate indicates the direction of the effect, the p-value its statistical significance, and the odds-ratio its magnitude. The odds-ratio interpretation being that for the average loan, a one-unit increase in the independent variable (or, for indicator variables, the increase from 0 to 1) changes the probability of an unscheduled draw *by a percentage* that equals the odds ratio minus 1.

Specifically, the financial assessment requirement and policy change odds-ratio estimate of 0.820, which is highly statistically significant, means that average likelihood of a default is reduced an estimated 18 percent (-0.180 = 0.820 – 1.000) after the policy went into effect. If the likelihood of a default were 10 percent, then after the policy change, it would be 8.20 percent, which can be viewed as either 82 percent of 10 percent, or an 18-percent reduction from 10 percent.[38]

The gender and ethnicity interactions with the policy change were statistically significant at the 5-percent level. On top of the straight policy change reduction, Hispanic borrowers see the likelihood of an additional 13-percent (0.868) default decrease after the policy change. Here, the original 10- to 8.20-percent reduction is further decreased to 7.12 percent, a 13.2-percent reduction from 8.2 percent. On top of the straight policy change reduction, women borrowers see the likelihood of default *increase* 8 percent (1.076) after the policy change. The 10 to 8.2 percent is followed by an increase to 8.8 percent (a 7.6-percent increase on 8.2 percent, as 8.2 * 1.076 = 8.8). The policy interaction with race did *not* result in a statistically significant estimate.

[38] The average likelihood of default for the population in the selected window is approximately 10.9 percent.

UNSCHEDULED-DRAW MODEL

It is important to find out whether the financial assessment requirement, which determines if a borrower requires a LESA, had the intended effect of reducing unscheduled draws.[39] The model isolates the policy change effect on unscheduled draws by controlling for previously delineated demographic and economic factors.

The dependent variable in this loan-level logistic model is a 0-1 indicator variable, set equal to 1 if the borrower made unscheduled draws totaling at least $1,000 in the first 5 years of the loan (and set equal to 0 if otherwise). Loans with unscheduled draws constituted approximately 5.6 percent of the population (57,564 of 134,779 loans) in the April 2013 through March 2017 window, removing loans from the 8 months from December 2014 through July 2015.

The key (independent) variable is a 0-1 indicator for whether the loan originated 4 months after the introduction of the requirement (equal to 1) or 4 months before it (equal to 0). The interaction terms of this policy indicator, with gender, race, and ethnicity, are also key parameters. Exhibit B-12 presents the results of the unscheduled-draw model. Variables that are statistically significant at the 10-percent level are highlighted in yellow.

Exhibit B-12. Results of the Unscheduled-Draw Model for the Financial Assessment-LESA Underwriting Requirement (Logistic)

Independent Variable	Estimate	p-Value	Odds Ratio
Intercept	– 3.7059	< 0.0001	
Woman	0.0241	0.5343	1.024
Black	0.2883	< 0.0001	1.334
Hispanic	0.4870	< 0.0001	1.627
California	– 0.4736	< 0.0001	0.623
Married	– 0.0710	0.0363	0.931
Florida	0.5445	< 0.0001	1.724
Texas	0.2191	< 0.0001	1.245
Line-of-credit loan	0.3432	< 0.0001	1.409
Borrower age	0.0248	< 0.0001	1.025
Interest rate	– 0.3576	< 0.0001	0.699
Property value ($100,000s)	0.1083	< 0.0001	1.114
Property value squared	– 0.0031	< 0.0001	0.997
Time trend	0.5098	< 0.0001	1.665
Time trend squared	– 0.0376	< 0.0001	0.963
Consumer sentiment	0.0088	0.0765	1.009
Principal limit factor for the loan	– 0.0378	< 0.0001	0.963
Policy changes	– 0.3026	0.0001	0.739
Woman * Policy	– 0.0000	0.9993	1.000
Black * Policy	0.1867	0.0099	1.205
Hispanic * Policy	– 0.1634	0.0598	0.849
Sample size	134,779		
Dependent variable	Unscheduled draw or not		

LESA = Life Expectancy Set-Aside.

The policy change odds-ratio estimate of 0.739, which is highly statistically significant, means that the average likelihood of an unscheduled draw is reduced an estimated 26 percent (-0.261 = 0.739 – 1.000) after the policy went into effect. If the likelihood of an unscheduled draw were 10 percent, then after the policy change it would be 7.39 percent, which can be viewed as either 74

[39] According to HUD staff, voluntary LESAs are permitted but do not occur often.

percent of 10 percent, or a 26-percent reduction from 10 percent. If the likelihood were 6 percent, as it was in this window at 5.6 percent, then after the policy change, it would be 4.4 percent, which is 74 percent of 6 percent, or a 26-percent reduction from 6 percent.

The race and ethnicity policy change interactions were significant at the 1- and 10-percent levels, respectively, meaning that on top of the straight policy change reduction, Hispanic borrowers see the likelihood of an unscheduled draw decrease after the policy change an additional 15 percent (0.849). Here, the 10- to 7.39-percent estimate further decreases to 6.27 percent, which is 85 percent of 7.39. Conversely, Black borrowers see the likelihood of an unscheduled draw *increase* 20.5 percent (1.205). Here, the 10 to 7.39 percent then increases to 8.90 percent, which is 20.5 percent above 7.39. The gender and policy change interactions were insignificant.

NET-GAIN MODEL

It is important to find whether the requirement of financial assessment, LESAs, and underwriting ultimately reduced net losses (increase net gains) to the program and, if so, by what degree. Discussions with industry experts indicated that they believe that these financial assessment requirements were among the most impactful of the policy changes that have been implemented since 2009, so estimating the benefits in terms of net-loss reduction per loan is the objective of this model.

As previously discussed regarding the PLF-reduction and net-gain models, the loan population for this analysis are terminated loans only, because the net gain for a loan can only be determined after termination. In addition to the 15 controls delineated previously and applied in the unscheduled-draw model using all endorsed loans, the terminated loan population for this model means that duration and home price appreciation can only be included as controls. Given that duration has a negative effect on net gains, it is an important control in a model that is isolating the effect of the policy change on net gains.

The dependent variable in this loan-level OLS model is the dollar value of the net gain (or net loss) from each loan. Exhibit B-13 presents the results of the model with variables that are statistically significant at the 10-percent level highlighted in yellow.

Exhibit B-13. Results of the Net-Gain Model for the Financial Assessment-LESA Underwriting Requirement (Ordinary Least Square)

Independent Variable	Estimate	p-Value
Intercept	– 24,770	< 0.0001
Woman	330	0.0419
Black	– 2,544	< 0.0001
Hispanic	321	0.3322
Married	1,147	< 0.0001
California	3,176	< 0.0001
Florida	– 644	0.0015
Texas	– 169	0.4606
Line-of-credit loan	589	0.0024
Borrower age	– 211	< 0.0001
Interest rate	656	< 0.0001
Property value ($100,000s)	2,032	< 0.0001
Property value squared	– 34	< 0.0001
Home price appreciation	210	< 0.0001
Time trend	329	0.1807
Time trend squared	– 18	0.3629

Independent Variable	Estimate	p-Value
Consumer sentiment	10	0.6592
Principal limit factor for the loan	201	< 0.0001
Duration	– 22	< 0.0001
Policy changes	– 205	0.5742
Woman * Policy	– 421	0.0581
Black * Policy	3,218	< 0.0001
Hispanic * Policy	383	0.4172
Sample size	41,956	
Adjusted R-squared	0.21	
Dependent variable	$ net gain for a loan	
Unit of the estimate	$ per loan	

LESA = Life Expectancy Set-Aside.

The policy change indicator is insignificant, as the model was unable to detect any effect on the overall population due to the rule change. The model did, however, estimate a statistically significant reduction in net losses for loans to Black borrowers after the policy change of $3,218 per loan (an estimated coefficient of 3,218), suggesting the change worked to bring down net losses to the program for this group. With regard to ethnicity and gender, the Hispanic and policy interaction was statistically *in*significant, and the model detected a small *increase* in net losses (421, which was significant at the 10-percent level) for women borrowers. In sum, the model detected a $3,218 net-loss reduction per loan for Black borrowers after the requirements went into effect but did not detect any reduction for the overall population or by gender or ethnicity specifically.

Summary

These models detected that the introduction of the financial assessment, LESA, and underwriting requirement was associated with reduced likelihood of defaults, lower unscheduled draws, and lower net losses to loans made to Black borrowers—although a net loss reduction to the overall population could not be established.

Analysis of Change in Treatment of Nonborrowing Spouses

Unlike the models for PLF reductions and financial assessment—which estimated the effect of those policy changes on reducing net losses, defaults, unscheduled draws, and demand—the models analyzing the change in the treatment of loans with nonborrowing spouses concentrate on the effect on the duration of the loan, the proportion of loans with a co-borrower, and whether the loan was refinanced. Consequently, the three loan-level models in this section inform on outcomes related to loan duration, proportion of co-borrowers, and refinancing. The 0-1 aspect of outcomes for refinancing requires a logistic regression model, whereas the duration model is OLS. Both models are at the loan level. The model analyzing the proportion of co-borrowers is at the month level, like the demand models for PLF reduction, and is OLS.

The change to the treatment of loans with nonborrowing spouses occurred in August 2014. April 2014 is 4 months before this requirement went into effect, and November 2014 is 4 months after it, so the 8 months from April 2014 through November 2014 are removed from the analysis.

Given the 4-year window on either side for the *month-level* proportion-with-a-co-borrower model, the 44 months from August 2010 through March 2014 before the first reduction and the 44 months from December 2014 through July 2018 after the second reduction comprise the 88 months of observations for the proportion-with-a-co-borrower model. Given the 2-year window

on either side of the policy change for the duration and refinancing, loans originating in the 20 months from August 2012 through March 2014 are compared with those originating in the 20 months from December 2014 through July 2016.

DURATION MODEL

First, it is important to find if change in the treatment of loans with nonborrowing spouses affects the duration of a loan. Discussions with academic researchers indicated that they expected this change in treatment to increase in duration but have had trouble measuring that effect.[40] Consequently, obtaining statistically significant estimates of this treatment change on loan length is the objective of this model. As with net-gain models, the loan *population f*or this analysis is terminated loans only, because the duration for a loan can only be determined after termination.

Because each window places 2 years on either side of the treatment change, loans originating the 2 years before will have longer durations than the loans originating the 2 years after. To control for this variation, the model analyzes loans that have a maximum duration of the most recent year of the window. The longest duration for a loan originating in July 2016 (the most recent month of the window) is 4 years, so only loans with durations of 4 years or less originating from August 2012 through July 2016 are the analysis of this rule change.

The dependent variable in this loan-level OLS model is the length in months of a terminated loan. The key (independent) variable is a 0-1 indicator set equal to 1 if the loan originated 4 months after the treatment change (December 2014 or later) or set equal to 0 if it originated 4 months before it (March 2014 or earlier). The interaction terms of this policy indicator, with gender, race, and ethnicity, are also key parameters. Exhibit B-14 presents the results, with variables that are statistically significant at the 10-percent level highlighted in yellow.

Exhibit B-14. Results of the Duration Model for the Change in Treatment of Loans with Nonborrowing Spouses (Ordinary Least Square)

Independent Variable	Estimate	p-Value
Intercept	– 69.1000	< 0.0001
Woman	0.4688	0.0010
Black	0.9167	< 0.0001
Hispanic	– 0.9820	0.0011
Married	0.0796	0.4659
California	– 4.0747	< 0.0001
Florida	– 6.6873	< 0.0001
Texas	– 2.7022	< 0.0001
Line-of-credit loan	0.3086	0.0693
Borrower age	– 0.0549	< 0.0001
Interest rate	– 0.3099	< 0.0001
Property value ($100,000s)	0.0651	0.0164
Property value squared	0.0020	0.0322
Home price appreciation	0.8355	< 0.0001
Time trend	– 0.0355	0.0127
Time trend squared	0.0948	< 0.0001
Consumer sentiment	2.1187	< 0.0001
Policy changes	– 4.1390	< 0.0001
Woman * Policy	– 0.1485	0.4192

[40] See appendix A. Researchers attributed the difficulty in detecting the effect to the fact that HUD has instituted various changes to the treatment of nonborrowing spouses over time, as opposed to making a single change at one point in time.

Independent Variable	Estimate	p-Value
Black * Policy	0.4701	0.1115
Hispanic * Policy	1.5648	< 0.0001
Sample size	39,114	
Adjusted R-squared	0.46	
Dependent variable	Loan duration (in months)	
Unit of the estimate	Months per loan	

The estimate for the policy change effect is negative (-4.14). Therefore, contrary to expectations, the model was unable to detect the expected positive effect of the treatment change on duration.[41] In addition to this estimate for this overall population, both the race effect (Black and policy) and the gender effect (woman and policy) after the change were insignificant. The ethnicity effect (Hispanic and policy) after the change was significant and positive, but only three-eighths of the amount of the overall policy change (the 1.57 estimate offsets approximately three-eighths the overall effect of -4.14). The most likely explanation for this unsuccessful modeling of the spousal-treatment change on duration is that the eligible population for the analysis were loans that terminated within 4 years of origination. This limited population did not provide sufficient time for the effect of the treatment change to be detected.

Proportion with a Co-Borrower Model

Second, it is important to find whether the spousal-treatment change had the intended effect of increasing the proportion of loans with a co-borrower. The month-level model is designed to isolate policy change effect on this proportion by controlling for demographic and economic factors. The dependent variable in the model is the percentage of co-borrowers in a month, which is the percentage married. The nine controls are those monthly percentages (women, Black, and Hispanic) and averages (age, PLF, property value, and interest rate) from the PLF demand models, *except for the percentage married, which serves as the dependent variable*.

The key (independent) variable is a 0-1 indicator set equal to 1 if the month was 4 months after the policy change (December 2014 or later) or set equal to 0 if the month was 4 months before it (March 2014 or earlier). Exhibit B-15 presents the result of the model, with variables that are statistically significant at the 10-percent level highlighted in yellow.

Exhibit B-15. Results of the Proportion-with-a-Co-Borrower Model for the Change in Treatment of Loans with Nonborrowing Spouses (Ordinary Least Square)

Independent Variable	Estimate	p-Value
Intercept	110.0	0.0076
% Women	– 27.0	< 0.0001
% Black	– 48.0	0.0080
% Hispanic	– 11.0	0.5635
Average principal limit factor	– 0.9	0.1180
Average age	1.8	0.1612
Average property value	– 0.4	0.1161
Average interest rate	0.2	0.0005
Consumer sentiment index	– 0.0	0.9381
Time trend	– 0.0	0.2200
Policy changes	1.0	0.0863

[41] This expectation was based on the notion that surviving spouses would tend to be younger than the borrowing spouse and would cause the loan life to extend beyond the original underwriting period. The analysis found no effect on loan duration, possibly because surviving spouses are likely to refinance HECM loans, which are treated as new loans rather than extensions of loan duration.

Independent Variable	Estimate	p-Value
Sample size	88 months	
Adjusted R-squared	0.72	
Dependent variable	% With co-borrower for the month	
Unit of the estimate	Change in co-borrower % per unit	

Note that the average property value and the average PLF variables are significant at the 12-percent level, which is slightly more than the 10-percent cutoff; those two controls should be viewed in that context.

The key variable in the model is the policy change indicator, statistically significant at the 10-percent level (specifically, the 8.63-percent level), controlling for these demographic, economic, and loan-average factors. The estimated coefficient of 0.95 indicates that if all else is equal after implementing the treatment change, the proportion in a given month with a co-borrower increased 1 percent (0.95 percent).

Refinance Model

It is important to find whether the change in the nonborrowing spouse treatment group is associated with a greater likelihood of refinancing. The model isolates the policy change effect on the borrower's choice to refinance by controlling for demographic and economic factors.

The dependent variable in the loan-level logistic refinance model is a 0-1 indicator variable, set equal to 1 if the borrower refinanced and equal to 0 if not. Refinances comprised 7.3 percent of the population (12,009 of 164,305 loans) from August 2012 through July 2016, removing loans from the 8 months from April 2014 through November 2014.

The key (independent) variable is a 0-1 indicator, set equal to 1 if the loan originated 4 months after the treatment change (December 2014 or later) or equal to 0 if it originated 4 months before it (March 2014 or earlier). The interaction terms of this policy indicator, with gender, race, and ethnicity, are also key parameters. Exhibit B-16 presents the results of the unscheduled-draw model. Variables that are statistically significant at the 10-percent level are highlighted in yellow.

Exhibit B-16. Results of the Refinance Model for the Change in Treatment of Loans With Nonborrowing Spouses (Logistic)

Independent Variable	Estimate	p-Value	Odds Ratio
Intercept	– 12.9031	< 0.0001	
Woman	– 0.0039	0.9206	0.996
Black	1.0362	< 0.0001	2.818
Hispanic	– 0.0520	0.5022	0.949
Married	– 0.1723	< 0.0001	0.842
California	1.0317	< 0.0001	2.806
Florida	0.5298	< 0.0001	1.699
Texas	0.1934	< 0.0001	1.213
Line-of-credit loan	0.4882	< 0.0001	1.629
Borrower age	– 0.0416	< 0.0001	0.959
Interest rate	– 0.0931	< 0.0001	0.911
Property value ($100,000s)	0.6043	< 0.0001	1.830
Property value squared	– 0.0414	< 0.0001	0.959
Time trend	0.2802	< 0.0001	1.323
Consumer sentiment	0.0292	< 0.0001	1.030
Principal limit factor for the loan	0.1185	< 0.0001	1.126
Policy changes	0.7464	< 0.0001	2.109

Independent Variable	Estimate	p-Value	Odds Ratio
Woman * Policy	– 0.0780	0.0843	0.925
Black * Policy	– 0.0430	0.4580	0.958
Hispanic * Policy	0.1288	0.1515	1.137
Sample size	164,305		
Dependent variable	Refinance or not		

The policy change odds-ratio estimate of 2.109, which is highly statistically significant, means that the average likelihood of refinancing is estimated to increase 211 percent—that is, more than double—after the change in the treatment of nonborrowing spouses went into effect. If the likelihood of refinancing were 10 percent, after the policy change it would be 21.1 percent (2.109 * 10 percent).

The race and ethnicity policy change interactions were *in*significant, and the gender effect after the policy change was a slight decrease of 7.75 percent (-0.075 = 0.925 – 1.000), meaning that, on top of the straight policy change reduction, women borrowers see the likelihood of an unscheduled draw after the policy change decrease an additional 7.75 percent. The 21.1-percent increase in refinance likelihood would then decrease to 19.5 percent, which is 92.5 percent of 21.1 percent, or 21.1 percent decreased by 7.75 percent.

SUMMARY

Although the duration model was unable to detect an effect of the change in the treatment of nonborrowing spouses on loan duration, the policy change is associated with an increase in the proportion of loans with a co-borrower by approximately 1 percent and with more than double the percentage of refinanced loans.

ANALYSIS OF REQUIREMENT TO PROVIDE A SECOND APPRAISAL

The objective of requiring a second appraisal to deter overappraisals, which went into effect in October 2018, was to reduce to amount of overappraisal and, ultimately, the net losses to the program. It was also reasoned that this requirement could reduce loan duration by encouraging the refinancing of more HECM loans.[42] Consequently, these three OLS models concentrate on informing on the outcomes related to appraised value, duration, and net losses (gains).

The policy change for second appraisals occurred in October 2018. June 2018 is 4 months before this requirement went into effect, and January 2019 is four months after it, so the 8 months from June 2018 through January 2019 are removed from the analysis. Given the 2-year window on either side of the policy change, loans originating in the 20 months from October 2016 through May 2018 are compared with those originating in the 20 months from January 2019 through September 2020.

NET-GAIN MODEL

First, it is important to determine whether these second appraisal requirements acted to reduce net losses (and thereby increase net gains) to the program. The model isolates the policy change effect on net gains by controlling for demographic and economic factors.

[42] The argument is that by reducing the extent to which homes were overvalued to begin with, the policy would increase the probability that the borrower could obtain a larger loan amount through refinancing as the home value increased over time. An overvalued home is less likely to go up in price, because its price is already too high.

The loan population for this analysis are terminated loans only, because the net gain for a loan can only be determined after termination. In addition to the 15 controls delineated previously and applied in the unscheduled-draw model using all endorsed loans, the terminated loan population for this model means that duration and home price appreciation can only be included as controls. Given that duration has a negative effect on net gains, it is an important control in a model that is isolating the effect of the policy change on net gains.

The dependent variable in this loan-level OLS model is the dollar value of the net gain from each loan. The key (independent) variable is a 0-1 indicator set equal to 1 if the loan originated 4 months after the policy change (in January 2019 or later) or set equal to 0 if 4 months before the first PLF reduction (May 2018 or earlier). The interaction terms of this policy indicator, with gender, race, and ethnicity, are also key parameters. Exhibit B-17 presents the results of the net-gain model for the second appraisal requirement. Variables that are statistically significant at the 10-percent level are highlighted in yellow.

Exhibit B-17. Results of the Net-Gain Model for the Second Appraisal Requirement (Ordinary Least Square)

Independent Variable	Estimate	p-Value
Intercept	– 6,318	0.0043
Woman	– 209	0.0733
Black	738	0.0004
Hispanic	1,010	< 0.0001
Married	707	< 0.0001
California	2,469	< 0.0001
Florida	– 556	0.0033
Texas	– 1,047	< 0.0001
Line-of-credit loan	– 514	0.0011
Borrower age	– 133	< 0.0001
Interest rate	873	< 0.0001
Property value ($100,000s)	1,343	< 0.0001
Property value squared	– 21	< 0.0001
Home price appreciation	37	0.0034
Time trend	539	< 0.0001
Consumer sentiment	6	0.7273
Principal limit factor for the loan	99	< 0.0001
Duration	178	< 0.0001
Policy changes	991	0.0035
Woman * Policy	80	0.8185
Black * Policy	– 1,855	0.0058
Hispanic * Policy	– 2,160	0.0045
Sample size	18,042	
Adjusted R-squared	0.30	
Dependent variable	$ net gain for a loan	
Unit of the estimate	$ per loan	

The policy change indicator is highly statistically significant with an estimated coefficient of 991, which indicates that net losses after this appraisal requirement went into effect were reduced by $991 per loan.

For the policy change interaction terms with race and ethnicity, which were highly statistically significant, the combined effect of the policy change (991), with the interactions, reversed the result from a reduction of approximately $1,000 per loan in net losses to an *increase* of

approximately $1,000 per loan in net losses for these groups—as the race and ethnicity interaction-term estimates were -1,855 and -2,160, respectively.

Duration Model

Second, it is important to find whether the second appraisal requirement made the transaction less attractive to the point that it reduced the duration of loans. As with the net-gain model, the loan population for this analysis is terminated loans only, because the duration of a loan can only be determined after termination.

Because each window places 2 years to either side of the treatment change, loans originating the 2 years before have longer durations than loans originating 2 years after. To control for this variation, these models analyze the loans with a maximum duration that extends from the most recent year of the window to the most recent year of available data. However, unlike the duration model in the nonborrowing spouses analysis, which had 4 years between the end of the window and the end of the available data in September 2020, the end of the 2-year window after the policy change is September 2020, coinciding with the end of the available data. To work around this intractable issue, the maximum duration was set to 6 months, making it difficult to detect a duration reduction after this October 2018 policy change.

The dependent variable in this loan-level OLS model is the length in months of a terminated loan. The controls are the same as those for the duration model in the nonborrowing spouse analysis, with one addition controlling for the bias per square foot—an important factor in appraisals.

The key (independent) variable is a 0-1 indicator set equal to 1 if the loan originated 4 months after the policy change (in January 2019 or later) or set equal to 0 if 4 months before the first PLF reduction (May 2018 or earlier). The interaction terms of this policy indicator, with gender, race, and ethnicity, are also key parameters. Exhibit B-18 presents the results of the net-gain model for the first and second PLF reductions. Variables that are statistically significant at the 10-percent level are highlighted in yellow.

Exhibit B-18. Results of the Duration Model for the Second Appraisal Requirement (Ordinary Least Square)

Independent Variable	Estimate	p-Value
Intercept	– 16.412	< 0.0001
Woman	0.072	0.5072
Black	0.085	0.7374
Hispanic	0.573	0.0238
Married	0.110	0.3597
California	– 0.049	0.6916
Florida	– 0.051	0.7244
Texas	– 0.111	0.5341
Line-of-credit loan	– 0.010	0.9471
Borrower age	0.009	0.0527
Interest rate	0.047	0.5813
Property value ($100,000s)	– 0.041	0.5549
Property value squared	0.002	0.7138
Home price appreciation	0.147	< 0.0001
Time trend	0.464	< 0.0001
Consumer sentiment	0.042	< 0.0001
Bias per square foot	0.000	0.6900
Policy changes	– 0.723	0.0050

Independent Variable	Estimate	p-Value
Woman * Policy	– 0.365	0.0637
Black * Policy	– 0.599	0.1777
Hispanic * Policy	– 0.429	0.4134
Sample size	1,216	
Adjusted R-squared	0.07	
Dependent variable	Loan duration (in months)	
Unit of the estimate	Months per loan	

The policy change indicator is highly statistically significant, with a coefficient of -0.723, meaning that the model estimates that after this appraisal requirement went into effect, loan duration was reduced by approximately three-quarters of a month. This three-quarters-of-a-month estimate should be viewed in the context that—

Only terminated loans of a duration of 6 months or less were part of the 1,216 population.

The subset of loans in the "after" group between April 2019 and September 2020 (comprising 6 of the 20 months, which is 60 percent of the "after" population) could not reach a duration of 6 months (given the workaround previously discussed).

The model had an adjusted-r^2 of 0.07, so the controls and key variables in this model explain little of the variation in the dependent variable.

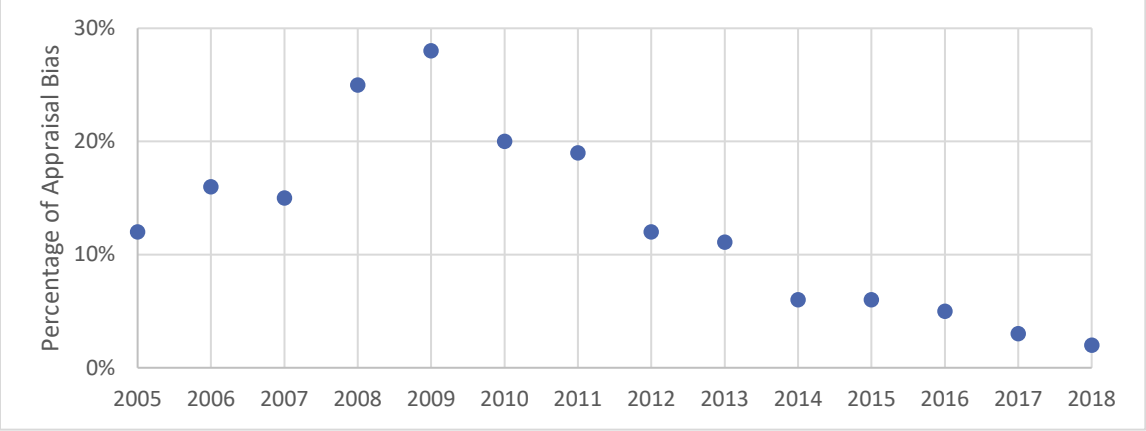
The policy change interaction with gender has an estimated coefficient of -0.365 and is significant at the 10-percent level, meaning that the duration of loans to women borrowers decreased by approximately an additional three-eighths of a month after the second appraisal requirements were enacted, bringing the combined effect to 1 1/8 of a month. The policy change interaction terms with race and ethnicity were insignificant.

Overappraisal Model

Third and finally, it is important to determine whether these second appraisal requirements acted to reduce overappraisals. The model isolates the policy change effect on net gains by controlling for demographic and economic factors.

Exhibit B-19 illustrates the annual percentage of appraisal bias (overappraisal) from 2005 until the second appraisal requirement was instituted in 2018 (HUD, 2018). The bias reached its peak at almost 30 percent in 2009 and has been steadily and consistently declining for 9 consecutive years from the apex in 2009 to 2018, when it was less than 5 percent.

Exhibit B-19. Home Equity Conversion Mortgage Appraisal Bias by Endorsement Year



The loan population for this model is all endorsed loans. The model includes the gender, race, ethnicity, and geographic factors for controls, as well as the monthly consumer sentiment index and a time trend. The model does not include whether it was a line-of-credit loan or the borrower's age, because, in theory, neither should affect the appraised value—whereas the gender, race, and ethnicity of the borrower might.[43]

To control for home size, the dependent variable in this loan-level OLS model is the appraised value per square foot. The key (independent) variable is a 0-1 indicator, set equal to 1 if the loan originated 4 months after the policy change (January 2019 or later) or set equal to 0 if 4 months before the first PLF reduction (May 2018 or earlier). The relationship to isolate by including the controls is the effect of the second appraisal policy change on the appraised value per square foot.

The interaction terms of this policy indicator, with gender, race, and ethnicity, are also key parameters. Exhibit B-20 presents the results of the appraisal model for the first and second PLF reductions. Variables that are statistically significant at the 10-percent level are highlighted in yellow.

Exhibit B-20. Results of the Appraisal Model for the Second Appraisal Requirement (Ordinary Least Square)

Independent Variable	Estimate	p-Value
Intercept	187.5412	< 0.0001
Woman	6.7716	< 0.0001
Black	– 3.6249	0.0364
Hispanic	2.8818	0.1611
California	172.0530	< 0.0001
Florida	– 28.7971	< 0.0001
Texas	– 65.2999	< 0.0001
Time trend	6.2237	< 0.0001
Time trend squared	– 0.0042	0.9747
Consumer sentiment	– 0.2589	0.0016
Policy changes	– 7.8476	0.0019
Woman * Policy	1.6580	0.2608
Black * Policy	1.9392	0.4967
Hispanic * Policy	9.4193	0.0031
Sample size	144,638	
Adjusted R-squared	0.26	
Dependent variable	Appraised value per square foot	
Unit of the estimate	$ per square foot	

The policy change indicator is highly statistically significant, with an estimated coefficient of -7.85, which indicates a $7.85 per-square-foot reduction in the appraised value. Given that the *average* appraised value per square foot for the loan population in the 4-year window is $233 per square foot, this $7.85 per-square-foot reduction estimate amounts to 3.5 percent of the appraised value. Consequently, the implementation of this policy change is that the appraised value fell 3.5 percent ($7.85 of $223), with all else being equal.

[43] If borrowers have more positive expectations about the economy, they feel less financially insecure and may be more inclined to accept lower appraised values for their homes. Appraised value had a significant negative effect of 25 cents per square foot (for each point increase in the index), given a $223 per-square-foot average value. A difference of 25 cents is about 0.1 percent of value, which is not a large amount.

The policy change interaction term for ethnicity is 9.42, which effectively cancels the -7.85 reduction for the policy change. Consequently, implementing the second appraisal requirements does not affect the appraised value for homes of Hispanic borrowers much (combining the two effects leads to an increase in appraised value of $1.57). The policy change interactions terms with gender and race were *in*significant.

Summary

The second appraisal requirement policy change was estimated to have been associated with reducing—

- Net losses by approximately $1000 per loan ($991).
- Duration by approximately three-quarters of a month for loans 6 months or less in duration.
- Appraised value by $7.85 per square foot, or 3.5 percent of the $223 per-square-foot average for homes.

Analysis of Incentives to Procure Tax Services

The objective of providing incentives to procure tax services was to reduce the likelihood of default. Consequently, the model presented in this section informs on outcomes related to defaults. The 0-1 aspect of the outcomes (default or not) is suitable for a logistic model.

This policy change was introduced in October 2016. June 2016 is 4 months before this requirement went into effect, and January 2017 is 4 months after it, so the 8 months from June 2016 through January 2017 are removed from the analysis. Given the 2-year window on either side of the policy change, loans originating in the 20 months from October 2014 through May 2016 are compared with those originating in the 20 months from February 2017 through September 2018.

Default Model

The importance of this model is to find whether tax service incentives had the intended effect of reducing the likelihood of a loan default. The model isolates the policy change effect on demand by controlling for demographic and economic factors.

The dependent variable in this loan-level logistic model is a 0-1 indicator variable, set equal to 1 if the borrower defaulted on the loan and set equal to 0 if not. This scenario constituted approximately 8.75 percent of the population (14,670 of 167,682 loans) in the October 2014 through September 2018 window, removing loans from the 8 months from June 2016 through January 2017.

The key (independent) variable is a 0-1 indicator for whether the loan originated 4 months after the introduction of the requirement (equal to 1 if February 2017 or later) or 4 months before the introduction (equal to 0 if May 2016 or earlier). The interaction terms of this policy indicator, with gender, race, and ethnicity, are also key parameters. Exhibit B-21 presents the results of the default model. Variables that are statistically significant at the 10-percent level are highlighted in yellow.

Exhibit B-21. Results of the Default Model for the Introduction of the Incentives to Procure Tax Services (Logistic)

Independent Variable	Estimate	p-Value	Odds Ratio
Intercept	– 3.2395	< 0.0001	
Woman	0.0155	0.4848	1.016

Independent Variable	Estimate	p-Value	Odds Ratio
Black	0.5683	< 0.0001	1.765
Hispanic	0.4218	< 0.0001	1.525
Married	– 0.5591	< 0.0001	0.572
California	– 0.1389	< 0.0001	0.870
Florida	0.1119	0.0003	1.118
Texas	– 0.3567	< 0.0001	0.700
Line-of-credit loan	0.4067	< 0.0001	1.502
Borrower age	0.0090	0.0002	1.009
Interest rate	0.1027	< 0.0001	1.108
Property value ($100,000s)	– 0.0170	0.0020	0.983
Property value squared	0.0004	0.0232	1.000
Time trend	– 0.5663	< 0.0001	0.568
Time trend squared	0.0154	0.1717	1.016
Consumer sentiment	0.0161	< 0.0001	1.016
Principal limit factor for the loan	– 0.0039	0.1792	0.996
Policy changes	– 0.1037	0.0631	0.901
Woman * Policy	0.0666	0.0847	1.069
Black * Policy	– 0.1190	0.0416	0.888
Hispanic * Policy	0.1516	0.0312	1.164
Sample size	167,682		
Dependent variable	Default or not		

As previously discussed, the estimate indicates the direction of the effect, the p-value its statistical significance, and the odds-ratio its magnitude. The odds-ratio interpretation shows that for the average loan, a one-unit increase in the independent variable (or, for indicator variables, the increase from 0 to 1) changes the probability of an unscheduled draw *by a percentage* that equals the odds ratio minus 1.

Specifically, the tax service incentives and policy change odds-ratio estimate of 0.901—which is statistically significant at the 10-percent level—means that average likelihood of defaulting is estimated to be reduced 10 percent (-0.099 = 0.901 – 1.000) after the policy went into effect. If the likelihood of a default were 10 percent (close to the default rate for this window of 8.75 percent, with 14,670 out of 167,682 defaulting), then after the policy change, it would be 9 percent, which can be viewed as either 90 percent of 10 percent, or a 10-percent reduction from 10 percent.

All three of the gender, race, and ethnicity interactions were statistically significant—gender at the 10-percent level and race and ethnicity at the 5-percent level. On top of the straight policy change reduction, Black borrowers see the likelihood of a default decrease by an additional 11.2 percent (0.888) after the policy change. Here, the 10- to 9-percent reduction is further decreased to 8 percent, which is an 11-percent reduction from 9 percent. On top of the straight policy change reduction, women borrowers see the likelihood of a default *increase* of 7 percent (1.069) after the policy change. The original 10- to 9-percent reduction increases to 9.6 percent, a 7-percent increase on 90 percent, as 9 * 1.069 = 9.62. The policy interaction with race did *not* result in a statistically significant estimate. On top of the straight policy change reduction, Hispanic borrowers see the likelihood of a default *increase* of 16 percent (1.164) after the policy change. The original 10- to 9-percent reduction increases to 10.5 percent—a 16-percent increase on 90 percent, as 9 * 1.164 = 10.48. Consequently, Hispanic borrowers see a slight increase in the likelihood of default.

Summary

The model estimates that the introduction of incentives to procure tax services is associated with a statistically significant 10-percent decrease in the likelihood of default, indicating that the policy change was successful in reducing defaults.

Second-Stage Analysis of Impact of Policy Changes on Net Gains or Losses and Defaults

Each of the three analyses in this section do not directly estimate a specific policy change effect but are the second stage of analyzing when a policy change first affects an outcome, and that outcome may subsequently affect net gains and losses or defaults. The three models are—

1. The effect of refinance on net gains and losses, given that the change in the *treatment of loans with nonborrowing spouses* (OLS) model affects refinancing.
2. The effect of overappraisal bias on net gains and losses, given that the *second appraisal requirement* (OLS) model affects overappraisal.

The effect of unscheduled draws on the likelihood of default, given that *PLF reductions* and the *introduction of financial assessments, LESAs, and underwriting* (logistic) model affects unscheduled draws.

Unlike the 4-year windows established for the policy change analyses, these three models use loans during the 2005–20 period. The two net-gain models used only terminated loans, and the unscheduled-draw model used all endorsed loans.

Loan Refinancing Effect on Net Gains or Losses

Having established that the change in the treatment of loans with nonborrowing spouses increases makes refinancing more than twice as likely (an estimated 211-percent increase), informing on the extent to which refinancing affects net gains is the logical next step. The design of this net-gain model is similar to that of the five net-gain models presented in the previous policy change sections.

The controls are identical to the previous models, and the dependent variable in this loan-level OLS model is the dollar value of the net gain from each loan. The difference is that the key (independent) variable in the model does not relate to a policy change—it is a 0-1 indicator, set equal to 1 if the loan was refinanced and set equal to 0 if not. Exhibit B-22 presents the results of this model, isolating the refinance effect on net gains, with variables that are statistically significant at the 10-percent level highlighted in yellow.

Exhibit B-22. Results of the Model of the Loan Refinancing Effect on Net Gains (Ordinary Least Square)

Independent Variable	Estimate	p-Value
Intercept	– 26,486	< 0.0001
Woman	3,774	< 0.0001
Black	– 15,460	< 0.0001
Hispanic	– 3,326	< 0.0001
Married	7,519	< 0.0001
California	3,060	< 0.0001
Florida	– 11,588	< 0.0001
Texas	3,355	< 0.0001
Line-of-credit loan	– 16,979	< 0.0001

Independent Variable	Estimate	p-Value
Borrower age	– 274	< 0.0001
Interest rate	– 2,932	< 0.0001
Property value (in $100,000s)	3,576	< 0.0001
Property value squared	– 47	< 0.0001
Home price appreciation	870	< 0.0001
Time trend	– 2,973	< 0.0001
Consumer sentiment	557	< 0.0001
Principal limit factor for the loan	– 916	< 0.0001
Duration	– 577	< 0.0001
Refinance (or not)	– 14,529	< 0.0001
Sample size	405,446	
Adjusted R-squared	0.33	
Dependent variable	$ net gain for a loan	
Unit of the estimate	$ per loan	

All the variables in the model are highly statistically significant. The estimated effect of the refinance indicator of -14,529 means that net losses of a loan that is refinanced is, on average, $14,529 greater than a loan that is not refinanced. Given that the change in treatment of loans with nonborrowing spouses is associated with more than double the refinance rate, the policy change may be associated with increases in net losses.

Home Appraisal Bias Effect on Net Gains or Losses

Having established that the introduction of the requirement for a second appraisal is associated with a reduction in the appraised value of $7.85 per square foot (a general 3.5-percent reduction), informing on the extent to which a reduction in appraisal bias affects net gains is the logical next step. The design of this net-gain model is similar to the five net-gains models in the previous policy change sections.

The controls are identical to the previous models, and the dependent variable in this loan-level OLS model is the dollar value of the net gain from each loan. The difference is that the key (independent) variable is the estimated appraisal bias (measured as a percentage) for the ZIP Code of the home address of the loan.[44] Exhibit B-23 presents the results of this model isolating the appraisal-bias effect on net gains, with variables that are statistically significant at the 10-percent level highlighted in yellow.

Exhibit B-23. Results of the Model of the Home Appraisal-Bias Effect on Net Gains (Ordinary Least Square)

Independent Variable	Estimate	p-Value
Intercept	– 18,784	< 0.0001
Woman	3,615	< 0.0001
Black	– 16,279	< 0.0001
Hispanic	– 3,991	< 0.0001
Married	8,112	< 0.0001
California	– 213	0.3631
Florida	– 10,123	< 0.0001
Texas	2,752	< 0.0001
Line-of-credit loan	– 17,255	< 0.0001

[44] Home price appreciation is measured using the Zillow Home Value Index, which is a smoothed, seasonally adjusted measure that captures both the level and appreciation of home values across a wide variety of housing types and geographies, including ZIP Codes.

Independent Variable	Estimate	p-Value
Borrower age	– 114	< 0.0001
Interest rate	– 3,832	< 0.0001
Property value (in $100,000s)	2,231	< 0.0001
Property value squared	– 25	< 0.0001
Home price appreciation	944	< 0.0001
Time trend	– 3,164	< 0.0001
Consumer sentiment	490	< 0.0001
Principal limit factor for the loan	– 1,112	< 0.0001
Duration	– 636	< 0.0001
% Bias per square foot	– 41	< 0.0001
Sample size	322,099	
Adjusted R-squared	0.35	
Dependent variable	$ net gain for a loan	
Unit of the estimate	$ per loan	

All the variables in the model are highly statistically significant, except for living in California. The interpretation of the -41 estimate for the percentage of appraised bias is that for each 1-percent decrease in the appraised bias (per square foot), net losses are reduced by $41 per loan.[45]

Given that the second appraisal requirement is associated with a $7.85 reduction in appraised value per square foot, which amounts to a 3.5-percent reduction from the average value of $223 per square foot, and an appraisal bias reduction of 1 percent is associated with a $41 reduction in net losses, the policy change may be associated with a reduction in net losses.

Unscheduled Draw Effect on Loan Defaults

Having established that the first, second, and fourth PLF reductions and the introduction of financial assessment, LESAs, and underwriting are associated with at least a 26-percent reduction in unscheduled draws, informing on the extent to which a reduction in unscheduled draws affects the likelihood of default is the logical next step. The design of this default model is also similar to the default models in the previous policy change sections.

The dependent variable in this loan-level logistic model is a 0-1 indicator variable, set equal to 1 if the borrower defaulted, or set equal to 0 if not. For the population (sample size) of 1,027,625 loans for the analysis, 17 percent (0.1706 = 175,203 / 1,027,265) defaulted. The controls are identical to the previous models and the dependent variable in this model. The difference is that the key (independent) variable is a 0-1 indicator variable on whether the borrower made unscheduled draws totaling at least $1,000 in the first 5 years of the loan (set equal to 1 if so) or not (set equal to 0 if not). Exhibit B-24 presents the results of this model isolating the unscheduled-draw effect on defaults, with variables that are statistically significant at the 10-percent level highlighted in yellow.

Exhibit B-24. Results of the Model of the Unscheduled Draw Effect on Loan Defaults (Logistic)

Independent Variable	Estimate	p-Value	Odds Ratio
Intercept	– 1.6248	< 0.0001	
Woman	0.0468	< 0.0001	1.048
Black	0.4076	< 0.0001	1.503
Hispanic	0.4243	< 0.0001	1.529
Married	– 0.2175	< 0.0001	0.805

[45] It is a negative effect (-41) on net gains, so an increase in bias is correlated with a net-gain decrease. Therefore, a bias decrease is correlated with (a net-gain increase or) a net-loss decrease.

Independent Variable	Estimate	p-Value	Odds Ratio
California	– 0.3513	< 0.0001	0.704
Florida	0.1743	< 0.0001	1.190
Texas	– 0.2720	< 0.0001	0.762
Line-of-credit loan	0.5391	< 0.0001	1.714
Borrower age	– 0.0139	< 0.0001	0.986
Interest rate	0.0656	< 0.0001	1.068
Property value ($100,000s)	– 0.1137	< 0.0001	0.893
Property value squared	0.0012	< 0.0001	1.001
Time trend	– 0.0945	< 0.0001	0.910
Consumer sentiment	– 0.0131	< 0.0001	0.987
Principal limit factor for the loan	0.0153	< 0.0001	1.015
Unscheduled draw (or not)	1.6318	< 0.0001	5.113
Sample size	1,027,265		
Dependent variable	Default or not		

All the variables in the model are highly statistically significant. The unscheduled-draw odds-ratio estimate of 5.113 means that the average likelihood of a loan default is estimated to increase 511 percent if the borrower makes unscheduled draws totaling at least $1,000 during the first 5 years of the loan. The likelihood of a default is 5.11 times greater for a loan with an unscheduled draw than one without.

Given that the first, second, and fourth PLF reductions and the financial assessment and LESA requirements are associated with at least a 26-percent reduction in unscheduled draws, finding that a loan with an unscheduled draw is more than 5 times more likely to default implies that the policy changes ultimately reduced the likelihood of default.

SUMMARY

Each of the three analyses in this section informed on an indirect effect of a policy change affecting refinancing (nonborrowing spouses), appraisal bias (second appraisal), and unscheduled draws (PLF reductions and financial assessment and LESAs) ultimately affecting net gains and defaults. The findings were as follows.

Net losses for a loan that is refinanced are on average $14,529 greater than for a loan that is not refinanced. Given that the change in treatment of loans with nonborrowing spouses is associated with a more than doubling of the refinance rate, this finding indicates the policy change may be associated with increases in net losses.

Each 1-percent decrease in the appraisal bias (per square foot) is associated with a reduction in net losses of $41 per loan. Given that the second appraisal requirement is associated with a reduction in appraised value, this finding suggests that the policy change may be associated with a reduction in net losses.

The likelihood of a default is 5.11 times greater for a loan with an unscheduled draw than for those without. Given that the first, second, and fourth PLF reductions and the financial assessment and LESA requirements are associated with at least a 26-percent reduction in unscheduled draws, this finding implies that these policy changes ultimately reduced the likelihood of default

APPENDIX C. DATA VARIABLES USED IN THE ANALYSIS

Exhibit C-1. Data Dictionary

Field Name	Type	Size	Attribute Name	Data Source	Description
case_nbr	V_String	11	FHA Case Number	hermit_case_detail	The unique case identifier sequentially assigned by CHUMS during the receiving/assignment process. It identifies the application for a specific property's mortgage insurance.
trmntn_dt	Date	10	Termination Date - HECM	hermit_case_detail	Date that the loan was terminated.
Active	String	10	HECM Active or Terminated as of Sept. 30, 2020	Calculated	Determines if the H ECM loan was active or terminated as of September 30, 2020, which is the end of fiscal year 2020.
clsng_dt	Date	10	Closing Date - HECM	hermit_case_detail	Date the loan closed. It is the date the lender and borrower agree on the terms of the loan and sign the closing documents. It is the loan settlement date from the HUD 1 form, block I.
adtl_prncpl_lmt_amt	Int32	4	Additional Principal Limit Amount - HECM	hermit_case_detail	Indicates amount of the additional 10% of the initial principal limit that a borrower intends to use during the first 12-month disbursement period.
adtl_prncpl_lmt_ind	V_String	1	Additional Principal Limit Indicator - HECM	hermit_case_detail	Indicates borrower's intent to use a portion or full amount of the additional 10% of the initial principal limit. Values: Y = Yes; N = No.
asgnmnt_acptd_dt	Date	10	Assignment Accepted Date - HECM	hermit_case_detail	The date HUD accepts the assignment. The step "Assignment to HUD sent for recording/Servicer files CT 22 form 27011" on the timeline will need to be completed to produce this date.
asgnmnt_rcrd_dt	Date	10	Assignment Recorded Date - HECM	hermit_case_detail	The date the title has been recorded to HUD. The step "Recorded Assignment Received" on the timeline will need to be completed to produce this date.
asgnmnt_rcrd_fy	Int32	4	Assignment Recorded Fiscal Year	Calculated	The fiscal year that the title has been recorded to HUD. It is calculated from the asgnmnt_rcrd_dt field.
borr_brth_dt	Date	10	Borrower Date of Birth - HECM	Hermit-case detail	Date of birth of the youngest borrower.
borr_dth_dt	Date	10	Borrower Date of Death - HECM	hermit-case detail	Death date of the youngest borrower.
borr_gender	V_String	13	Borrower Gender	idb_1	This code indicates the gender of the primary borrower who will be the legal property owner at the time of insurance. Values: 1 = Male; 2 = Female; 0 = Information not collected from or provided by applicant.
borr_incm_cat	Int16	2	Borrower Income Category	idb_1	Derived value based on the Total Annual Effective Income (tot_ann_eff_incm). Values: 0 = 1–14,999; 1 = $15,000–19,999; 2 = $20,000–24,999; 3 = $25,000–29,999; 4 = $30,000–34,999; 5 = $35,000–39,999; 6 through 77 are in $4,999 increments; 78 = > $400,000; 99 = the "tot_ann_eff_incm" is zero (0) or does not have a value.
tot_mnthly_eff_incm	Int32	4	Total Monthly Effective Income	idb_1	Represents the total monthly income for all borrowers, including base pay, other earnings, and net income from real estate. Source: Form HUD-92900-PUR, line 13f, or form HUD-92900-WS, line 11f.
tot_ann_eff_incm	Int32	4	Total Annual Effective Income	idb_1	Represents the total annual income for all borrowers, including base pay, other earnings, and net income from real estate. Source: Form HUD-92900-PUR, line 13f, or form HUD-92900-WS, line 11f.
Borrower_Age	Int32	4	Borrower Age at Endorsement	Calculated	Subtracted the borrower's date of birth from the date of HECM endorsement.
Borrower_Death_Age	Int32	4	Borrower Age at Death	Calculated	Subtracted the borrower's date of birth from the date of borrower's death.
Age_of_HECM_at_Death	Int32	4	Age of HECM at Death	Calculated	Subtracted the HECM endorsement date from the date of borrower's death.
ClaimType24	Byte	1	Supplemental Claim Used	Calculated	Identified if a supplemental claim was listed in hermit_case_detail for a given HECM.
clm_typ	Int16	2	Claim Type - HECM (excluding Supplemental Claims)	hermit_claim_detail	A 2-digit identifier that identifies the Claim Type. Values: 20 = Demand Assignment; 21 = Foreclosure / Deed in Lieu; 22 = Optional Assignment; 23 = Mortgagor's Short Sale.
claim_date	Date	10	Claim Approved Date - HECM	hermit_claim_detail	Renamed "clm_aprvd_dt" for the claim the "clm_typ" field identifies, which is the loan settlement date populated on the Advice of Payment.
coborr_brth_dt_1	Date	10	Co-Borrower Date of Birth - HECM	hermit_case_detail	Date of birth of the co-borrower.
coborr_dth_dt_1	Date	10	Co-Borrower Date of Death - HECM	hermit_case_detail	Date of death of the co-borrower.
Coborrower_Age	Int32	4	Co-Borrower Age at Endorsement	Calculated	Subtracted the co-borrower's date of birth from the date of HECM endorsement.
Coborrower_Death_Age	Int32	4	Co-Borrower Age at Death	Calculated	Subtracted the co-borrower's date of birth from the date of borrower's death.
coborr_brth_dt_2	Date	10	Co-Borrower 2 Date of Birth - HECM	hermit_case_detail	Date of birth for second co-borrower.
coborr_brth_dt_3	Date	10	Co-Borrower 3 Date of Birth - HECM	hermit_case_detail	Date of birth for third co-borrower.
coborr_brth_dt_4	Date	10	Co-Borrower 4 Date of Birth - HECM	hermit_case_detail	Date of birth for fourth co-borrower.
coborr_dth_dt_2	Date	10	Co-Borrower 2 Date of Death - HECM	hermit_case_detail	Date of death for second co-borrower.
coborr_dth_dt_3	Date	10	Co-Borrower 3 Date of Death - HECM	hermit_case_detail	Date of death for third co-borrower.
coborr_dth_dt_4	Date	10	Co-Borrower 4 Date of Death - HECM	hermit_case_detail	Date of death for fourth co-borrower.
bldg_typ	V_String	1	Building Type	idb_2	Indicates the type of dwelling structure. Values: A = Attached; C = Condo; D = Detached; G = Garden; H = Highrise; L = Low-rise; M = Midrise; O = Other; R = Row/Townhouse; S = Semidetached/End Unit; 4= Condo; 5 = Attached; 6= Garden; 7= Midrise; 8 = Highrise; 9 = Other; 0= To Be Determined. This data element is populated from the appraisal.
condo_ind	V_String	1	Condo Indicator	idb_1	Indicates if the ADP Codes are used for condominiums. Values: Y = Yes; N = No.
cs_nbr_asgnd_dt	Date	10	Case Number Assigned Date - HECM	hermit_case_detail	The date that HUD assigns the case number.
cs_sub_sts	V_String	10	Case Sub Status - HECM	hermit_case_detail	A code or character value that reflects the current case sub-status of a particular loan. This data element can be used in place of the Termination Code (trmntn_cd) and the Termination Type (trmntn_typ).
endrsmnt_dt	Date	10	Endorsement Date - HECM	hermit_case_detail	The date HUD endorses (issues certificate of insurance for) the loan and notifies the lender.
endrsmnt_fy	Int32	4	Endorsement Fiscal Year - HECM	hermit_case_detail	Derived from the Endorsement Date (endrsmnt_dt)
fips_cnty_cd	V_String	3	FIPS County Code	idb_1	Three-digit FIPS code that identifies the county location of the property.
fips_st_cd	V_String	2	FIPS State Code	idb_1	Two-digit FIPS code that identifies the state location of the property and is determined during geocoding.
hecm_assets	Int32	4	HECM Assets	hermit_case_detail	Associated with HECM loan and borrower screen. Indicates whether total assets available are adequate for closing.
hecm_re_assets	Int32	4	HECM Real Estate Assets	hermit_case_detail	Required entry that must be equal to or greater than Property Value. Total value of real estate assets. Range is $000001–999,999.
hecm_re_debts	Int32	4	HECM Real Estate Debts	hermit_case_detail	Optional entry that if entered, must be equal to or greater than Existing Liens entered. Total amount of real estate assets. Range is $000001–999,999.
tot_assets	Int32	4	Total Borrower Assets Available for Closing	idb_1	Total value of liquid assets available to complete the closing at settlement.
init_prncpl_lmt	FixedDecimal	14	Initial Principal Limit - HECM	hermit_case_detail	Initial principal limit established on the loan at closing. It is the present value of loan proceeds that are available to the borrower.
loan_prps_10_yr_lock_ind	V_String	1	Loan Purpose 10 Year Lock Indicator - HECM	hermit_case_detail	Ten-year rate locked indicator. Values: Y = Yes; N = No.
loan_prps_frwd_pymt_ind	V_String	1	Loan Purpose Forward Payment Indicator - HECM	hermit_case_detail	HECM loan purpose indicator to extinguish forward mortgage. Values: Y = Yes; N = No.
loan_prps_imprvmnt_ind	V_String	1	Loan Purpose Improvement Indicator - HECM	hermit_case_detail	HECM loan purpose indicator for home improvement. Values: Y = Yes; N = No.
loan_prps_incm_ind	V_String	1	Loan Purpose Income Indicator - HECM	hermit_case_detail	HECM loan purpose indicator for additional income. Values: Y = Yes; N = No.
loan_prps_insrnc_ind	V_String	1	Loan Purpose Insurance Indicator - HECM	hermit_case_detail	HECM loan purpose indicator for payment of insurance. Values: Y = Yes; N = No.
loan_prps_leisure_ind	V_String	1	Loan Purpose Leisure Indicator - HECM	hermit_case_detail	HECM loan purpose indicator for leisure. Values: Y = Yes; N = No.
loan_prps_medcl_ind	V_String	1	Loan Purpose Medical Indicator - HECM	hermit_case_detail	HECM loan purpose indicator for medical. Values: Y = Yes; N = No.
loan_prps_othr_ind	V_String	1	Loan Purpose Other Indicator - HECM	hermit_case_detail	HECM loan purpose indicator for other reasons. Values: Y = Yes; N = No.

Field Name	Type	Size	Attribute Name	Data Source	Description
loan_prps_taxes_ind	V_String	1	Loan Purpose Taxes Indicator - HECM	hermit_case_detail	HECM loan purpose indicator for payment of taxes. Values: Y = Yes; N = No.
loan_prps_text	V_String	25	Loan Purpose Text - HECM	hermit_case_detail	User entered explanation of why Other is checked for HECM Loan Purpose.
loan_term	Int16	2	Loan Term - HECM	hermit_case_detail	Current loan term (number of months that the monthly payments will be made). This field is required if the payment plan type has a value of 01 (Term) or 04 (Term and LOC). HUD-provided HECMOD software calculates loan term.
loan_typ	V_String	2	Loan Type - HECM	hermit_case_detail	The current loan type the borrower selects. This code indicates the type of payment plan set up for a loan. Values: 01 = Term; 02 = Line of Credit (LOC); 03 = Tenure (TEN); 04 = Term and LOC (TMLC); and 05 = Tenure and LOC (TNLC). Note: Effective November 2012, the value 06 = Lump Sum (LSUM) is no longer valid.
latitude	V_String	10	Latitude	idb_1	Geographical latitude of the property, blank if address does not geocode using Census 2010.
longitude	V_String	11	Longitude	idb_1	Geographical longitude of the property, blank if address does not geocode using Census 2010.
Marriage_Assumption	String	4	Assumption of Borrower and Co-Borrower Marriage	Calculated	TRUE if the borrower and co-borrower ages are within 20 years of each other. This field is blank for all others.
max_clm_amt	FixedDecimal	15	Maximum Claim Amount - HECM	hermit_case_detail	Maximum claim amount insured for each loan. This field is updated only by CHUMS/F17.
prop_addr_city	V_String	28	Property Address City	hermit_case_detail	City in which the insured property is located.
prop_addr_st	V_String	2	Property Address State	hermit_case_detail	Official alphabetic two-character U.S. Postal Service state abbreviation for the property location associated with a FHA mortgage insurance application.
prop_addr_strt	V_String	100	Property Address Street 1 - HECM	hermit_case_detail	Street address (line 1) of the property.
prop_addr_zip_5	V_String	5	Property Address Zip Code	hermit_case_detail	ZIP Code where the property is located.
Principal_Limit_Factor	Double	8	Principal Limit Factor	Calculated	Calculated by dividing the Initial Principal Limit field (init_prncpl_lmt) by the Maximum Claim Amount field (max_clm_amt).
prprty_aprsl_vl	FixedDecimal	14	Appraisal Amount - HECM	hermit_case_detail	FHA appraisal amount for the property. This field is updated only by CHUMS.
trmntn_fy	Int32	4	Termination Fiscal Year	Calculated	Fiscal year of the HECM loan termination.
Race	V_String	16	Borrower Race	Calculated	Uses borrower race indicator field to populate the following values: White, Black, Asian, American Indian, Hawaiian, more than one race, and not disclosed.
Ethnicity	String	18	Borrower Ethnicity	Calculated	Uses borrower race indicator field for Hispanic to populate the following values: Hispanic or Latino; Not Hispanic or Latino.
borr_race_not_dsclsd_ind	V_String	1	Borrower Race Not Disclosed Indicator	idb_1	One character indicator that reflects that the borrower chose not to disclose some or all of their ethnicity, race, or gender. Values: Y = Yes; N = No.
White	V_String	1	Borrower Race White Indicator	idb_1	One-character indicator that reflects the borrower disclosed they are White. Value: Y = Yes.
AmericanIndian	V_String	1	Borrower Race American Indian Indicator	idb_1	One-character indicator that reflects the borrower disclosed they are American Indian. Value: Y = Yes.
Asian	V_String	1	Borrower Race Asian Indicator	idb_1	One-character indicator that reflects the borrower disclosed they are Asian. Value: Y = Yes.
Black	V_String	1	Borrower Race Black Indicator	idb_1	One-character indicator that reflects the borrower disclosed they are Black. Value: Y = Yes.
Hawaiian	V_String	1	Borrower Race Hawaiian Indicator	idb_1	One-character indicator that reflects the borrower disclosed they are Hawaiian. Value: Y = Yes.
Hispanic	V_String	1	Borrower Race Hispanic Indicator	idb_1	One-character indicator that reflects the borrower disclosed they are Hispanic or Latino. Value: Y = Yes.
Claim_FY	Int32	4	Fiscal Year of Claim	Calculated	Fiscal year that the identified nonsupplemental claim occurred that is calculated from the claim date field.
Loan_Duration_Only_Terminated	Double	8	Months that HECM was Active Prior to Termination	Calculated	Calculated the months the HECM was active before it terminated.
Loan_Duration_Including_Active	Double	8	Months that HECM was Active as of Sept. 30, 2020 or Prior to Termination	Calculated	Calculated the months the HECM was active as of September 30, 2020, or the months the HECM was active before it terminated, whichever applies.
Status_End_FY2020	String	20	HECM Status as of Sept. 30, 2020	Calculated	Uses the information if a claim, termination, or assignment exists to produce the following values: “Active Not Assigned,” “Terminated No Claim,” “Terminated FCL or SS,” “Assigned to HUD,” and “Other Claim Active.”
appl_rcvd_dt	Date	10	Date Application Received/Case Number Issued	hermit_case_detail	Date the FHA mortgage insurance application was assigned a case number. Formatted as MM/DD/YYYY and is user entered.
int_rt	FixedDecimal	9.3	Interest Rate - HECM	hermit_case_detail	Mortgage interest rate at closing.
hecm_children	Int16	2	HECM Children	hermit_case_detail	Optional entry used to report number of children borrower(s) claim(s) as dependents.
acq_cost_to_hud	Int32	4	Acquisition Cost to HUD	idb_1	Amount of insurance benefits HUD pays to a lender in exchange for a mortgage note or property. Note: As HUD approved, if the range value is below -550,000 or above 550,000, the value is set to 0 (zero). Updated November 2011.
curr_mnthly_mip	FixedDecimal	12.2	MIP Monthly Amount - Current	idb_1	Annual insurance premium amount due on the next anniversary of the mortgage divided by 12. The amount is calculated in accordance with the original amortization provisions of the mortgage, without considering delinquent payments, prepayments, agreements to postpone payments, or assessments to recast the mortgage. Source: Calculated; MIP is the product of average unpaid principal balance and insurance premium rate.
dspstn_dt	Date	10	Property Disposition Date	idb_1	Date on which a HUD-owned property was sold or disposed of. Note: Due to the delay in reporting disposition data between SAMS/A80S and SFIS/A43, this column is updated each month with data from the dspstn_clsng_dt in sams_case_record when the dspstn_dt is null, and a matching case number exists between the two tables.
dspstn_dt_fy	Int32	4	Property Disposition Date - Fiscal Year	idb_1	Fiscal year in which a HUD-owned property was sold or disposed of. Fiscal year is formatted as YYYY.
dspstn_typ	Int16	2	Property Disposition Type	idb_1	Code to identify disposition of property. Values: 00 = Unsold Property; 11 = FHA-Insured Mortgage; 12 = VA-Guaranteed Mortgage Sale; 14 = Bulk Sale; 16 = Cash Sale (Noninsurance); 24 = Urban Homestead Mortgage; 27 = Purchase Money Mortgage Sale; 99 = Sold Property. Note: Due to the delay in reporting disposition data between SAMS / A80S and SFIS / A43, this column is updated each month with data from the sales_typ in sams_case_record. Because the data types are different, the following conversion is performed: When curr_step > 8 and sales_typ is IN then dspstn_typ = 11; when curr_step > 8 and sales_typ is UI then dspstn_typ = 16; when curr_step > 8 and sales_typ is DR then dspstn_typ = 99; and when curr_step < 9 and dspstn_typ = 0 then dspstn_typ = 00.
dt_acq	Date	10	Property Acquisition Date	idb_1	Date on which the insured assigns a defaulted note to HUD or HUD acquires the property title.
fma_dt_deed_in_lieu	Date	10	Deed in Lieu Date	idb_1	Date that the borrower offered the deed in lieu of foreclosure and the lender accepted the deed to the property as payment for the mortgage default.
hsng_pgm_cd	V_String	1	Housing Program Code	idb_1	Type of FHA single-family housing program, including FHA Standard Mortgage Program (203b): Basic FHA mortgage insurance for one- to four-family housing; Condominium (234c): FHA mortgage insurance for a unit in a condominium building that must contain at least four dwelling units; Improvements (203k): FHA mortgage insurance for a loan that covers both the acquisition and rehabilitation of a home; Home Equity Mortgage (255): FHA insurance on a reverse mortgage (HECM) for a home; Urban Renewal (220): FHA mortgage insurance for new or rehabilitated housing in a designated urban renewal area or area with concentrated programs of code enforcement and neighborhood development; HOPE for Homeowners (257): FHA mortgage insurance for a distressed loan refinanced under the HOPE for Homeowners program; and Other: Less common FHA single-family housing program (235(r) Homeownership Assistance/Refinance or 240 Fee Title Purchases). Values: A = HECM non-condo (cases assigned on/after 09/30/2013); B = HECM condo (cases assigned on/after 09/30/2013); C = Condominium (203b); D = HECM Saver Condo (cases assigned prior to 09/30/2013); E = HECM Condo (255) (cases assigned prior to 09/30/2013); F = FHA Standard (203b); H = HECM not Condo (cases assigned prior to 09/30/2013); I = HECM Saver not Condo (cases assigned prior to 09/30/2013); K = Improvements (203k); L = Improvements Condo (203k); O = Other; U = Urban Renewal (220); V = H4H not Condo (257); W = H4H Condo (257); Space = inactive ADP Codes.
insrnc_status_cd	V_String	1	Insurance Status Code	idb_1	Status of the FHA insurance. Values: A = Active; C = Terminated with Claim; T = Terminated, No Claim. A NULL value will be reported if A43 does not have the case, including HECMs, pipeline, and endorsed cases not on A43 but reported in F17 or F42. A case can be terminated then reactivated. The term_typ_cd and term_dt fields could contain values, and the insrnc_status_cd would be A for active.
insured_time	Int16	2	Mortgage Duration-Months (Endorse Until Terminate)	idb_1	Number of months between endorsement and termination of the mortgage loan.

Field Name	Type	Size	Attribute Name	Data Source	Description
loss_mit_cost_to_hud	FixedDecimal	14.2	Loss Mitigation Cost to HUD	idb_1	Total amount HUD pays on a loss mitigation claim to a lender. If the claim status code (clm_sts_cd) in the loss mitigation data is a 1 or 2, then the amount paid (amt_pd) is summed and reflected in this column. Comprised of incentive fee and, depending on loss mitigation tool, applicable and allowable expenses. Multiple occurrences of a case can exist in the loss mitigation data. Please reference the loss mitigation Sybase table in the Claims Datamart. Note: The A43CPMF data are used for this column.
mort_excld_fncd_mip	Int32	4	Mortgage Excluding Financed MIP	idb_1	Mortgage amount excluding financed MIP.
p_l_amt	Int32	4	Profit or Loss on Sale of HUD Property	idb_1	Calculated amount of profit or loss resulting from the sale of a HUD property. Equation A43 to calculate the profit or loss is Sales Price - [Acquisition Cost + Capital Income/Expense (rent and miscellaneous, repair costs, taxes, M&O expenses, sales expenses)] = P&L. A negative amount indicates a loss. Note: This column is identical to p_l_amt on the sf_actuarial table, with the exception that a positive amount indicates a loss. The idb_1 value may be 1 month behind due to the table refresh cycle.
pr_mnthly_mip	FixedDecimal	12.2	MIP Monthly Amount - Prior	idb_1	The annual amount of MIP due on the previous anniversary of the mortgage divided by 12. Source: Moved from Current Annual MIP when a new one is generated.
prc_excl_clsng_amt	Int32	4	Contract Sales Price Excluding Closing Costs	idb_1	Property sales price excluding closing costs. Note: As HUD approved, if the range value exceeds 1,500,000, the value is set to 0 (zero). Note: If the case is a refinance, (rfnc_nd = 'Y') this column will not have a value. Updated April 2007.
prc_incl_clsng_amt	Int32	4	Contract Sales Price Including Closing Costs	idb_1	Property sales price including closing costs. Note: As HUD approved, if the range value exceeds 1,500,000, the value is set to 0 (zero). Updated April 2007.
prem_rt	FixedDecimal	9.6	Premium Rate	idb_1	MIP or insurance charge annual percentage rate that HUD charges institutions to insure their loans. Derived from table. Note: Premiums are not charged on all cases. See single-family below market interest rate section change table for non billable sections. The following notes are general comments. Exceptions are listed in FRS and edit tables. Single-family premiums are a percentage of average scheduled unpaid principal balance of the year except for open-ended advances.
soa_cd	V_String	4	SOA Code	idb_1	Section of the Act Code. One or more ADP Codes are grouped under a SOA. Drilling down By Value Description will result a list of SOA Codes and their descriptions. Active Values: 203B = Mutual Mortgage; 203K = Improvements - First Lien; 203M = MM-Seasonal Housing; 203N = Cooperative - Individual Unit; 213 = Cooperative - Sales-Type Releases; 220 = Urban Renewal; 220H = Improvement; 221 = Low Cost; 221D = Low Cost; 221H = Low Cost; 221I = Low Cost - Condo Conv/BMR; 222 = Servicemen; 225 = Credit Risk-Condo Conv/BMR; 233 = Experimental; 233A = Experimental; 234C = Condominium; 235I = Homeownership Assistance; 235J = Homeowner Assist/Rehab; 235R = 235 Refinance; 237 = Credit Risk; 238C = Military Impact Area; 240 = Fee Simple Title; 244 = MM-Coinsur/Sect Not Spec; 245A = Mutual Mortgage; 245B = Mutual Mortgage; 255 = HECM; 257 = HOPE For Homeowners; 809 = Armed Forces; 810 = Armed Forces; Inactive Values: 002 = Inactive; 008 = Inactive; 603 = Inactive; 604 = Inactive; 605 = Inactive; 606 = Inactive; 607 = Inactive; 611 = Inactive; 903 = Inactive. Note: Disaster Housing (203(h)) can be identified using criteria soa_cd = 203B and prog id f17 = 2.
term_dt	Date	10	Insurance Termination Date	idb_1	Date lender terminated or canceled the insurance. Used to calculate refunds or premiums due, distributive shares, dividends due (if applicable). For single-family cases, this date represents the date through which premiums have been paid or are due. Formatted as MM/DD/YYYY. Note: If the insurance status code (insrnc_status_cd) is C for a claim, then it represents the date the property was conveyed or assigned to the Secretary or the settlement date for the preforeclosure sale. Note: For audit purposes, A43 retains the termination date when the insurance status has been re-activated. If the A43 extract provides a date in this data element, and the insrnc_status_cd = 'A', the data value that is set to null in the SFHEDW. Effective July 2009.
term_typ_cd	V_String	2	Termination Type Code	idb_1	Mortgage Insurance Termination Type Code identifies categories of insurance terminations. Used as a factor in selecting eligible cases for distributive shares. Only paid-in-full, matured, voluntary, and supercession cases are eligible for distributive shares. Values: 11 = Paid in Full; 12 = Supercession; 13 = Nonconveyance Foreclosure (withdrawal); 14 = Cancellation; 15 = Conveyance of Title for Insurance Benefits; 17 = Correction Cancellation; 18 = Matured Loans; 19 = Assignment of Note for Insurance Benefits; 20 = Conversion Title for Assigned Note; 21 = Voluntary Termination of Insurance by Lender; 22 = Refinance; 23 = Netting Refinance; 24 = Coinsurance Claim; 25 = Nonconveyance Claim; 28 = Generated 27050B (Old 2042). A case can be terminated then reactivated. The insrnc_status_cd reflects an A for active.
tot_clsng_csts	Int32	4	Total Closing Costs	idb_1	Beginning June 2008, these data are no longer collected on forward mortgages in response to ML 2008-15. These data are collected for HECM mortgages. Total legal and miscellaneous fees associated with the acquisition of the property or the refinancing of mortgages reported on the HUD-1 Settlement Sheet. These costs include FHA fees, lenders service charge, cost of appraisals and inspections, title search, preparation of the deed, mortgage tax, recording fees, and such other reasonable and customary charges as may be authorized. This data element is used in calculating value plus closing.
ufmip_amt_due	FixedDecimal	12.2	UFMIP Amount Due	idb_1	The amount of upfront insurance premium that HUD computes (F17 CHUMS system) that must be remitted by a mortgagee before a case can be endorsed. Note: As HUD approved, if the range value exceeds 10,000, the value is set to 0 (zero).
ufmip_earned_curr_mm	FixedDecimal	12.2	UFMIP Earned by HUD for Current Month	idb_1	The amount of upfront premium HUD earns for the current month. Source: Calculated; the monthly amount earned is the mortgage amount * (Last month's unearned premium factor - this month's unearned premium factor). Note: This database name was misnamed when added to the database in 1985 and should be named GHAS-PRE-CURR-MO-MIP.
unpd_bal	FixedDecimal	14.2	Unpaid Balance	idb_1	Unpaid balance is system generated each month during the billing run for each active case on HUD's database with a past beginning amortization date. For the first month, the unpaid balance is equal to the original mortgage amount (orig_mrtg_amt). Note: As approved by HUD, if the range value exceeds 1,500,000, the value is set to 0 (zero).
Ever_Defaulted_	Int64	8	Indicator that HECM Ever Defaulted	Calculated	Indicator derived from HECM default data received from HUD's Office of Policy Development and Research that indicates whether a HECM loan ever defaulted.
mndtry_oblgtns_amt	Int32	4	Mandatory Obligations Amount - HECM	hermit_case_detail	Fees and charges incurred in connection with mortgage origination that were paid at closing (that is, initial upfront mortgage insurance premium, loan origination fee, HECM counseling, and so on).
msa_cd_5	V_String	5	MSA Code (5-digit)	idb_1	Five-digit codes for MSA and MSD as defined by OMB and in use since 2004.
Appraisal_2019	Double	8	Appraisal Amount in 2019 Dollars	Calculated	Appraisal Amount field adjusted to 2019 dollars.
Appraisal_2019_SQ	Double	8	Appraisal Amount in 2019 Dollars by Square Foot	Calculated	Appraisal Amount field adjusted to 2019 dollars divided by the collateral property's square footage.
Sum_Unsched_draws_5Y	Double	8	Sum of Unscheduled Draw Amounts in the First Five Years of the HECM Loan	Calculated	Calculated sum from transactions recorded in the hermit_transactions_balance data table that were unscheduled draws within 5 years of the HECM loan's closing date.
Unsched_1k_draw_5Y	Int16	2	Number of Unscheduled Draws in the First Five Years of the HECM Loan	Calculated	Calculated total unscheduled transactions from transactions recorded in the hermit_transactions_balance data table draws within 5 years of the HECM loan's closing date.
Sum_Unsched_draws_4Y	Double	8	Sum of Unscheduled Draw Amounts in the First Four Years of the HECM Loan	Calculated	Calculated sum from transactions recorded in the hermit_transactions_balance data table that were unscheduled draws within 2 years of the HECM loan's closing date.
Unsched_1k_draw_4Y	Int16	2	Number of Unscheduled Draws in the First Four Years of the HECM Loan	Calculated	Calculated total transactions from transactions recorded in the hermit_transactions_balance data table that were unscheduled draws within 4 years of the HECM loan's closing date.
Sum_Unsched_draws_3Y	Double	8	Sum of Unscheduled Draw Amounts in the First Three Years of the HECM Loan	Calculated	Calculated sum from transactions recorded in the hermit_transactions_balance data table that were unscheduled draws within 3 years of the HECM loan's closing date.
Unsched_1k_draw_3Y	Int16	2	Number of Unscheduled Draws in the First Three Years of the HECM Loan	Calculated	Calculated total transactions from transactions recorded in the hermit_transactions_balance data table that were unscheduled draws within 3 years of the HECM loan's closing date.
Sum_Unsched_draws_2Y	Double	8	Sum of Unscheduled Draw Amounts in the First Two Years of the HECM Loan	Calculated	Calculated sum from transactions recorded in the hermit_transactions_balance data table that were unscheduled draws within 2 years of the HECM loan's closing date.
Unsched_1k_draw_2Y	Int16	2	Number of Unscheduled Draws in the First Two Years of the HECM Loan	Calculated	Calculated total transactions from transactions recorded in the hermit_transactions_balance data table that were unscheduled draws within 2 years of the HECM loan's closing date.
Sum_Unsched_draws_1Y	Double	8	Sum of Unscheduled Draw Amounts in the First Year of the HECM Loan	Calculated	Calculated sum from transactions recorded in the hermit_transactions_balance data table that were unscheduled draws within 1 year of the HECM loan's closing date.

Field Name	Type	Size	Attribute Name	Data Source	Description
Unsched_1k_draw_1Y	Int16	2	Number of Unscheduled Draws in the First Year of the HECM Loan	Calculated	Calculated total transactions from transactions recorded in the hermit_transactions_balance data table that were unscheduled draws within 1 year of the HECM loan's closing date.
Inflation_to_2019	Int32	4	Inflation Adjustment to 2019 Dollars	Calculated	Inflation rate to adjust appraisal values at time of HECM endorsement to 2019 dollars.
liv_units	Int16	2	Living Units	idb_1	Number of living units that a given property contains or will contain on completion. A living unit is defined as a house or portion, thereof, providing complete living facilities for one family.
IDB2_tot_sq_ft	Int32	4	Property Total Square Feet Living Space	idb_2	Total square footage of the property. This data element is populated from the appraisal.
lot_size	Int32	4	Lot Size	idb_2	Number of acres or the square footage of the property. This data element is populated from the appraisal.
HECM_Bias_Estimate_Percent	Double	8	Percent Estimate of HECM Loan Appraisal Bias	Calculated	Percentage difference between the appraised value per square foot of HECM collateral properties to the average appraised value per square foot of forward mortgage collateral properties in the same census tract after adjusting to 2019 dollars.
HECM_Bias_Estimate_Per_SQ_2019_D	Double	8	Estimate of HECM Loan Appraisal Bias Per Square Foot	Calculated	Difference between appraised value per square foot of HECM collateral properties and the average appraised value per square foot of forward mortgage collateral properties in the same census tract adjusted to 2019 dollars.
HECM_Overappraisal_Estimate_2019	Double	8	Estimate of HECM Loan Appraisal Bias	Calculated	Difference between the appraised value of HECM collateral properties and the average appraised value of forward mortgage collateral properties in the same census tract adjusted to 2019 dollars.
Loan_is_a_Refi	Double	8	Indicator that HECM Loan is a Refinance	Calculated	Indicator derived from HECM origination data that gauges whether a HECM loan was originated as a refinance of a previous HECM loan.
Profit_Loss_Amt	Double	8	Profit or Loss on Sale of HUD Property	Calculated	Calculated amount of profit or loss using the cash inflows and outflows for a terminated loan. All cashflows were future valued to September 30, 2020, using the Daily Treasury 1-Year Yield Curve Rates to facilitate the comparative analysis.
Profit_Loss_Amt_Future_Valued	Double	8	Future Valued Profit or Loss on Sale of HUD Property	Calculated	Calculated amount of profit or loss using the cash inflows and outflows for a terminated loan.

ADP = Automated Data Processing, CHUMS = Computerized Homes Underwriting Management System. FCL = flexible credit line. FHA = Federal Housing Administration. FIPS = Federal Information Processing Standards. FRS = Family Reporting Software HECM = Home Equity Conversion Mortgage. LOC = line of credit. MIP = mortgage insurance premium. ML = Mortgagee Letter. MSA = Metropolitan Statistical Area. MSD = Metropolitan Statistical Division. M&O = Maintenance and Operating. P&L = Profit and Loss. SOA = Section of the Act. SS = short sale. UFMIP = Upfront mortgage insurance premium. VA = U.S. Department of Veterans Affairs.

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