



U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

# ANNUAL REPORT TO CONGRESS

Regarding the Financial Status of the  
FHA Mutual Mortgage Insurance Fund

*Fiscal Year 2017*



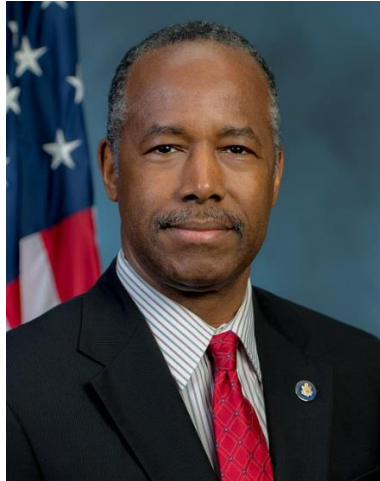


Annual Report to Congress Regarding the  
Financial Status of the Mutual Mortgage  
Insurance Fund Fiscal Year 2017

**U.S. Department of Housing and Urban Development**

**November 15, 2017**





## Secretary's Foreword

I am pleased to present the Annual Report to Congress regarding the status of the Federal Housing Administration's (FHA) Mutual Mortgage Insurance Fund (MMIF) for Fiscal Year (FY) 2017.

The MMIF Capital Ratio for FY 2017 is 2.09 percent, remaining above FHA's 2.0 percent statutory minimum. The Economic Net Worth of the MMIF is reported to be \$25.6 billion, a decrease of \$1.9 billion from FY 2016.

This year's Annual Report reflects a transition by FHA toward providing more transparency, consistency, and accountability. For example, FHA is providing a deeper examination of the financial conditions and composition of FHA-insured Single Family forward *and* reverse mortgages. This allows both policymakers and our customers to better analyze key drivers of the financial health of the MMIF.

As noted above, the MMIF Capital Ratio continues to be above the 2.0 percent statutory minimum, although it is lower than last year's revised level of 2.35 percent. While FHA's capital position is supported by positive trends in housing markets and the broader economy, it requires HUD's close attention going forward. Given FHA's total FY 2017 portfolio of approximately \$1.23 trillion of insurance-in-force, it is critical that FHA continue to closely monitor the fiscal condition of the MMIF and manage taxpayer exposure.

Among the most notable findings in this year's report is the continued negative impact of FHA's Home Equity Conversion Mortgage (HECM), or reverse mortgage program, on the economic condition of the MMIF. The stand-alone economic net worth of the HECM portfolio was negative \$14.5 billion at the end of FY 2017, resulting in a stand-alone capital ratio of negative 19.84 percent. By contrast, FHA's insured forward mortgages showed more robust performance, with a stand-alone capital ratio of 3.33 percent.

Faced with continued losses in the HECM program, this Administration took decisive action to place it on a more fiscally sound path for new endorsements. Effective October 2, 2017, FHA reduced the amount of funds that could be drawn for most new HECMs, restructured premiums, including reducing annual premiums for all new borrowers, and implemented other steps to enhance the servicing of HECMs. These changes are intended to preserve the program for future borrowers and do not impact seniors who already have a HECM. Because HECM is a historically volatile program, it will continue to require close scrutiny.

Much of our attention has also been turned to helping the victims of Hurricanes Harvey, Irma, and Maria, as well as FHA-insured borrowers impacted by the wildfires in California. These events caused widespread destruction and the dislocation of thousands of families. FHA is an integral part of HUD's response. To that end, FHA has granted an extended foreclosure moratorium, is working with lenders to help those borrowers struggling to make mortgage payments, and is coordinating with other federal agencies that play a significant role in the mortgage market. Our nation will get through these difficult times, and FHA will be there to help meet these challenges.

In addition, much important work is left to be done to reform our nation's housing finance market. HUD, through FHA and our Ginnie Mae mortgage backed securities program, plays a vital role in ensuring that creditworthy borrowers who are ready for homeownership can gain access to affordable and sustainable mortgage financing. There is an opportunity for reforms to ensure a well-functioning housing finance system for future generations that expands the role of the private sector and reduces taxpayer exposure. And, we can deliver FHA's products and programs with more efficiency and certainty for our partners and those whom we serve.

This report is an important source of information, not only for Congress, but for the American people. Our ability to fulfill our primary mission of providing sustainable homeownership opportunities can only be accomplished if we are good stewards on behalf of the taxpayers who support FHA's insurance programs. Our duty is clear: we must ensure that FHA remains financially viable so that future generations of homeowners can access affordable housing with the opportunity to build wealth and climb the economic ladder of success.

We look forward to working with Congress to ensure that our FHA program is managed prudently and meets the needs of borrowers and communities to achieve the shared goals of quality, affordable housing.



---

Ben Carson  
Secretary  
U.S. Department of Housing and Urban Development

## Table of Contents

Secretary's Foreword .....	1
Annual Report Overview .....	5
Introduction .....	5
Key Actuarial Review Highlights.....	5
Enhancements to the Actuarial Review Process.....	7
FHA Forward Mortgage Highlights.....	9
Historical Program Overview .....	9
Who FHA Serves.....	11
New Endorsement Risk Monitoring .....	11
Counterparty Risk Monitoring .....	11
Portfolio Credit Indicators.....	12
HECM Highlights - For Mortgages in the MMIF .....	13
FY 2017 Changes to Stabilize the Fiscal Condition of New HECM Endorsements .....	13
FHA HECM Mortgage Highlights .....	13
Cash Flow NPV: Meaning and Risks .....	14
A Note About FHA Loan-to-Value Ratio Reporting.....	14
Other FHA Programs and Exposures.....	15
Chapter I: FHA Single Family Mortgage and Borrower Characteristics .....	16
FHA Forward Mortgage Program: New Endorsement Trends and Composition .....	16
Forward Mortgage Program: Portfolio Overview and Credit Trends .....	31
Home Equity Conversion Mortgages (HECM) Program Overview .....	39
Home Equity Conversion Mortgages (HECM): Endorsement Characteristics .....	45
Chapter II: Condition of the Mutual Mortgage Insurance Fund .....	55
Summary .....	55
Total Capital Resources Increased in FY 2017.....	55
MMIF Capital Ratio Above 2.0 Percent but Decreased in FY 2017 .....	56
Capital Adequacy is Tested .....	56
Cash Flows From Insurance Operations Improved .....	56
New Independent Actuary for FY 2017 Confirms Baseline Projections Reasonable .....	57
Premium Decrease Impact Estimated: Would Have Moved MMIF Capital Ratio Below 2.0 Percent .....	57
MMIF Capital Ratio .....	58
Recovery in the Capital Account.....	59

Stand-Alone Capital Ratios for Forwards and HECM .....	60
Cash Flow from Insurance Operations.....	66
Capital Ratio Sensitivity to Assumptions .....	69
Comparison to Independent Actuary's Results .....	70
Capital Adequacy .....	71
Capital Adequacy Testing: Distribution of Cash Flow NPV .....	71
Capital Adequacy Testing: MMIF Capital Ratio Outcomes .....	75
Chapter III: Federal Housing Administration Objectives.....	78
Play a Significant Role in Disaster Recovery .....	78
Make Necessary Changes to the Home Equity Conversion Program (HECM) .....	79
Clarity and Consistency for Mortgagees .....	79
Implementation of the Loan Review System (LRS) .....	79
Continue Updates to the Single Family Housing Policy Handbook 4000.1 (SF Handbook) .....	80
FHA Technology Modernization.....	80
Develop FHA's Condominium Project Approval Final Rule .....	81
Appendix A: Data Tables for Annual Report Overview .....	82
Appendix B: Data Tables for Chapter I .....	84
Appendix C: Data Tables for Chapter II.....	109
Appendix D: FHA Single Family Housing Mortgagee Letters Published Fiscal Year 2017 .....	113
Appendix E: Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Forward Mortgage Insurance-in-Force.....	115
Appendix F: Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Home Equity Conversion Mortgage Insurance-in-Force .....	151

## Annual Report Overview

### Introduction

This year's *Federal Housing Administration (FHA) Annual Report to Congress: The Financial Status of the FHA Mutual Mortgage Insurance Fund* (FY 2017 Annual Report or Annual Report) reflects a transition by FHA in process, methodologies, and content toward providing more transparency, consistency, and accountability. These changes reflect FHA's commitment to enhanced disclosure on the financial condition and sustainability of its Single Family Housing (Single Family) mortgage insurance programs. The FY 2017 Annual Report also provides added insight into the economic drivers impacting the performance of the Mutual Mortgage Insurance Fund (MMIF, MMI Fund, or Fund).

### Key Actuarial Review Highlights

**Exhibit O-1: Mutual Mortgage Insurance Fund (MMIF) Capital Ratio Components**

Description	2016	2017
<b>Balances (\$ millions) as of September 30</b>		
Total Capital Resources	\$35,346	\$39,737
Plus: Cash Flow NPV	(\$7,795)	(\$14,112)
Equals: Economic Net Worth	\$27,551	\$25,625
Insurance-In-Force	\$1,170,421	\$1,226,843
<b>Balances as a Percent of Insurance-In-Force</b>		
Total Capital Resources	3.02%	3.24%
Plus: Cash Flow NPV	-0.67%	-1.15%
<b>Equals: Economic Net Worth - Capital Ratio</b>	<b>2.35%</b>	<b>2.09%</b>

- The FY 2017 MMIF Capital Ratio is 2.09 percent, exceeding the statutorily-required level of 2.00 percent.
  - This is the third-straight year it is above 2.00 percent.
  - The MMIF declined from its 2.35 percent Capital Ratio as of FY 2016.
- The Economic Net Worth totaled \$25.6 billion.
  - Economic Net Worth comprises Total Capital Resources of \$39.7 billion plus negative Cash Flow Net Present Value (Cash Flow NPV)<sup>1</sup> of negative \$14.1 billion.
  - Economic Net Worth declined by \$1.9 billion from its FY 2016 level, due to a decrease in Cash Flow NPV that more than offset an increase in Total Capital Resources.
- FHA's MMIF Insurance-in-Force (IIF) reached approximately \$1.23 trillion at the end of FY 2017.
  - IIF increased 4.8 percent from FY 2016.

**New Stand-Alone Reporting on Home Equity Conversion Mortgages (HECMs) and Forwards Provide Fiscal Insights**—FHA has provided further insight on the fiscal condition of the MMIF by estimating “stand-alone” capital resources and capital ratios for HECMS and forward mortgages.

<sup>1</sup> Cash Flow NPV is the net present value of future cash flows.

This new reporting more accurately reflects the cumulative contributions of each program to the MMIF since HECMs became part of the MMIF starting with new endorsements in FY 2009. Key findings:

- The fiscal condition of the forward mortgage portfolio is materially better compared to the HECM portfolio.
- Forward mortgage portfolio stand-alone highlights include:
  - The capital ratio for the forward portfolio is 3.33 percent.
  - The forward portfolio has a positive economic net worth of \$38.4 billion.
  - The forward mortgage portfolio contributed \$4.2 billion of Economic Net Worth to the MMIF in FY 2017.
- HECM portfolio stand-alone highlights include:
  - The capital ratio for the HECM portfolio is negative 19.84 percent, a further decline from FY 2016.
  - The HECM portfolio has an Economic Net Worth of negative \$14.5 billion.

**Impact of FHA’s Suspension of a Reduction in Annual Mortgage Insurance Premiums on the MMIF Capital Ratio**—In January 2017, a reduction in FHA forward annual Mortgage Insurance Premiums (AMIP) was announced through Mortgagee Letter 2017-01, to become effective with forward mortgage endorsements on or after January 27, 2017. This AMIP reduction was suspended before taking effect. Had the AMIP reduction taken effect as announced, FHA estimates that the MMIF Capital Ratio would have fallen below FHA’s statutory minimum Capital Ratio of 2.00 percent to 1.76 percent, resulting from a reduction in Cash Flow NPV of \$3.2 billion and an increase in IIF of \$45 billion.

**New Stress Testing Highlights MMIF Exposure**—FHA believes the assessment of capital adequacy across a range of economic environments is a critical component of evaluating future policy decisions, such as Mortgage Insurance Premium adjustments, and overall portfolio risk tolerance. This Annual Report includes new and refined stress tests of the FHA portfolio, providing insightful sensitivities on the MMIF Capital Ratio under 100 historical economic scenarios, including highly stressful periods in the housing market. Based on current forward and HECM IIF and existing Total Capital Resources, this stress testing found that:

- The MMIF Capital Ratio would remain at or above the 2.00 percent statutory minimum requirement in 79 outcomes.
- In an additional 15 outcomes, the MMIF Capital Ratio would fall below 2.00 percent but remain above zero.
- The remaining six outcomes resulted in the MMIF Capital Ratio falling below zero.
- The most severely adverse economic scenarios cause material declines in Cash Flow NPV and MMIF Capital Ratios. The beneficial effects of favorable economic scenarios are more muted.



## Enhancements to the Actuarial Review Process

FHA implemented significant enhancements to the roles, responsibilities, and methodologies as part of this year's actuarial review. Planning for these changes was initiated in FY 2014 and took effect this year. Items of note regarding this year's review include:

- **Greater Consistency with FHA Audited Financial Statements**—FHA produced the baseline estimate of Cash Flow NPV, resulting in more consistent results by harmonizing its financial and budgetary reporting. This change enabled FHA to standardize the underlying data and reporting methodologies used to produce Cash Flow NPV with those utilized to estimate the Liability for Loan Guarantees (LLG)<sup>2</sup>. In addition, Total Capital Resources and forward mortgage portfolio IIF have been conformed to amounts reported in FHA's audited financial statements for both FY 2017 and prior periods, resulting in revisions of prior period MMIF Capital Ratios ranging from one to 10 basis points.
- **Federal Credit Reform Act of 1990 (FCRA) Compliance**—The baseline estimate and related sensitivities were developed by FHA in accordance with the requirements of FCRA. The baseline estimates were developed utilizing the President's Economic Assumptions for the FY 2018 budget. All estimates of Cash Flow NPV are based on IIF as of the end of FY 2017 with no future endorsements.
- **Critical Role for Independent Actuary**—By serving as an important check on FHA's methodology and results, an independent actuarial review remains an integral part of the Annual Report. This year, the independent actuary was responsible for providing an independent assessment and opinion regarding the reasonableness of FHA's Cash Flow NPV estimate, in contrast to prior years when a financial engineering firm produced the baseline estimates, which were validated for reasonableness by an independent actuary. FHA believes this year's practice of the actuary validating and analyzing FHA-generated results is more consistent with the role of actuaries in the preparation of financial statement estimates for private sector companies.
  - Pinnacle Actuarial Resources, Inc. ("Pinnacle") is the independent actuary for this year's review. Pinnacle's reports for both Single Family Title II forward mortgages and HECMs are included in appendices E and F of this Annual Report.
  - FHA's estimates of Cash Flow NPV are well within Pinnacle's reasonable range of Actuarial Estimates, and Pinnacle's Actuarial Central Estimates for the MMIF exceed FHA's and differ by only 0.15 percent of IIF.
- **Better Alignment to Statutory Requirements**—For the purposes of calculating the MMIF Capital Ratio, as well as the stand-alone capital ratio for HECM, IIF for HECM was calculated using aggregate Unpaid Principal Balance (UPB)<sup>3</sup> versus the prior practice of

---

<sup>2</sup> Reported in FHA's annual audited financial statements contained in the *FHA Annual Management Report*.

<sup>3</sup> Unpaid Principal Balance is the current outstanding principal balance due on the mortgage loan.

using aggregate Maximum Claim Amount (MCA)<sup>4</sup>. This change better aligns to statutory requirements and the treatment of forward mortgages, and addresses the tendency of the prior methodology to overstate the HECM capital ratio when economic net worth is negative, as it is in FY 2017.

- **Impact from Recent Presidentially-Declared Major Disaster Areas Not Reflected**—The Cash Flow NPV projections for FY 2017 do not include any estimated impacts from the effects of Hurricanes Harvey, Irma or Maria, or wildfires in California. FHA anticipates future claims and losses in these areas, but at this time the expected loss from the damage caused by Hurricanes Harvey, Irma and Maria cannot be reasonably estimated.

---

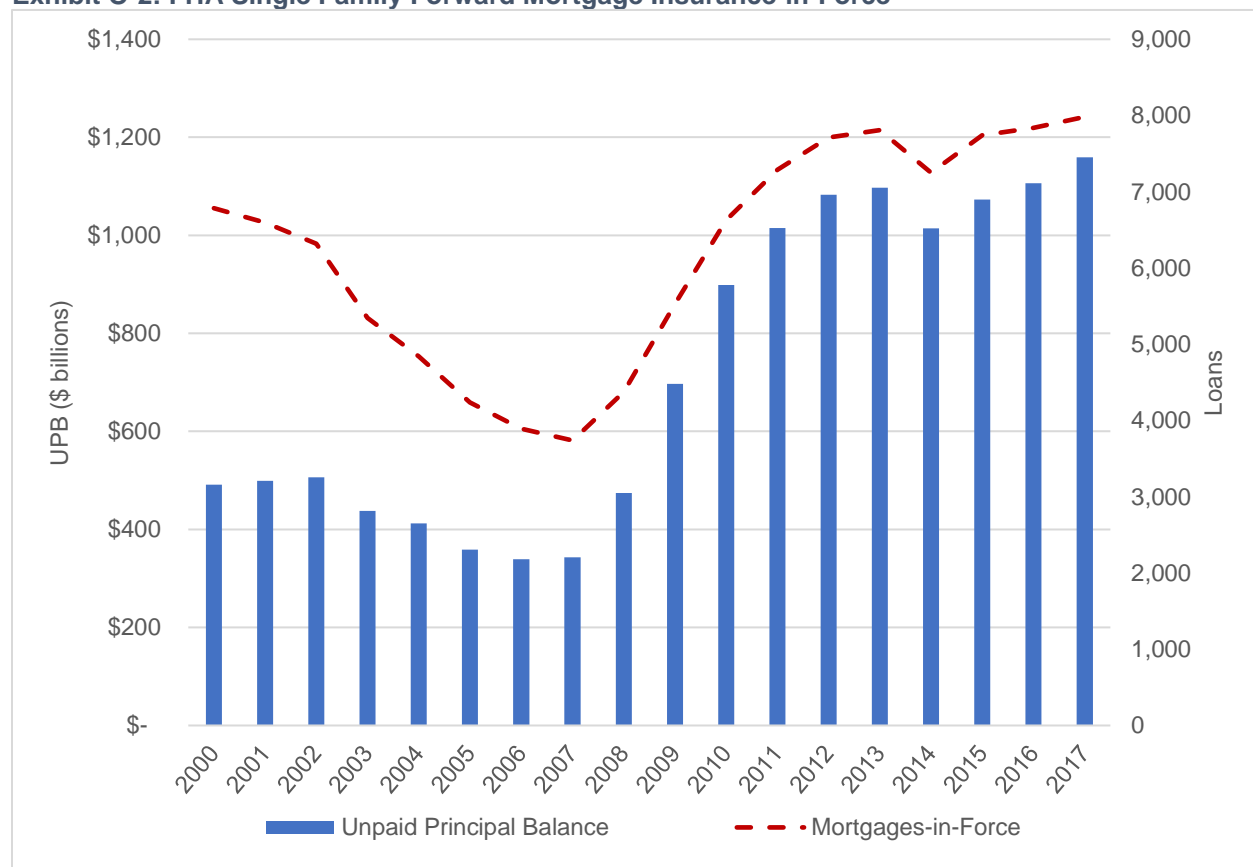
<sup>4</sup> Maximum Claim Amount is the lesser of the appraised value or purchase price of the property, but not to exceed FHA's HECM loan limit (currently \$636,150).

## FHA Forward Mortgage Highlights

### Historical Program Overview

As shown in Exhibit O-2 below, FHA's footprint in the U.S. housing finance market remains substantial, with the FHA Title II forward mortgage portfolio totaling \$1.15 trillion of IIF and comprises nearly 8 million mortgages. FHA's FY 2017 IIF increased by \$53.8 billion, an increase of 4.9 percent from FY 2016. FHA's IIF represents approximately 10.9 percent of all U.S. single-family residential mortgage debt outstanding as of June 30<sup>th</sup>, 2017, a substantial increase in the past decade from the 3.14 percent as of the end of FY 2007.

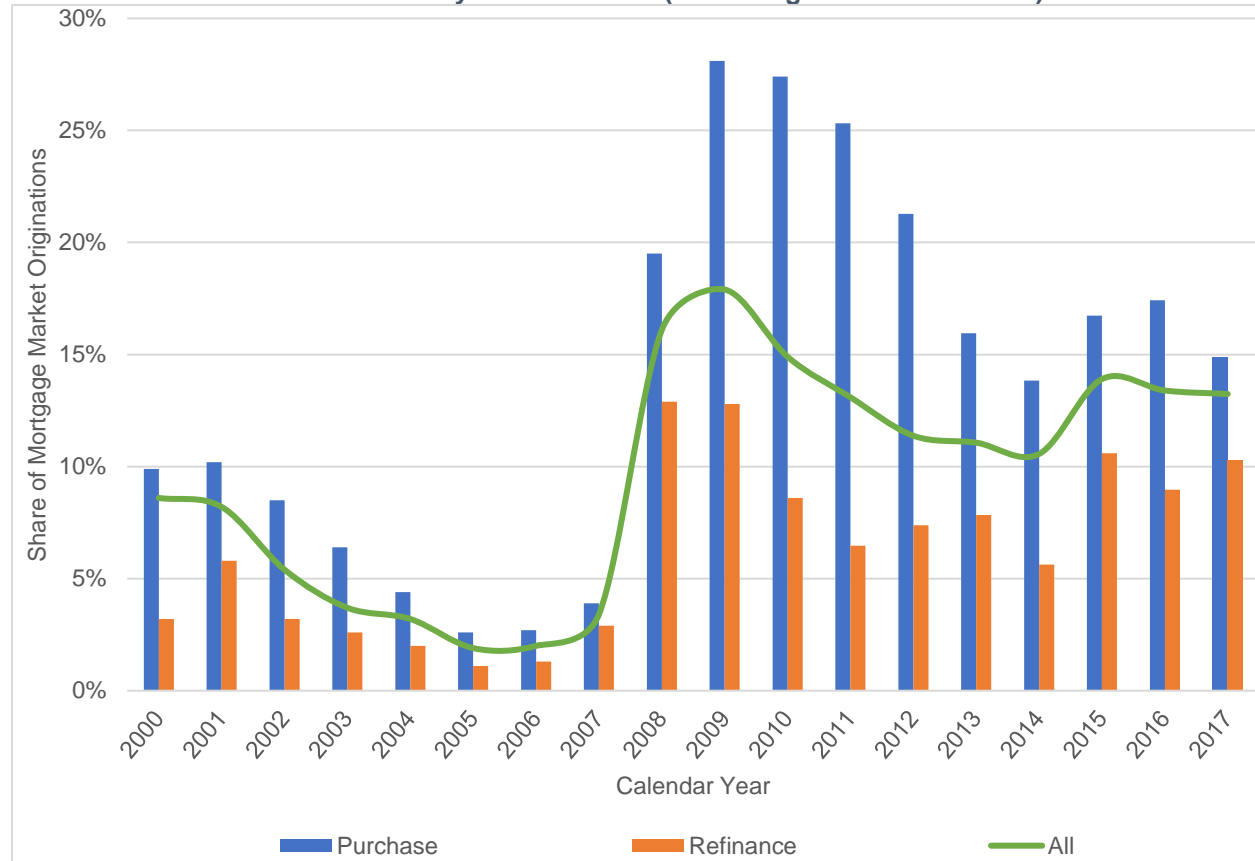
**Exhibit O-2: FHA Single Family Forward Mortgage Insurance-in-Force**



SOURCE: U.S. Department of HUD/FHA, October 2017  
Refer to data table A-1 in appendix A

The increase in FHA's IIF was driven by a significant increase in the share of the single-family residential mortgage market served by FHA in the wake of the financial crisis, as shown in Exhibit O-3. FHA played a significant countercyclical role in response to the constriction of private market mortgage credit availability.

**Exhibit O-3: FHA Share of Market by Calendar Year (Percentage of Dollar Volume)**



NOTE: Originations based on beginning amortization dates. Includes all conventional and government single family forward originations. 2017 Market Share calculated through June 30, 2017.

Source: U.S. Department of HUD as of July 31, 2017. Mortgage Bankers Association of America, "MBA Mortgage Finance Forecast," May 2017, and Corelogic TrueStandings © as of July 31, 2017.

Refer to data table A-2 in appendix A

After reaching its post-crisis peak in 2009, FHA market share steadily declined as a result of various factors including Mortgage Insurance Premium increases by FHA and a gradual return of private sources of mortgage credit. However, due to a substantial FHA Mortgage Insurance Premium reduction in January 2015, FHA's share of the purchase market increased in 2015 and the years following. This insurance premium reduction also generated a substantial increase in both FHA-to-FHA and Conventional-to-FHA refinance activity. Some of this increase in market share likely came from borrowers who, absent the premium reduction, would have otherwise been served with conventional financing.

## Who FHA Serves

FHA mortgage insurance continues to serve as an important source of mortgage credit availability and access to homeownership. Key highlights from FY 2017 endorsements:

- FHA endorsed 1,246,440 forward mortgages totaling \$251 billion in UPB.
- 882,079 forward mortgages were purchase endorsements, of which 725,233 (82.2 percent) were for first-time homebuyers.
- 33.3 percent of endorsements served minority borrowers and 56.4 percent served low-to moderate-income<sup>5</sup> borrowers.
- The average mortgage size for forward mortgages was \$201,337, an increase of 3.2 percent from FY 2016.
- The average credit score was 676, a decline from the FY 2016 average of 680.

## New Endorsement Risk Monitoring

FY 2017 forward mortgage endorsements show some potential credit risk indicators which bear monitoring, such as:

- The average debt-to-income (DTI) ratio for FHA-insured purchase mortgages was 41.9 percent, and has generally trended upward since FY 2000.
  - 49.1 percent of FHA purchase mortgages had DTI ratios greater than 43 percent.
- The share of new purchase mortgages with some form of down payment assistance was 38.4 percent.
- \$28.6 billion of new endorsements went to borrowers taking “cash out”, representing 38.9 percent of FHA refinance volume.
  - \$16.8 billion of cash-out refinance UPB served borrowers that previously had conventional financing and refinanced into a new mortgage with FHA insurance.

## Counterparty Risk Monitoring

A significant trend within FHA’s business has been reticence on the part of depository institutions to make mortgages utilizing FHA insurance, driven in part by concern with exposure arising from government enforcement practices. This market change may be adversely impacting consumer access to credit and increasing counterparty risk to both FHA’s Single Family insurance programs and Ginnie Mae. This trend is evidenced by a substantial shift in endorsements by type of lender. In FY 2017, only 14.1 percent of FHA’s new endorsements came from depository lenders. In contrast, the share of new endorsements from depository institutions peaked in FY 2010 at 43.6 percent.

---

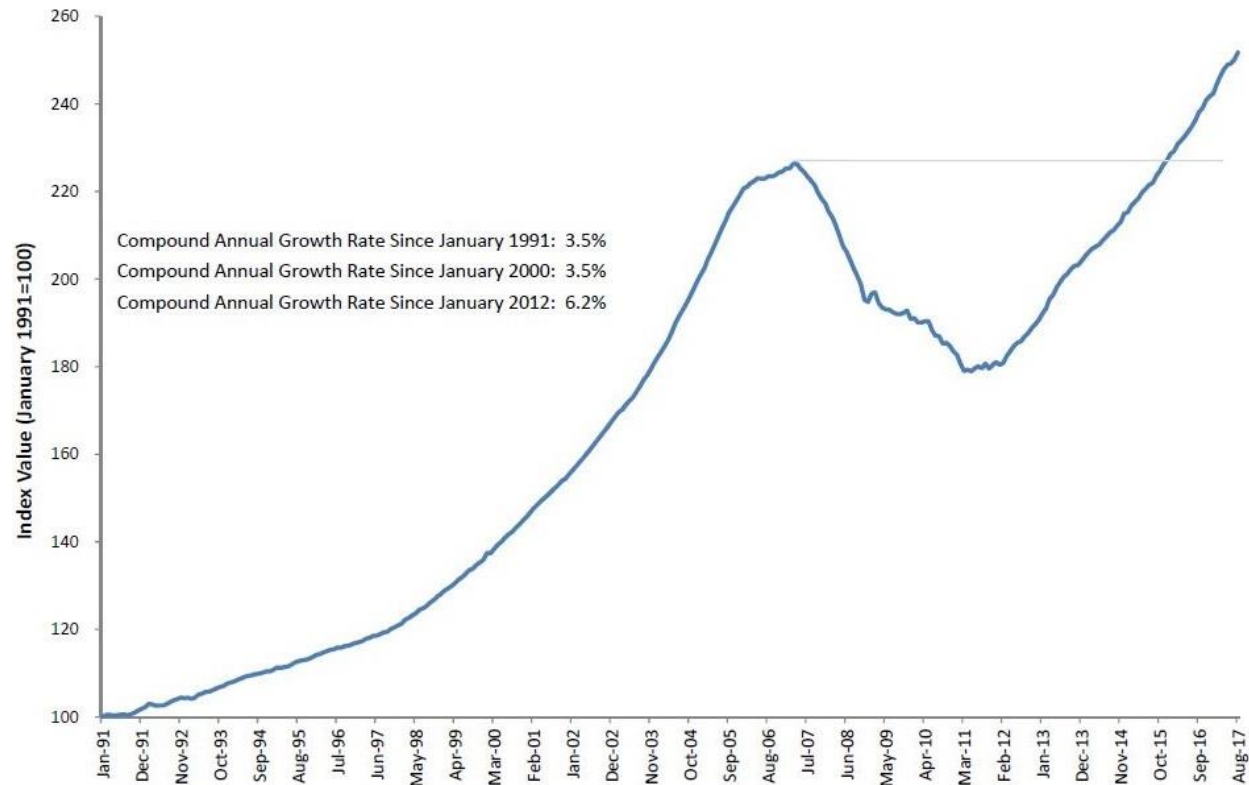
<sup>5</sup> Low- to moderate-income individuals or families refer to individuals or families whose household income does not exceed 115 percent of the median income for the area when adjusted for family size, and excludes Streamline Refinance mortgages.



## Portfolio Credit Indicators

As shown in Exhibit O-4 below, after a substantial decline resulting from the financial crisis, home price indicators have enjoyed a substantial recovery aided by low interest rates and a strengthening economy. In fact, national home price growth has been robust, averaging in excess of six percent since January 2012 as shown in the U.S. Monthly House Price Index published by the Federal Housing Finance Agency (FHFA).

**Exhibit O-4: Monthly House Price Index for U.S.**



NOTE: Purchase Only, Seasonally Adjusted Index, January 1991-Present  
 SOURCE: Federal Housing Finance Agency, October 2017

This improving economic and housing environment, combined with risk management actions taken by FHA, have resulted in favorable trends in most key FHA portfolio credit metrics. Metrics of note include:

- Early payment default rates remain relatively stable and below 0.50 percent.
- Serious delinquency rates continue to decline, ending FY 2017 at 4.32 percent, down from 4.92 percent a year ago.
- Total forward mortgage claims were \$10.7 billion in FY 2017, down \$3.7 billion from the FY 2016 level of \$14.3 billion.
- FY 2017 loss rates improved slightly to 51.5 percent, down from 54.8 percent in FY 2016. In FY 2017, 359,558 mortgages required assisted cures, down from 408,739 in FY 2016.

- Deeper assistance cures, defined as those where the borrower's monthly payment is reduced by 25 percent or more, represented 32.7 percent of total assisted cures in FY 2017.

## HECM Highlights - For Mortgages in the MMIF

### FY 2017 Changes to Stabilize the Fiscal Condition of New HECM Endorsements

As previously noted, the HECM portfolio has been a substantial economic drain since joining the MMIF beginning in FY 2009. Despite prior efforts to stabilize the program, FY 2018 endorsements were projected to continue to cause additional losses to the MMIF absent further changes. In response, FHA implemented a set of changes to premiums, PLFs and certain servicing requirements effective for new HECM endorsements beginning in FY 2018 intended to place HECM on a more fiscally sustainable path. These changes are detailed in Chapter 3. None of these changes have any effect on HECMs already insured, and therefore will have no mitigating impact on future losses from the HECM portfolio outstanding as of the end of FY 2017. The impact of these changes on new endorsements and the ongoing performance of the currently outstanding HECM portfolio will continue to be closely monitored and managed by FHA.

### FHA HECM Mortgage Highlights

The HECM program continues to serve eligible seniors with a financing option that can help them age in place. The following are key highlights from FY 2017 endorsements and the in-force portfolio:

- HECM endorsements were strong in FY 2017, with 55,291 mortgages endorsed, representing a total MCA of \$17.7 billion. These amounts represent increases of 13.1 percent and 20.3 percent over the respective amounts in FY 2016.
- Average MCA per HECM reached \$319,955 in FY 2017, a historic high for the program and a driver of the increase in total MCA endorsed.
- Average borrower age for a newly endorsed HECM slightly decreased from 75 years in FY 2016 to 74 years in FY 2017.
- The top three states for HECM endorsements, based on total MCA, were California (34.85 percent), Florida (7.25 percent), and New York (5.53 percent). HECMs are more geographically concentrated than forward mortgages.
- The HECM portfolio grew to \$73.0 billion of IIF, \$110.2 billion in total outstanding MCA, and 412,822 in endorsed mortgages.
- Claims from HECMs continued to increase in FY 2017, rising to \$5.0 billion, up from the \$4.2 billion in claims paid in FY 2016.
- As a result of rising claims, FY 2017 net cash flow from insurance operations was negative 5.07 percent of HECM average IIF.

## Cash Flow NPV: Meaning and Risks

As noted earlier, Cash Flow NPV is a critical component of Economic Net Worth and the MMIF Capital Ratio, and is calculated according to the requirements of FCRA based on a single economic scenario. As such, Cash Flow NPV does not represent the fair value that willing market participants would pay for the future net cash flows of the MMIF. According to the Congressional Budget Office, “Unlike FCRA estimates, fair-value estimates account for the cost of market risk that taxpayers face because federal payments to cover losses on guaranteed mortgages tend to be high when economic and financial conditions are poor and resources therefore more valuable.”<sup>6</sup>

When modeled across a range of economic scenarios, Cash Flow NPV demonstrates that the decrease in present value in very bad economic scenarios is substantially greater than the increase in present value in good economic scenarios. This asymmetric risk profile, generally applicable to all mortgage credit risk-bearing activity such as mortgage insurance, is evident in FHA’s capital adequacy testing results presented in Chapter 2.

In addition, estimates of Cash Flow NPV are dependent on a variety of assumptions, critical estimates, complex models, and projections for economic variables such as future national and regional home prices, and interest rates. HECM estimates present added uncertainty due to reliance on long-dated future projections of home prices and interest rates, assumptions regarding the timing and amount of borrower draws from any available credit line, mobility (the degree to which borrowers move out of the home while still living), mortality, and the impact of challenges faced by some aging seniors in the upkeep and maintenance of their homes.

## A Note About FHA Loan-to-Value Ratio Reporting

Readers of this Annual Report should note that FHA reporting of loan-to-value (LTV) ratios (the ratio of the original mortgage amount to the lesser of the purchase price or the appraised value of the property) differs from how such ratios are customarily reported in the conventional mortgage market. The key differences include:

- *Treatment of Upfront Premiums* – FHA charges an upfront Mortgage Insurance Premium (UFMIP) of 1.75 percent of the loan balance. FHA permits borrowers to finance the UFMIP by having it added to the loan balance, and nearly all FHA borrowers do so. However, despite the increase in the loan balance, FHA reporting conventions have been, and remain, to report the LTV ratio on the loan balance without inclusion of the UFMIP. In the conventional market, the custom would be to include a financed premium into the loan balance, and therefore it would be included in the calculation of the LTV ratio.

---

<sup>6</sup> Congressional Budget Office Report titled “Options to Manage FHA’s Exposure to Risk from Guaranteeing Single-Family Mortgages” dated September 2017. Excerpt is from footnote c. in Table 1 on page 3 of the report.

- *Treatment of Interested Party Contributions (IPCs)*<sup>7</sup> – IPCs are contributions made to the borrower from an interested party to the transaction, customarily the property seller. In the conventional market for a low down payment mortgage, an IPC in excess of three percent of the value of the home is treated as a reduction in the value of the home, resulting in an increase in the reported LTV ratio of the transaction. For FHA-insured mortgages, no downward adjustment is made to the value of the property until an IPC exceeds six percent of the value of the home.

The effect of these differences is that the LTV ratios on FHA-insured mortgages would be higher if reported on the same basis as customarily reported in the conventional market.

- For example, for a FHA-insured purchase transaction with an initial LTV ratio of 96.5 percent and a 1.75 percent financed UFMIP (and no IPC), the LTV ratio in the conventional market would be reported as 98.2 percent (96.5 percent plus  $0.0175 \times 96.5$  percent).
- If the same transaction also had a six percent IPC, the LTV ratio calculation would include a property value reduction of three percent. The resulting LTV ratio in the conventional market would be reported as 101.2 percent (98.2 percent divided by 0.97).

## Other FHA Programs and Exposures

This Annual Report is statutorily required to address mortgages insured in the MMIF. FHA has various other programs, including its Single Family Title I program, Multifamily and Healthcare insurance programs that are not part of the MMIF. Readers interested in a comprehensive view of all of FHA's programs, exposures and the related audited financial statements should see the FHA Annual Management Report for Fiscal Year 2017<sup>8</sup>.

---

<sup>7</sup> Interested Party Contributions may be contributed toward the borrower's origination fees, other closing costs and discount points but cannot be used for the borrower's minimum required investment (MRI) of 3.5 percent required by FHA. The Housing and Economic Reform Act of 2008 (HERA) prohibited seller-funded down payment assistance effective for loans receiving credit approval on or after October 1, 2008.

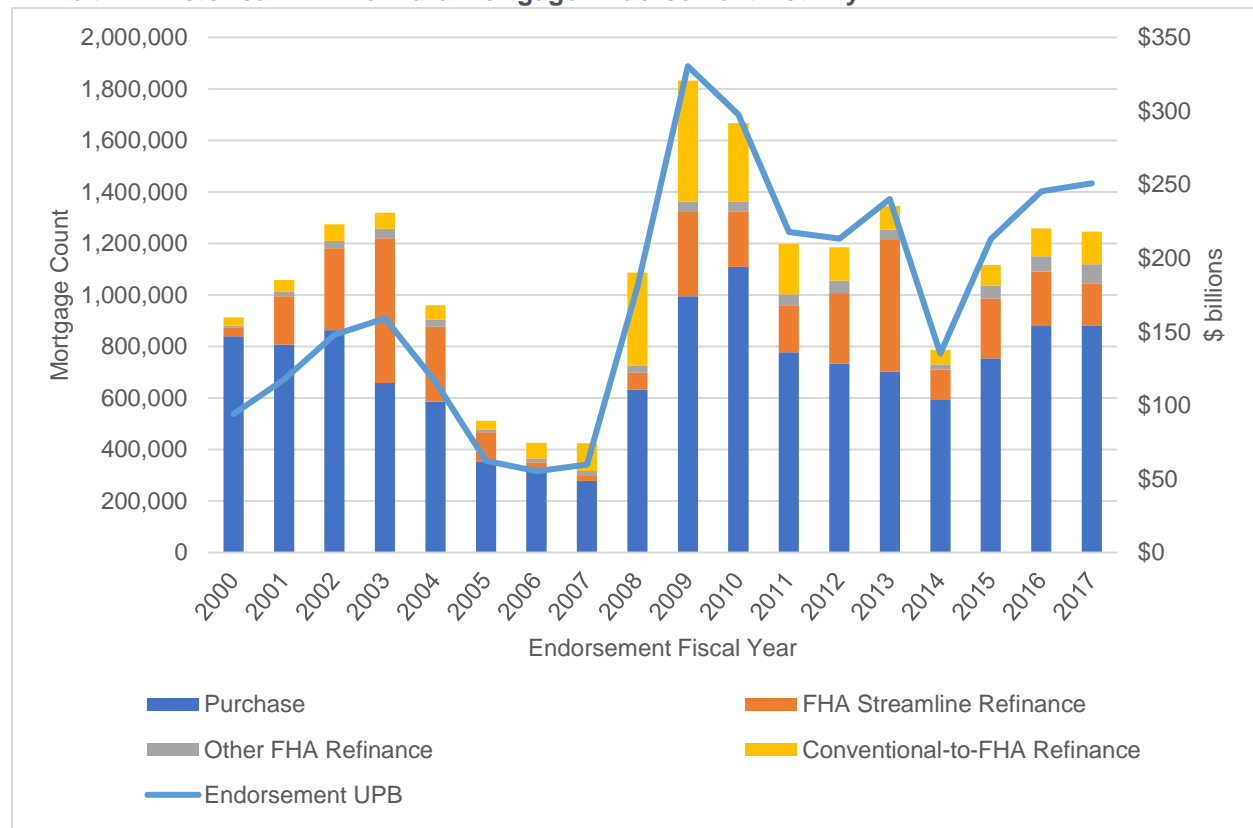
<sup>8</sup> [https://www.hud.gov/program\\_offices/housing/hsgroom/fhaamr](https://www.hud.gov/program_offices/housing/hsgroom/fhaamr)

## Chapter I: FHA Single Family Mortgage and Borrower Characteristics

### FHA Forward Mortgage Program: New Endorsement Trends and Composition

Through its Title II forward mortgage insurance programs, FHA plays an important role in the single family residential mortgage market. FHA insurance is available for mortgages to purchase a home or refinance an existing mortgage, including both fixed-rate and adjustable rate mortgages. By absorbing mortgage credit risk for lenders and investors, FHA insurance expands liquidity and enables access to secondary market securitization. Borrowers and lenders have relied on FHA-insured mortgages when robust access to other sources of mortgage financing was constrained, such as during the financial crisis when FHA played a substantial countercyclical role. In addition, some borrowers may choose FHA insurance because it provides more flexible underwriting requirements and better terms than alternatives available in the market. As a result, FHA-insured mortgages play a significant role for borrowers traditionally underserved by the conventional mortgage market, with a majority of new endorsements serving first-time homebuyers and a strong presence in the financing of mortgages for minority homebuyers.

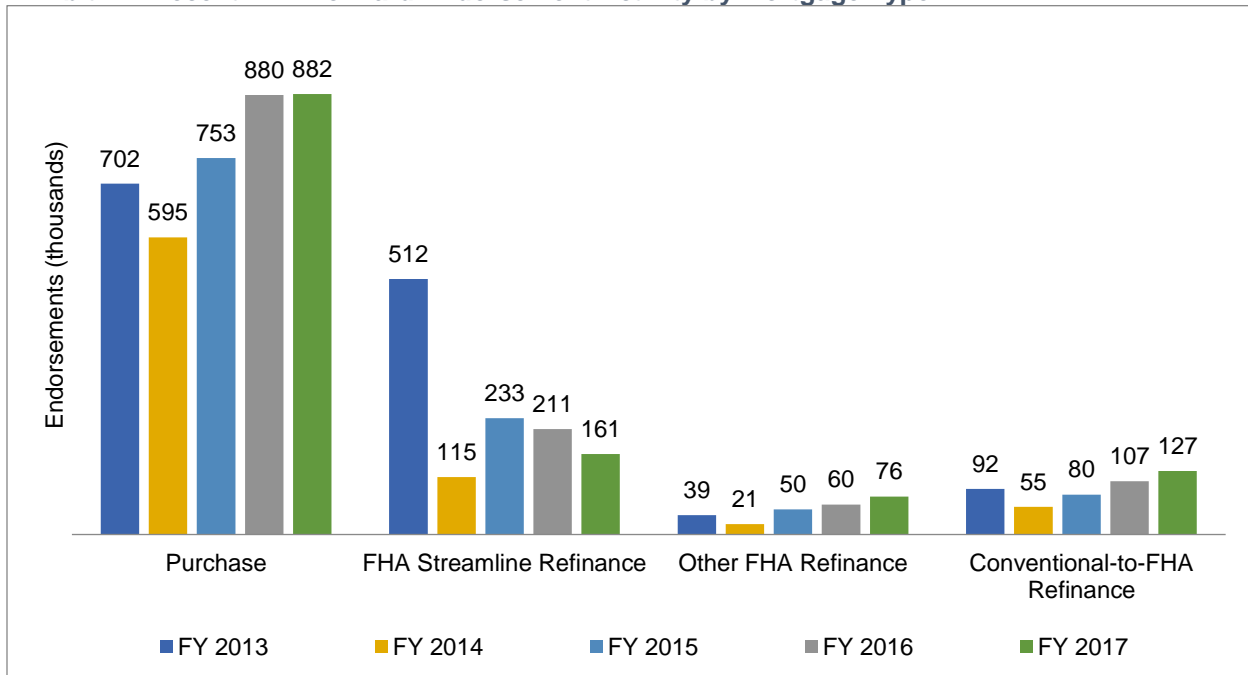


**Exhibit I-1: Historical FHA Forward Mortgage Endorsement Activity**

SOURCE: U.S. Department of HUD/FHA, October 2017.  
Refer to data table B-1 in Appendix B.

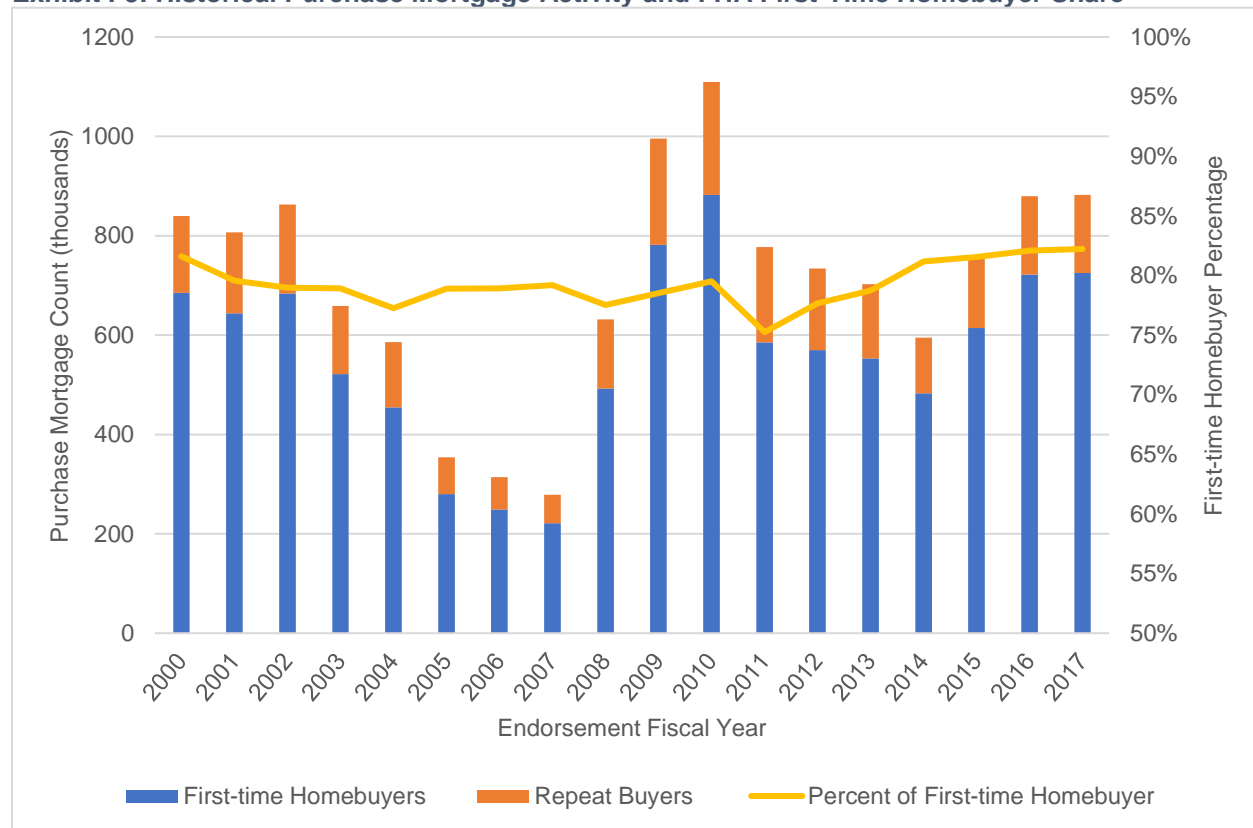
Exhibit I-1 provides a historical overview of FHA endorsements by purpose and the aggregate Unpaid Principal Balance (UPB) of endorsed mortgages for each fiscal year. In FY 2017, FHA endorsed 1,246,440 forward home mortgages, including 882,079 to purchase a home, of which 725,233 served first-time homebuyers<sup>9</sup>. New endorsements by count in FY 2017 were slightly lower than FY 2016. The UPB of all mortgages endorsed – purchase and refinance – in FY 2017 totaled \$251.0 billion, up from total FY 2016 endorsement UPB of \$245.4 billion. The average forward mortgage amount of FHA endorsements in FY 2017 was \$201,337, an increase of 3.2 percent from the FY 2016 average of \$195,068.

<sup>9</sup> A first-time home buyer is: an individual who has had no ownership in a principal residence during the three-year period ending on the date of purchase of the property. This includes a spouse (if either meets the above test, they are considered first-time homebuyers).

**Exhibit I-2: Recent FHA Forward Endorsement Activity by Mortgage Type**

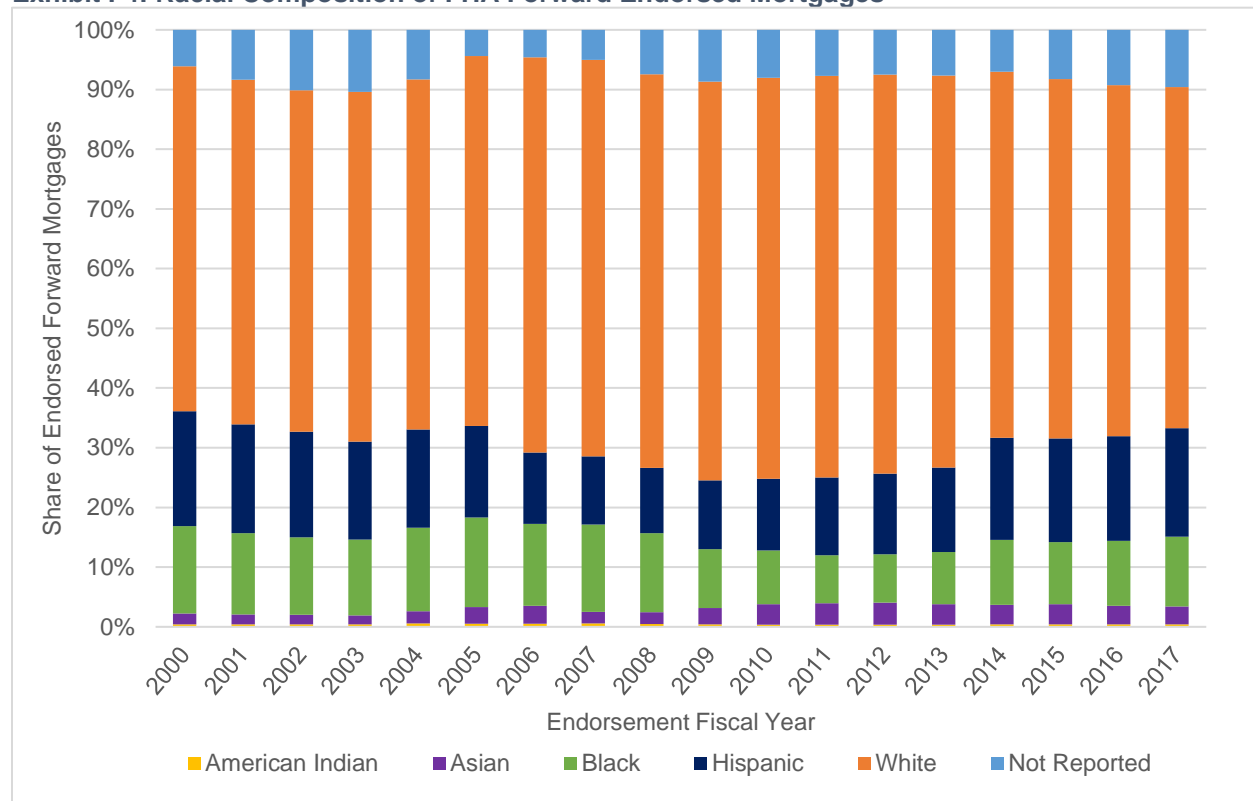
SOURCE: U.S. Department of HUD/FHA, October 2017.  
Refer to data table B-1 in Appendix B.

Exhibit I-2 above summarizes FHA forward mortgage endorsement activity over the last five years. In FY 2017, purchase endorsements changed little from the prior year level. However, FHA Streamline Refinance program activity decreased from FY 2016 by 23.4 percent. The continued upward trend of fully underwritten FHA-to-FHA refinances and of conventional mortgages refinancing into FHA-insured mortgages partially offset this decrease. The growth in endorsement activity in FY 2015 and FY 2016 reflects, in part, an increase in FHA market share as a result of the 50 basis point annual Mortgage Insurance Premium decrease implemented by FHA in the second quarter of FY 2015.

**Exhibit I-3: Historical Purchase Mortgage Activity and FHA First-Time Homebuyer Share**

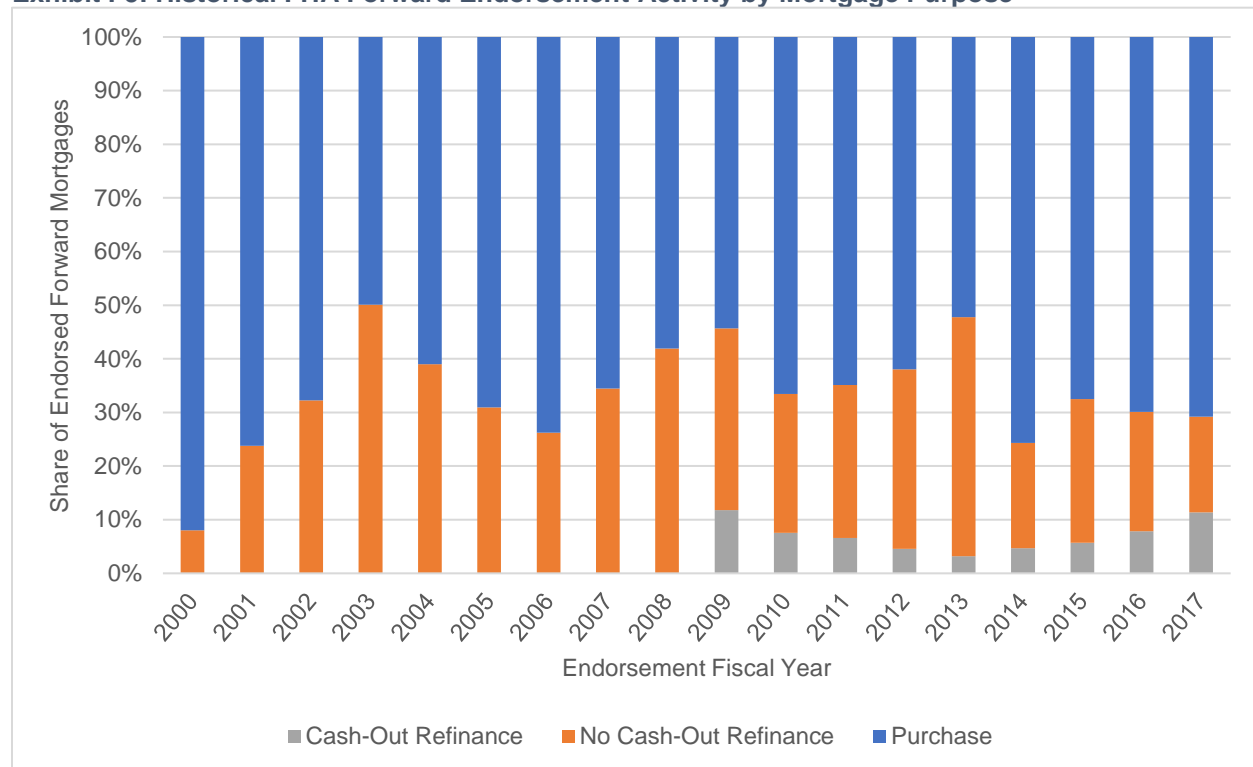
SOURCE: U.S. Department of HUD/FHA, October 2017.  
Refer to data table B-2 in Appendix B.

As illustrated by Exhibit I-3, despite the historical variability in the total number of home purchase endorsements, first-time homebuyers consistently represent a substantial portion of all FHA forward mortgage purchases. The percent of first-time homebuyers in FY 2017 remained consistent with the previous fiscal year, at 82.2 percent of forward loans endorsed. The average age of FHA first-time homebuyers has increased from 33 years in FY 2001, to 38 years in FY 2017.

**Exhibit I-4: Racial Composition of FHA Forward Endorsed Mortgages**

SOURCE: U.S. Department of HUD/FHA, October 2017.  
Refer to data table B-3 in Appendix B.

FHA insured mortgages continue to serve as an important source of financing for minority homebuyers. Exhibit I-4 above shows that for FY 2017, 33.3 percent of FHA endorsements served minority borrowers, up from 31.9 percent in FY 2016. For FY 2017 the composition of minority borrowers was: 18.2 percent Hispanic; 11.7 percent Black; 3.0 percent Asian; and 0.4 percent American Indian. Based on Calendar Year 2016 Home Mortgage Disclosure Act (HMDA) data, FHA endorsed mortgages served 37.7 percent of all minority borrowers with mortgage purchase transactions.

**Exhibit I-5: Historical FHA Forward Endorsement Activity by Mortgage Purpose**

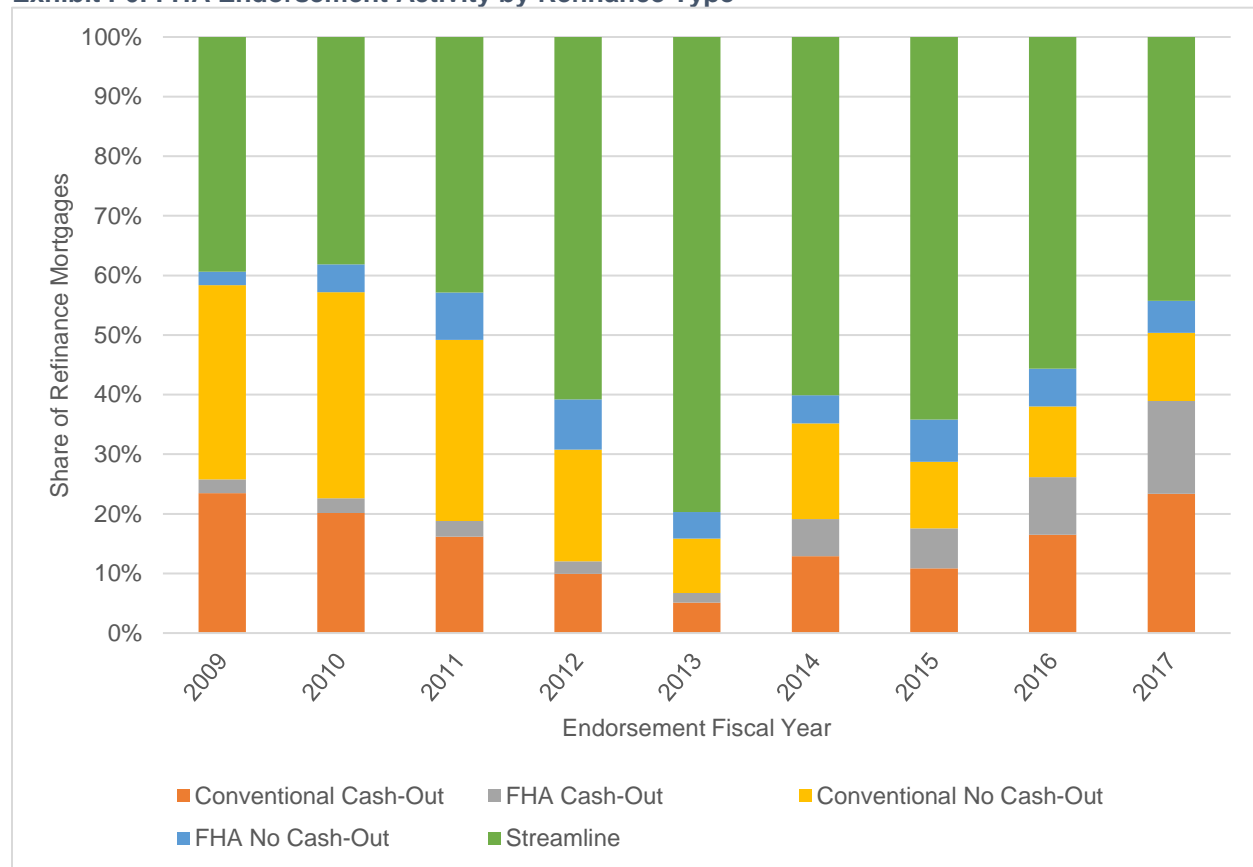
NOTE: Cash-Out Refinance data is not available prior to FY 2009.

SOURCE: U.S. Department of HUD/FHA, October 2017.

Refer to data table B-4 in Appendix B.

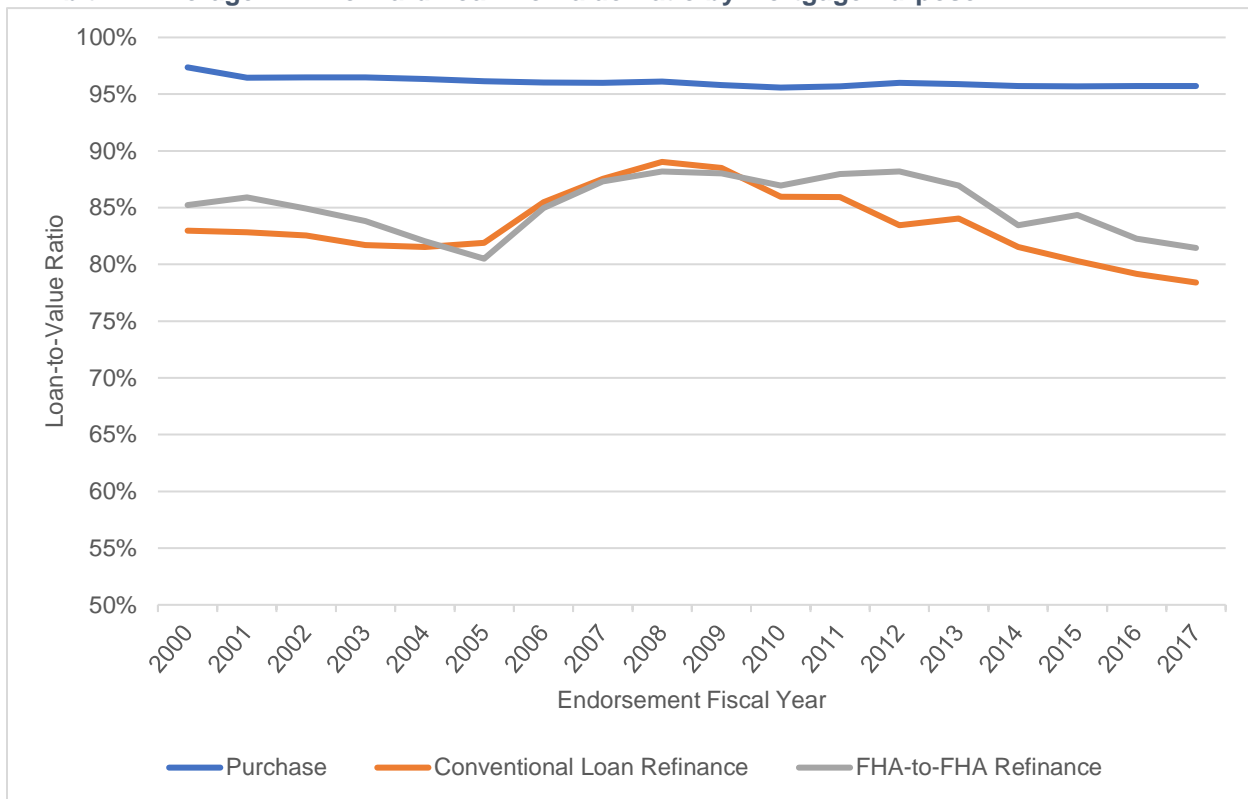
In FY 2017, FHA-insured purchase mortgages represented 70.8 percent of all FHA insurance endorsements, a less than one percentage point increase from FY 2016. One notable trend is that, since bottoming in FY 2013, the share of total FHA endorsements utilized for cash-out refinancing has increased, reaching 11.4 percent in FY 2017. A cash-out refinance transaction allows the borrower to draw from the accumulated equity in their home to qualify for a larger mortgage, enabling the borrower to pay off their current mortgage and obtain cash at closing.



**Exhibit I-6: FHA Endorsement Activity by Refinance Type**

SOURCE: U.S. Department of HUD/FHA, October 2017.  
Refer to data table B-5 in Appendix B.

Exhibit I-6 above provides a more detailed breakdown of FHA refinance endorsements by type of refinance transaction. In FY 2017, cash-out refinance transactions represented 38.9 percent of all of FHA refinance transactions, an increase from the FY 2016 level of 26.1 percent. The increase in cash-out refinance activity includes both an increase in the number of endorsements where the borrower's prior loan was an FHA loan, as well as an increase in the number of endorsements where the borrower previously had a conventional loan. An additional 11.4 percent of FHA-insured refinance transactions are loans refinancing into an FHA-insured mortgage from the conventional market without taking cash out, which was a slight decrease from 11.9 percent in FY 2016. FHA will continue to monitor both the trends of the increasing volume of cash-out refinances, and the utilization of FHA-insured refinancing by borrowers with conventional mortgages.

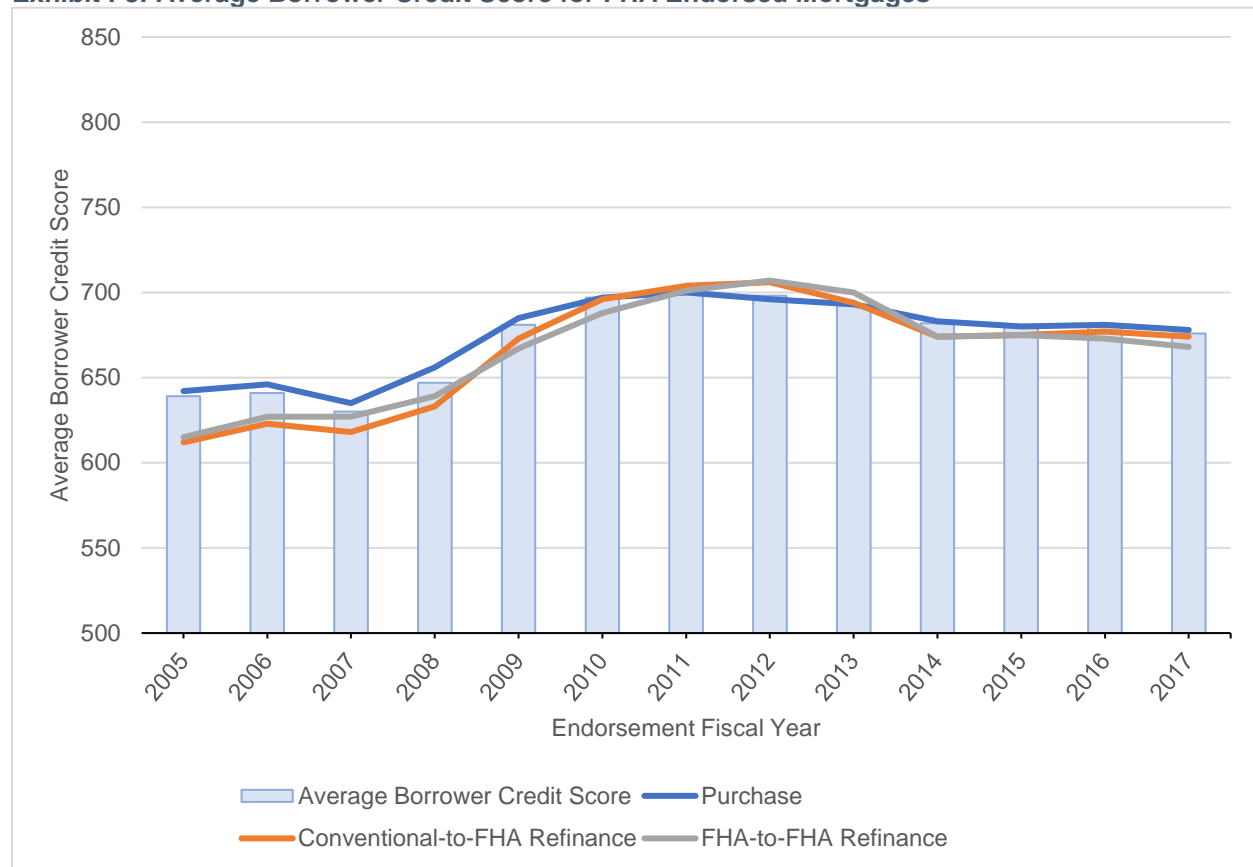
**Exhibit I-7: Average FHA Forward Loan-To-Value Ratio by Mortgage Purpose**

NOTE: In accordance with statutory requirements for determining eligibility of loans for FHA insurance, HUD measures loan-to-value (LTV) without including any mortgage insurance premium financed into the loan balance. Exhibit I-7 includes only fully-underwritten loans and excludes Streamline Refinances.

SOURCE: US Department of HUD/FHA, October 2017.

Refer to data table B-6 in Appendix B.

The average loan-to-value (LTV) ratio for purchase transactions in FY 2017 was 95.7 percent, unchanged from the FY 2016 average LTV ratio. The average LTV ratio for FHA-insured purchase loans has remained relatively stable since 2001. The average LTV ratio for both Conventional-to-FHA and FHA-to-FHA refinance transactions continues to decrease from the highs of FY 2007 through FY 2013, with Conventional-to-FHA refinances at 78.4 percent, and FHA-to-FHA refinances at 81.5 percent in FY 2017. Home price appreciation, as well as the previously noted increase in endorsements of cash-out refinance loans, which are limited to a maximum LTV ratio of 85 percent by FHA, may be contributing factors to the declining average LTV ratio of new refinance endorsements.

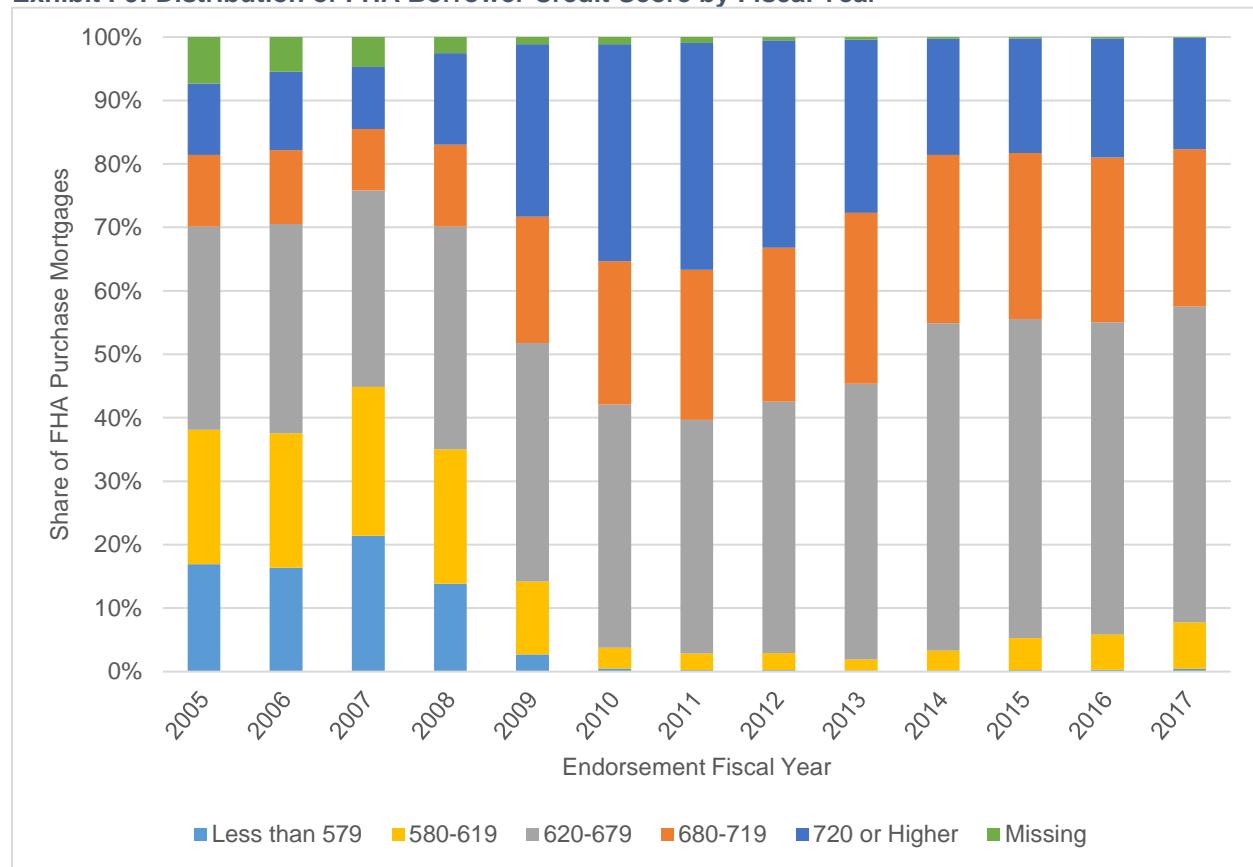
**Exhibit I-8: Average Borrower Credit Score for FHA Endorsed Mortgages**

NOTE: Borrower credit score data was not collected prior to 2005 and does not include Streamline Refinance mortgages.

SOURCE: U.S. Department of HUD/FHA, October 2017

Refer to data table B-7 in Appendix B.

Credit score is an indicator of mortgage credit risk. As reflected in Exhibit I-8 above, FHA's average credit score has decreased steadily since the levels reached in FY 2011 when FHA was serving a significant countercyclical role in the market. The average borrower credit score for an FHA-insured mortgage in FY 2017 was 676, decreasing from 680 in FY 2016. In FY 2017, the average credit score did not differ much between purchase transactions and Conventional-to-FHA refinance transactions, but was slightly lower for FHA-to-FHA refinances.

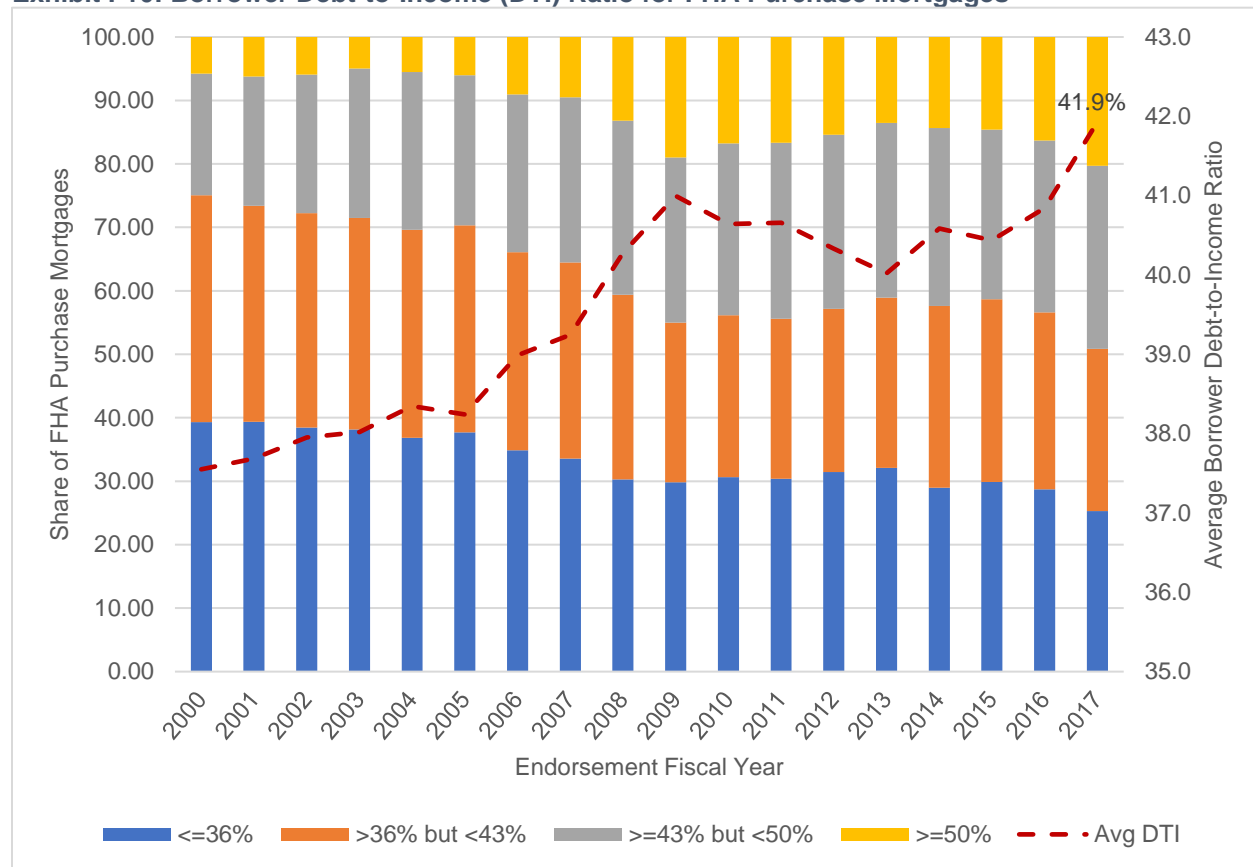
**Exhibit I-9: Distribution of FHA Borrower Credit Score by Fiscal Year**

NOTE: Borrower credit score data was not collected prior to 2005 and does not include Streamline Refinance mortgages.

SOURCE: U.S. Department of HUD/FHA, October 2017.

Refer to data table B-8 in appendix B.

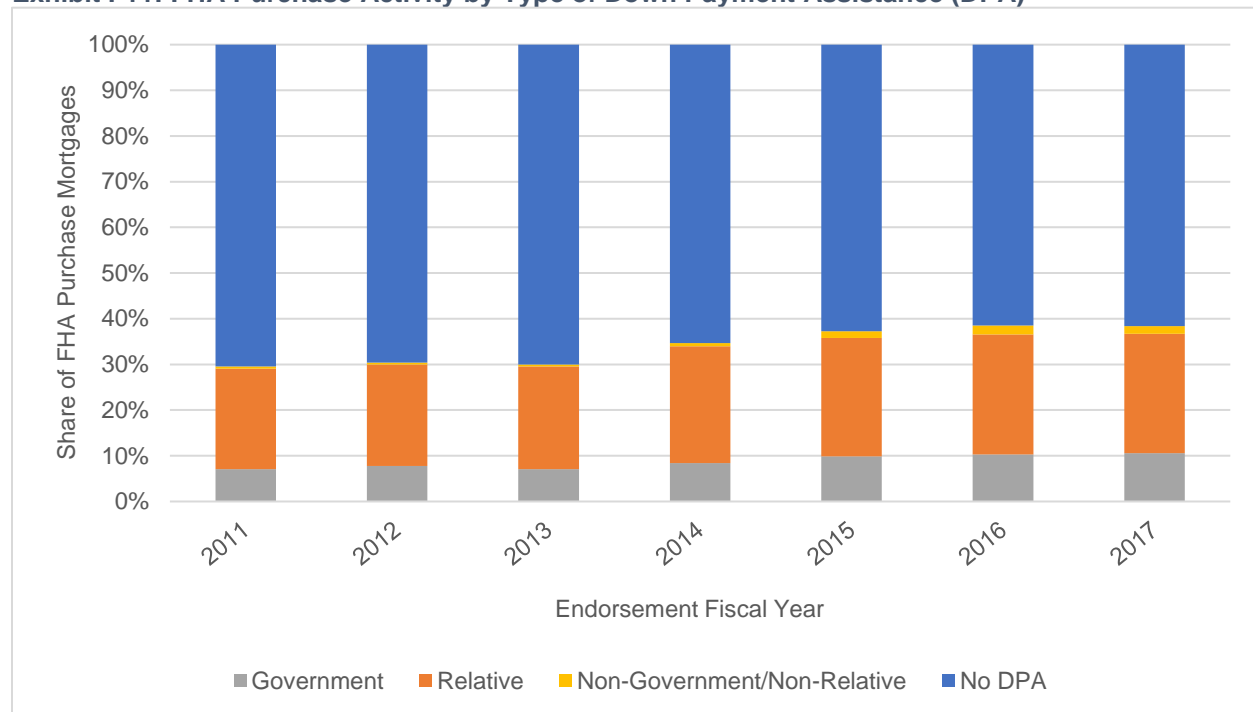
The distribution of credit scores for borrowers obtaining FHA-insured mortgages provides insight into the drivers of the decline in FHA's average credit score for new endorsements. After bottoming in FY 2013, the share of endorsements with credit scores of 619 and below has increased steadily and represented 7.8 percent of endorsements in FY 2017. The share of endorsements with credit scores between 620 and 679 also increased from 49.2 percent in FY 2016 to 49.7 percent in FY 2017. The share of endorsements on mortgages with credit scores of 720 or higher decreased from 18.8 percent in FY 2016 to 17.5 percent in FY 2017.

**Exhibit I-10: Borrower Debt-to-Income (DTI) Ratio for FHA Purchase Mortgages**

SOURCE: U.S. Department of HUD/FHA, October 2017.  
Refer to data table B-9 in appendix B.

The average Debt-to-Income (DTI) ratio for borrowers with FHA-insured purchase mortgages continues to rise, with an average DTI ratio of 41.9 percent in FY 2017. The proportion of borrowers with DTI ratios above 50 percent was at an all-time high in FY 2017, with over 20 percent of borrowers with FHA-insured purchase mortgages having a DTI ratio at or greater than 50 percent. The percentage of borrowers with DTI ratios greater than 43 percent rose to 49.1 percent in FY 2017 from 43.4 percent in FY 2016.



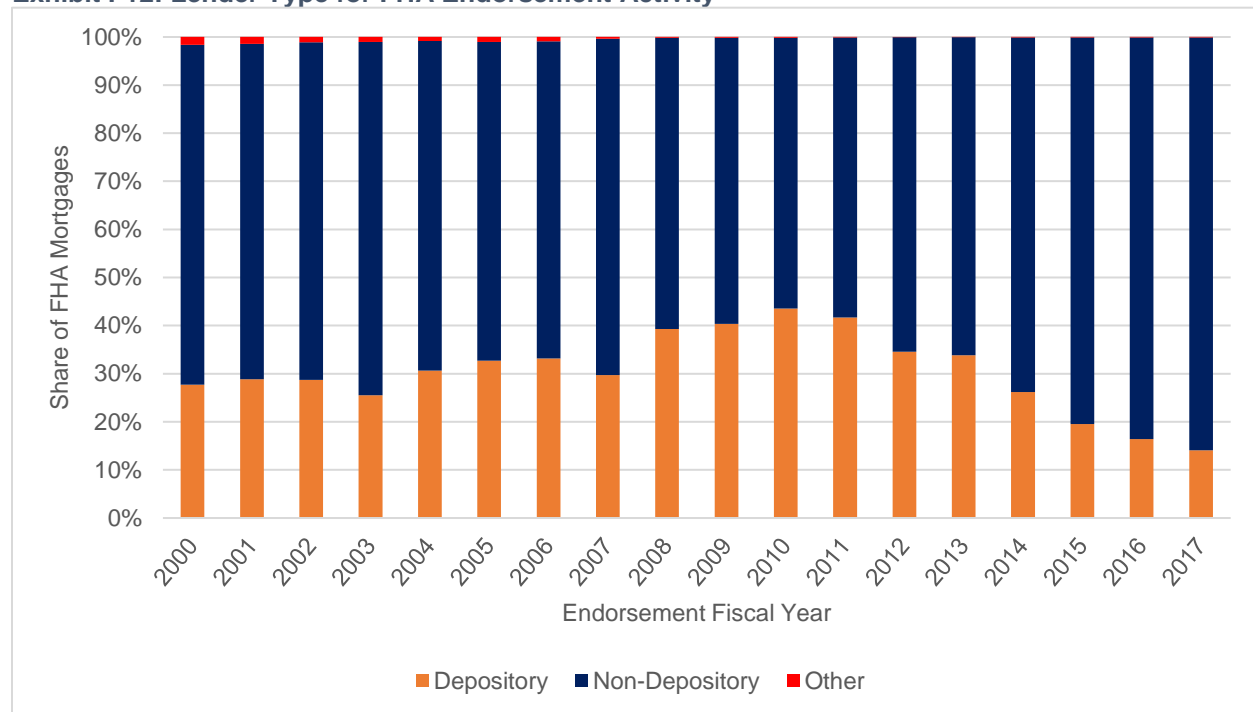
**Exhibit I-11: FHA Purchase Activity by Type of Down Payment Assistance (DPA)**

NOTE: Data does not account for instances where down payment assistance data was missing from origination data submitted to FHA.

SOURCE: U.S. Department of HUD/FHA, October 2017.

Refer to data table B-10 in Appendix B.

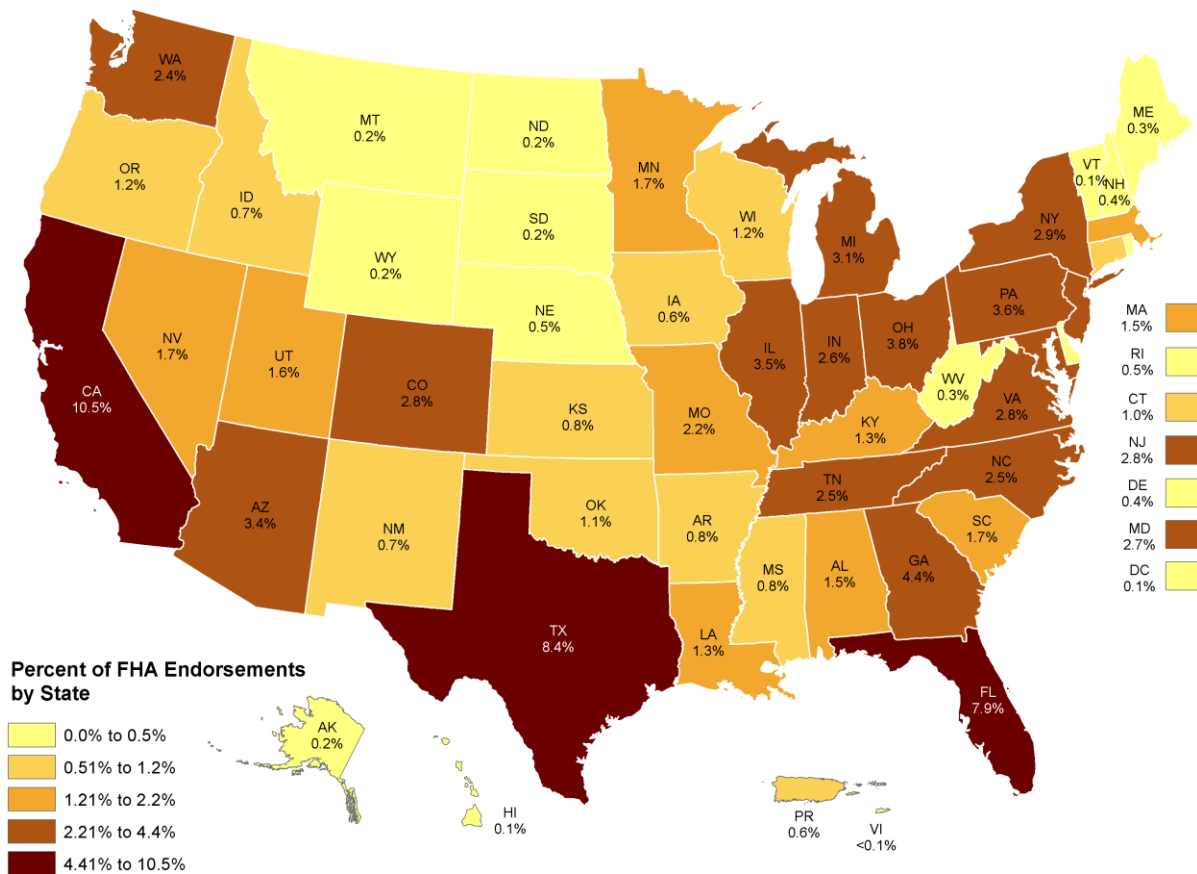
FHA insures some mortgages where the borrower obtains funds to use toward the down payment from another eligible source. These eligible sources include grants from a governmental entity or nonprofit organization, or, most commonly, a gift of funds from an eligible family member (collectively a down payment assistance or “DPA” loan). In FY 2017, approximately 31 percent of purchase mortgages received gift funds. In addition, 6.2 percent of all purchase mortgages had some type of secondary financing. Secondary financing is a type of down payment assistance provided by governmental entities in which the borrower executes a note and security instrument agreeing to repay the assistance under specified conditions. Combined, 38.4 percent of all purchase mortgages received either gift funds or secondary financing, with less than two percent receiving both. As Exhibit I-11 above shows, gift funds obtained from an eligible family member were the largest source of down payment assistance used by borrowers with FHA-insured DPA mortgages, representing 26.1 percent of FHA’s total forward mortgage purchase volume in FY 2017. The second largest source of down payment assistance funds were governmental entities, representing 10.6 percent of FY 2017 endorsements.

**Exhibit I-12: Lender Type for FHA Endorsement Activity**

SOURCE: U.S. Department of HUD/FHA, October 2017.  
Refer to data table B-11 in Appendix B.

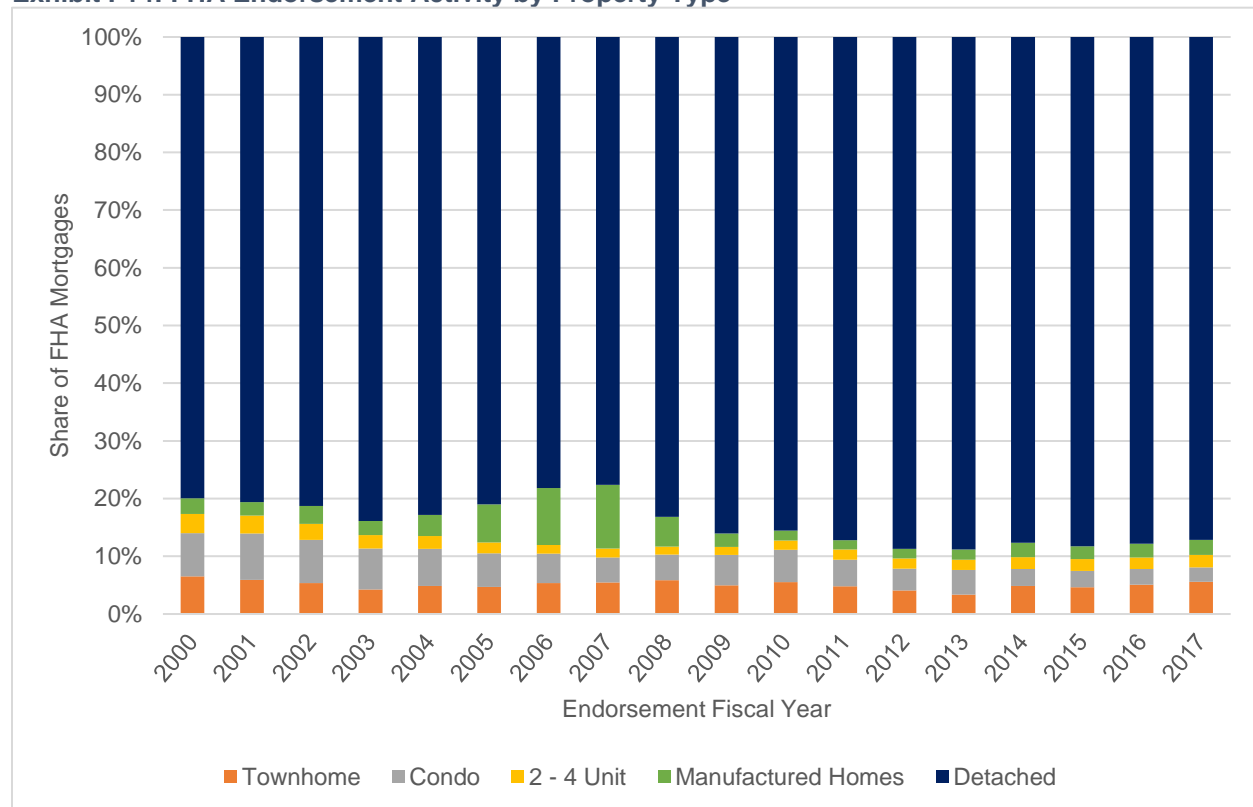
The composition of FHA's new endorsements by type of lender has been undergoing an impactful transformation. In FY 2017, 85.8 percent of FHA insurance endorsements were on mortgages originated by non-depository lenders, up from 56.3 percent in FY 2010. Depository institutions have decreased their FHA participation for a number of reasons, including perceived enforcement risk.

Reduced participation by depository institutions may reduce opportunities for borrowers to access FHA-insured mortgages. While meeting FHA requirements, non-depository lenders typically hold less capital than depository institutions participating in FHA, and are subject to different regulatory regimes.

**Exhibit I-13: FY 2017 FHA Forward Endorsement Concentration by State**

SOURCE: U.S. Department of HUD/FHA, October 2017.  
Refer to data table B-12 in Appendix B.

Exhibit I-13 above shows the percentage of FY 2017 endorsements by state. The three most populous states, California, Texas, and Florida, are also the states that had the greatest counts of FHA-insured mortgage endorsements in FY 2017, totaling 26.8 percent of forward endorsements. The concentration in the top ten states totaled 51.5 percent of FY 2017 endorsements. The correlation between population and FHA mortgage concentration does not hold for every state. Factors such as property values in relation to FHA loan limits influence the concentration of FHA business.

**Exhibit I-14: FHA Endorsement Activity by Property Type**

SOURCE: U.S. Department of HUD/FHA, October 2017.  
Refer to data table B-13 in Appendix B.

FHA mortgages can be secured by a variety of single-family property types. The majority of FHA's FY 2017 new business was collateralized by single-family detached housing. Other types of single-family housing are important sources of affordable housing, but may also represent increased credit risk. The volume of FHA-insured mortgage endorsement secured by manufactured homes titled as real estate continues to represent a small portion of the overall forward mortgage new business since reaching a peak of 11 percent in FY 2007. In FY 2017, only 2.6 percent of FHA-insured mortgages were secured by manufactured homes. Similarly, mortgages for condominium units historically have represented a small percentage of new endorsements. In part, this can be attributable to both economic conditions and regulatory challenges related to Condominium Project Approvals. Currently, FHA only insures condominium unit mortgages in FHA-approved Condominium Projects. FHA is finalizing rulemaking that will communicate updated Condominium Project approval policies. FHA published its proposed rule on September 28, 2016, and is currently assessing the numerous comments received from the proposed rule's public comment period. The final rule is anticipated to lower burdens on Condominium Projects to obtain FHA approval, while effectively managing risk to the MMIF. For more information about FHA's Condominium Project Approval final rule, see Chapter 3.

## Forward Mortgage Program: Portfolio Overview and Credit Trends

**Exhibit I-15: Insurance in Force, UPB, and SDQ by Vintage as of September 30, 2017**

Endorsement Fiscal Year	Insurance in Force				Seriously Delinquent	
	Counts	IIF Share (Percent)	UPB (\$ millions)	UPB Share (Percent)	Counts	Rate (Counts)
Pre-2004	653,111	8.2	31,305	2.7	45,862	7.0
2004	171,117	2.1	12,503	1.1	12,849	7.5
2005	122,654	1.5	9,864	0.9	11,070	9.0
2006	96,843	1.2	8,735	0.8	10,886	11.2
2007	92,416	1.2	9,389	0.8	13,155	14.2
2008	220,099	2.8	26,013	2.2	31,275	14.2
2009	484,480	6.1	62,769	5.4	42,673	8.8
2010	624,592	7.8	80,882	7.0	35,792	5.7
2011	502,184	6.3	67,662	5.8	22,779	4.5
2012	613,182	7.7	85,611	7.4	22,091	3.6
2013	848,310	10.6	125,277	10.8	24,928	2.9
2014	422,515	5.3	56,718	4.9	19,328	4.6
2015	797,854	10.0	134,498	11.6	25,859	3.2
2016	1,106,462	13.9	203,969	17.6	21,858	2.0
2017	1,226,251	15.4	243,643	21.0	4,818	0.4
<b>Total</b>	<b>7,982,070</b>	<b>100.0</b>	<b>1,158,838</b>	<b>100.0</b>	<b>345,223</b>	<b>4.3</b>

NOTE: These mortgage counts and balances are active as of September 30, 2017. Portfolio UPB differs slightly from IIF amounts reported in Chapter 2.

SOURCE: U.S. Department of HUD/FHA, October 2017.

Exhibit I-15 above provides a breakdown of FHA Insurance-in-Force (IIF) by vintage, including the Serious Delinquency (SDQ) rate for each cohort. As of the end of FY 2017, the FHA forward portfolio consisted of approximately 1.16 trillion in insurance-in-force with an active mortgage count of 7,982,070 and with an overall SDQ rate of 4.32 percent. FY 2017 endorsements represent the largest single vintage in the FHA insured portfolio. By a wide range of measures, the credit performance of the forward mortgage program has improved significantly since the housing and economic crisis.

**Exhibit I-16: FHA Early Payment Default Rates by Mortgage Purpose**

NOTE: FY 2017 data is through February 2017.

SOURCE: U.S. Department of HUD/FHA, October 2017.

Refer to data table B-14 in Appendix B.

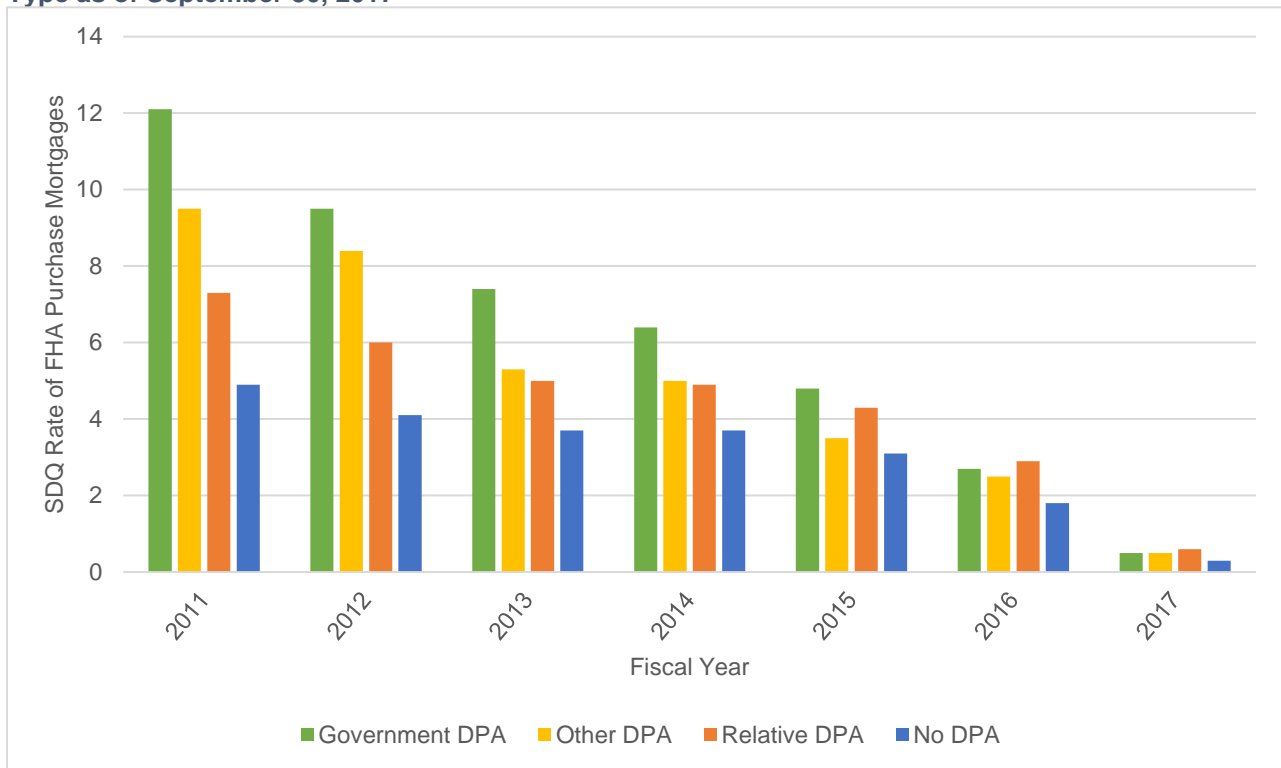
Early Payment Defaults (EPDs) are those FHA-insured mortgages where the borrower becomes 90 days or more delinquent on their mortgage within the first six payments. EPD rates (the percentage of EPDs that occur for each vintage) are reflective of the credit quality of new endorsements and serve as an important early indicator of mortgage performance. EPD rates spiked in FY 2007 and 2008, exceeding two percent in both years, but beginning in FY 2010 have decreased to less than half of a percent for all mortgages and have remained relatively low and stable. For recent vintages, EPD rates have been higher for purchase transactions in comparison to refinance transactions.

**Exhibit I-17: Historical Serious Delinquency Rates for FHA Mortgages**

SOURCE: U.S. Department of HUD/FHA, October 2017.  
Refer to data table B-15 in Appendix B.

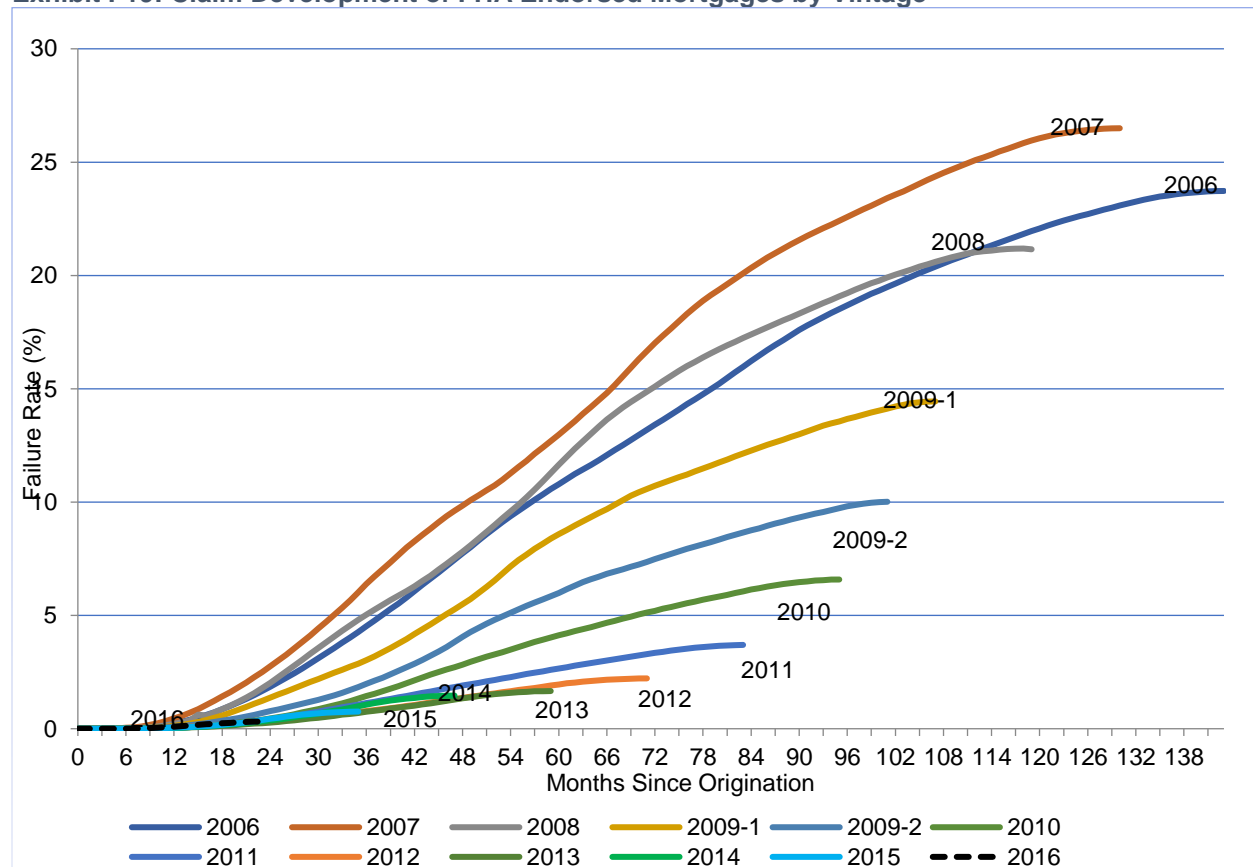
The SDQ rate tracks the percentage of FHA-insured mortgages where the borrower is 90 or more days delinquent, including mortgages in foreclosure and bankruptcy, and is another key indicator of portfolio performance. FHA's SDQ rate for its forward mortgage portfolio as of the end of FY 2017 was 4.32 percent, down from 4.92 percent at the end of FY 2016. Exhibit I-17 demonstrates a very significant improvement in the SDQ rate after rising substantially as a result of the crisis.



**Exhibit I-18: Serious Delinquency Rate of FHA Purchase Mortgages by Down Payment Assistance Type as of September 30, 2017**

SOURCE: U.S. Department of HUD/FHA, October 2017.  
Refer to data table B-16 in Appendix B.

Exhibit I-18 above shows the current SDQ rate of FHA-insured purchase mortgages endorsed for FY 2011 through FY 2017 by down payment type. SDQ rates tend to rise as mortgages season. The currently low SDQ rates for FY 2017 vintage mortgages reflects the short amount of time such mortgages have had to season. More seasoned vintages show higher SDQ rates, and there is a significant difference in SDQ rates between mortgages with and without down payment assistance. Generally, higher SDQ rates are associated with mortgages where down payment assistance came from governmental entities, such as state or municipal agencies.

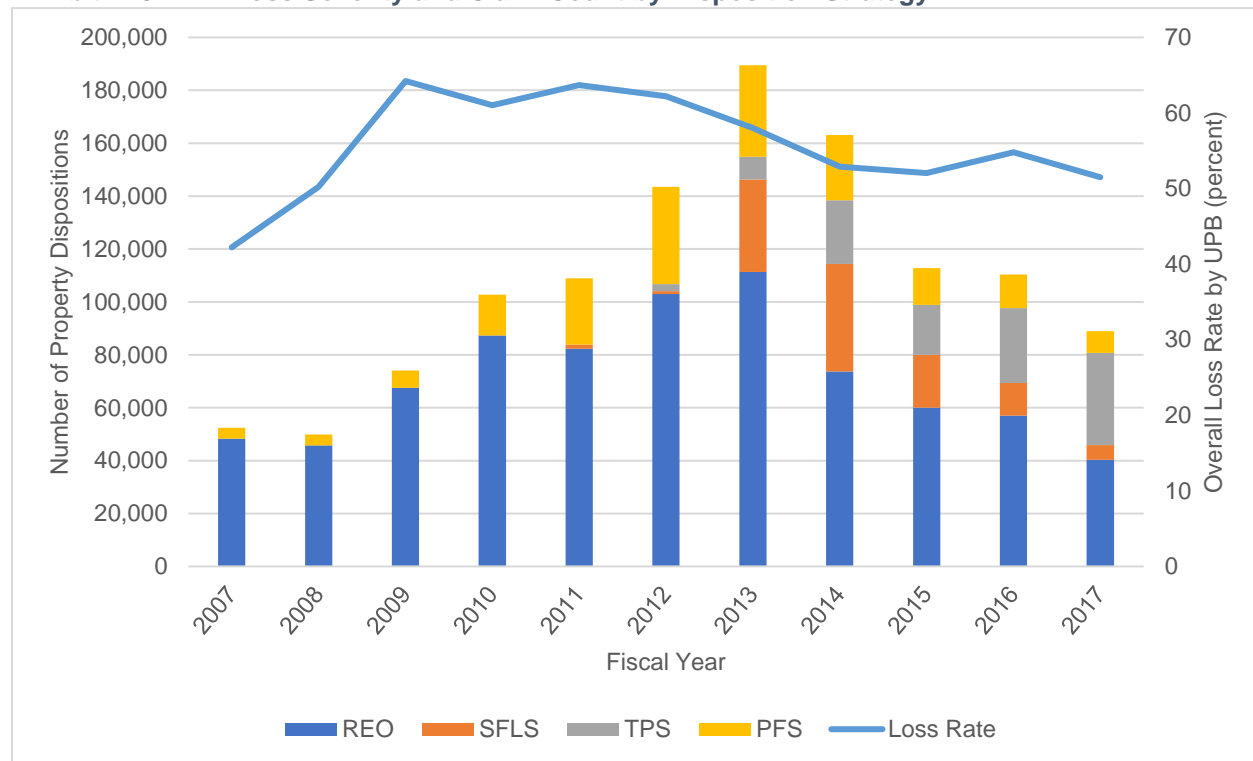
**Exhibit I-19: Claim Development of FHA Endorsed Mortgages by Vintage**

NOTE: The FY 2009 cohort is separated into two parts, representing mortgage originations from October through March in 2009-1 and mortgage originations from April through September in 2009-2. A mortgage that is in the process of foreclosure or has proceeded to an FHA insurance claim is deemed to be a 'failure' for this illustration. The failure rate is the sum of Cumulative Claim Rate and Cumulative Active Foreclosure Rate divided by Total Mortgages.

SOURCE: U.S. Department of HUD/FHA, October 2017.

Refer to data table B-17 in Appendix B.

Another useful measure of portfolio performance is the development of cumulative claim rates by vintage. Exhibit I-19 above breaks down FHA insurance claims by fiscal year books of business, and shows the ongoing impact to the MMIF of poorly performing books where defaults, and subsequent claims, show a substantial increase more than a decade after the mortgage was originated and subsequently endorsed by FHA. Recent vintages show substantial improvement in claim development rates since the housing crisis, beginning with the FY 2009-2 vintage, which reflects the performance of mortgages endorsed in the second half of 2009. Vintages beginning with FY 2012 and later are performing well and trending toward cumulative claim rates below the five percent threshold, although ultimate performance depends on future economic conditions. It is important to note that loss mitigation claims, such as an FHA HAMP mortgage modification and/or utilizing a partial claim from FHA, are not counted as a claim unless and until the mortgage redefaults and goes to final claim. Exhibit I-21 of this report provides additional details on FHA claim rates.

**Exhibit I-20: FHA Loss Severity and Claim Count by Disposition Strategy**

SOURCE: U.S. Department of HUD/FHA, October 2017.  
Refer to data table B-18 in Appendix B.

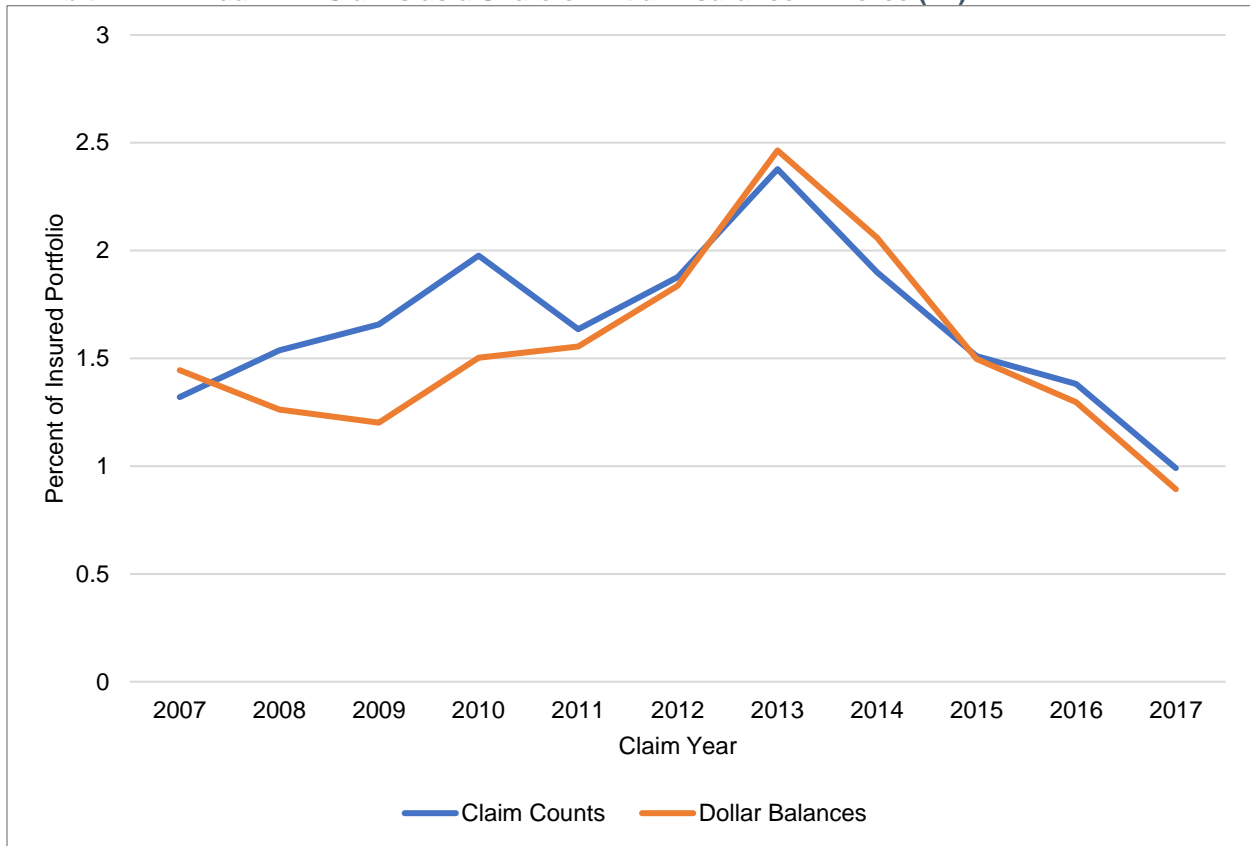
The favorable trends in the credit performance of the FHA forward portfolio are further evidenced by a continued decline in asset dispositions and the average loss rate on disposed assets, as reflected in Exhibit I-20 above. The average loss rate declined to 51.5 percent in FY 2017, down from 54.8 percent in FY 2016 and well below the highs that resulted in the wake of the housing crisis when loss rates exceeded 60 percent.

FHA utilizes four asset disposition strategies: sale of HUD real-estate owned (REO) properties; the Single Family Loan Sales (SFLS) Initiative<sup>10</sup>; Third Party Sales (TPS)<sup>11</sup>; and Pre-foreclosure Sales (PFS). A notable trend is the continuing reduction, beginning in FY 2013, of REO dispositions, versus other asset disposition options that are less costly to HUD. In FY 2017, REO sales represented 45.3 percent of asset dispositions, down from 51.7 percent in FY 2016. TPS dispositions increased to 39.2 percent of dispositions in FY 2017, a substantial increase from 25.7 percent in FY 2016.

<sup>10</sup> The FHA Office of Housing conducts mortgage loan sales under the Single Family Loan Sales (SFLS) Initiative. The current sales structure consists of whole loan, competitive auctions, offering for purchase defaulted single family mortgages provided by FHA-approved loan servicers. The loans sold contain specified representations and warranties and may be sold with post-sale restrictions and/or reporting requirements. Currently, FHA is selling loans in large national pools, as well as loan pools in designated geographical areas that are aimed at a neighborhood stabilization outcome (NSO pools).

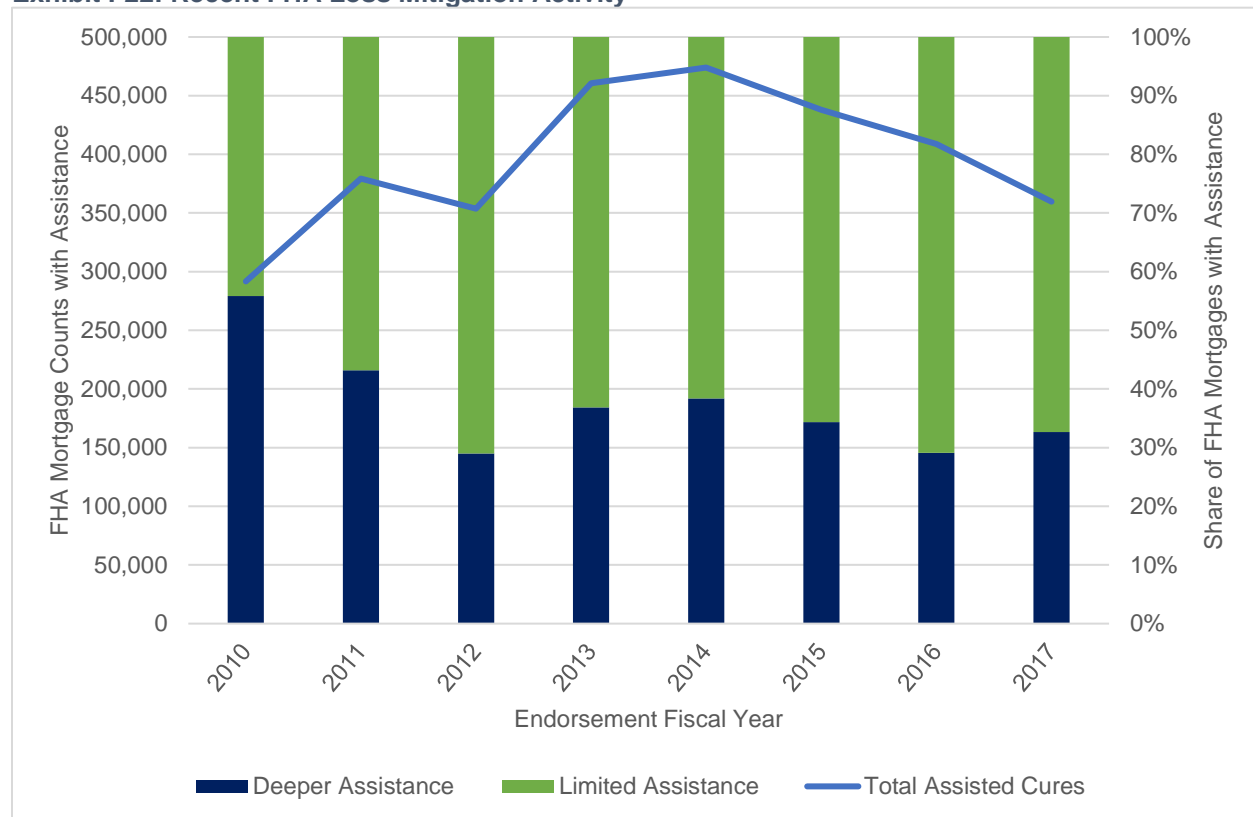
<sup>11</sup> Through the TPS program, also known as the Claims Without Conveyance of Title program, lenders seek to sell properties securing non-performing loans at foreclosure or prior to conveyance to HUD.

**Exhibit I-21: Annual FHA Claims as a Share of Initial Insurance-in-Force (IIF)**



SOURCE: U.S. Department of HUD/FHA, October 2017.  
Refer to data table B-19 in Appendix B.

Exhibit I-21 above expresses claims paid as a percentage of insurance-in-force for both the number of claims and the dollar balance of claims. The improvement in claims paid as a percentage of IIF since FY 2013 reflects the impacts of improving mortgage performance and a favorable housing and economic environment.

**Exhibit I-22: Recent FHA Loss Mitigation Activity**

NOTE: Deeper Loss Mitigation Assistance includes FHA HAMP, Partial Claims, and Loan Modifications. Limited Loss Mitigation Assistance includes Promise to Pay and Repayment Plans. Starting in May 2013, Promise to Pay is no longer classified as a Repayment Plan and is considered its own category.

SOURCE: U.S. Department of HUD/FHA, October 2017.

Refer to data table B-20 in Appendix B.

In FY 2017, FHA-insured mortgages with assisted cures totaled 359,558, and have been steadily declining since their peak of 473,950 in FY 2014, consistent with the improving credit environment. In FY 2017, deeper assistance cures represented 32.7 percent of all cures, an increase of 3.6 percentage points from the FY 2016 level of 29.1 percent.

FHA's loss mitigation activities begin with home retention options to help borrowers facing hardship stay in their homes, if possible. FHA's home retention options include a range of tools tailored to the borrower's circumstances. FHA differentiates assistance into deeper assistance and limited assistance categories. FHA categorizes a cure as deeper assistance when the mortgage is restructured to result in at least a 25 percent reduction in the borrower's monthly principal, interest, taxes and insurance (PITI) payment. Such deeper assistance cures may include a partial claim payment by FHA when necessary to achieve a targeted level of payment reduction. Where FHA has paid a partial claim, the borrower executes a non-interest-bearing note and mortgage securing the amount of the partial claim that is payable when the borrower sells the home or pays off their mortgage. Limited assistance includes other loss mitigation options, such as forbearance or repayment plans.

## Home Equity Conversion Mortgages (HECM) Program Overview

Through the Home Equity Conversion Mortgage (HECM) program, FHA provides insurance on the vast majority of all reverse mortgages available in the nation. When initially authorized by the Housing and Community Development Act of 1987, the HECM program was made available on a very limited basis and all HECMs were obligations of the General Insurance Fund. Over time, the program has expanded significantly, with \$30 billion of HECM Maximum Claim Amount (MCA) insured by FHA in FY 2009 alone. FHA has now insured over one million HECMs. Beginning in FY 2009, all new HECM endorsements are obligations of the MMIF.

The HECM program enables senior homeowners aged 62 or older who meet various borrower, property ownership, and financial requirements to withdraw a portion of the value of their home without any corresponding periodic requirement to repay amounts borrowed. Instead, the principal borrowed, along with interest, Mortgage Insurance Premiums, and servicing fees are added to the mortgage balance over time. As a result, HECM balances may eventually equal or exceed the value of the home. HECM borrowers remain responsible for the payment of taxes, insurance, and property charges.

Subject to the nationwide limits on claim amounts, the amount of funds that any particular borrower can access through a HECM depends on a variety of factors, including the value of the property, the age of the youngest borrower or eligible non-borrowing spouse and the interest rate charged to the borrower<sup>12</sup>.

The lender will calculate the amount of money that can be made available to the borrower. First, the lender determines the MCA for the HECM, which is the lesser of: the appraised value of the home<sup>13</sup> or the nationwide HECM maximum claim limit (currently \$636,150). Next, the lender determines the appropriate Principal Limit Factor (PLF) based on the age of the youngest borrower or eligible non-borrowing spouse and the expected applicable interest rate. The lender then multiplies the MCA by the PLF to determine what Principal Limit will be established for the HECM. This Principal Limit will grow monthly by a factor of one-twelfth of the actual interest rate for the HECM and one-twelfth of the annual mortgage insurance premium.

At origination, a HECM borrower is permitted to draw up to 60 percent of the Principal Limit or some higher portion of the Principal Limit that is equal to the sum of the borrower's mandatory obligations, which include items like outstanding debt secured by the property, plus cash to the borrower of up to 10 percent of the Principal Limit. The borrower can select from a variety of payment plans to receive funds under the HECM. These payment options include Lines of Credit (LOC), tenure payments, term payments, or a combination of the LOC with a term or tenure payment option. The borrower is allowed to change payment plans at any time, provided there

---

<sup>12</sup> The age of the youngest non-borrowing spouse was first introduced as a factor on August 4, 2014.

<sup>13</sup> In HECM for Purchase transactions, the appraised value is deemed to be the lesser of the appraised value or the sales price of the home.

are funds available under the Principal Limit. If no funds remain under the Principal Limit, the borrower cannot request additional funds. Payments under the HECM tenure plan, which essentially functions as an annuity, continue under the terms of the tenure plan regardless of the technical availability of funds under the Principal Limit.

A HECM is only required to be repaid when it becomes due and payable, which occurs: when the last surviving borrower or eligible non-borrowing spouse<sup>14</sup> dies or ceases to occupy the property as their principal residence, or when certain other events of default occur, including the failure to pay taxes, insurance, or property charges due on the property. Because the HECM is non-recourse, lenders and FHA can only look to the value of the property for recovery of losses. If the balance of the mortgage exceeds the appraised value of the property when the mortgage becomes due and payable and the property is sold via foreclosure or private sale, the lender is entitled to file a mortgage insurance claim with FHA.<sup>15</sup> All claims associated with HECMs endorsed on or after FY 2009 are paid by the MMIF.

Additionally, lenders are also permitted to file mortgage insurance claims where the balance of the HECM reaches 98 percent of the MCA. The lender will assign the HECM to the HUD Secretary in exchange for claim payment. The Secretary will then hold and service the HECM until the HECM becomes due and payable. Since 2009, these assigned HECM loans are held by the Secretary as assets of the MMIF. When a HECM held by the Secretary becomes due and payable, the Secretary may foreclose the mortgage. Following foreclosure, HUD will sell the property and return any proceeds to the MMIF to offset claims losses.

Finally, where the borrower dies and there is an eligible non-borrowing spouse, the lender is permitted to assign the loan to the Secretary in exchange for claim payment. Before August 2014, HECMs did not provide protections for non-borrowing spouses; however, following litigation, HUD has made available an assignment option that allowed the lender to choose to defer the due and payable status of the HECM and assign the HECM in exchange for claim payment without foreclosing the HECM.<sup>16</sup> HUD holds these HECMs until the period of deferral of due and payable status ends due to death, failure to reside in the property or the failure to meet other obligations under the HECM. Because these spouses were not considered at the time the HECM was originated, the MCA and Principal Limit calculations did not take into account risk characteristics of these spouses.

Since August 2014, the HECM program has provided protections for non-borrowing spouses and the risk characteristics of these individuals are factored into the origination of the HECM. The age of the youngest borrower or non-borrowing spouse now dictates the amount of principal that will be made available to the borrower throughout the duration of the HECM.

---

<sup>14</sup> The inclusion of a non-borrowing spouse was made for all HECMs after August 4, 2014; HECMs originated prior to that date allow for the deferral of due and payable status at the discretion of the lender when certain eligibility criteria are met.

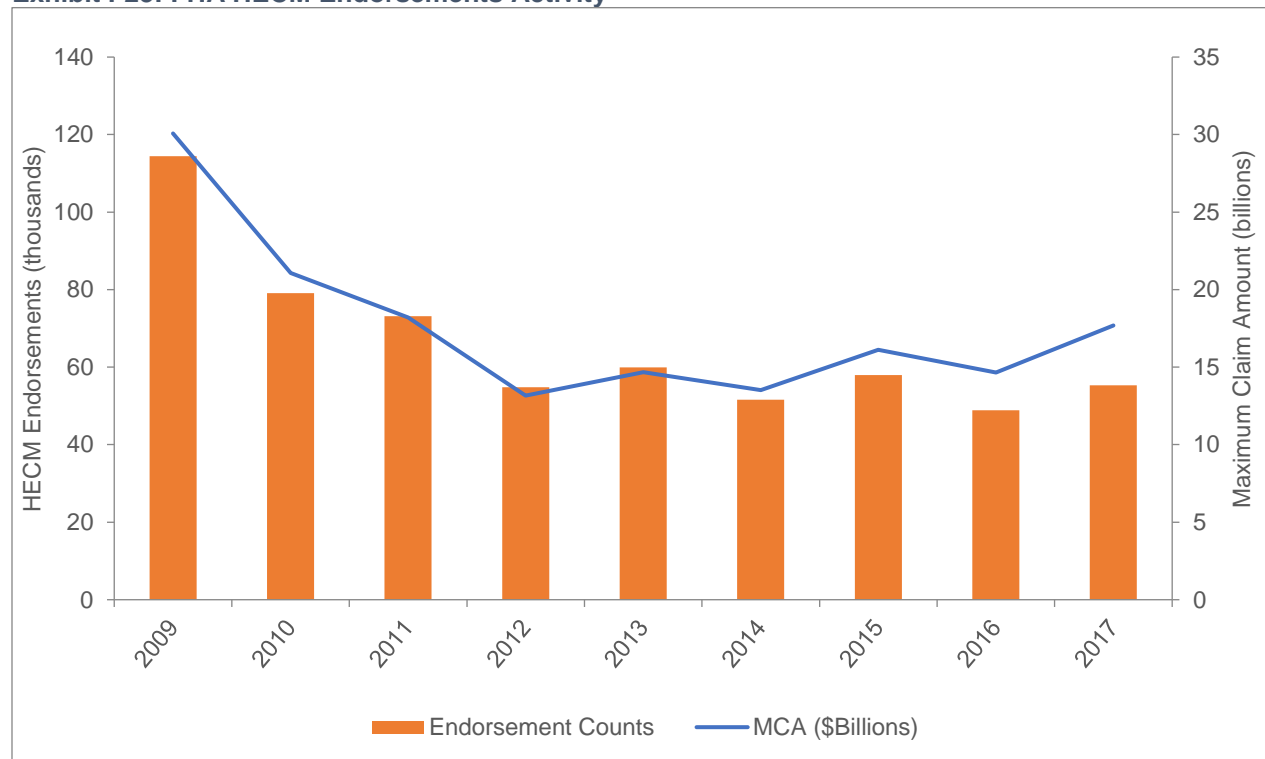
<sup>15</sup> This type of claim is referred to as a Claim Type 1.

<sup>16</sup> This assignment claim is referred to as the Mortgagee Optional Election (MOE).

Due to the uncertainty of home prices, interest rates, and other factors that impact the loan balance, the HECM portfolio's financial performance has been historically volatile, and the transition of HECM obligations to the MMIF continues to negatively impact the MMIF's performance. Net cash flow from HECM insurance operations has been increasingly negative, with all books of business between FY 2009 and FY 2017 projected to lose money. The negative cash flow is due to a variety of economic and other factors, and is covered, or subsidized, by the positive cash flow coming into the MMIF as a result of favorable forward mortgage portfolio performance. Chapter Two of this Annual Report discusses the impacts of the HECM portfolio on the MMIF in more detail.

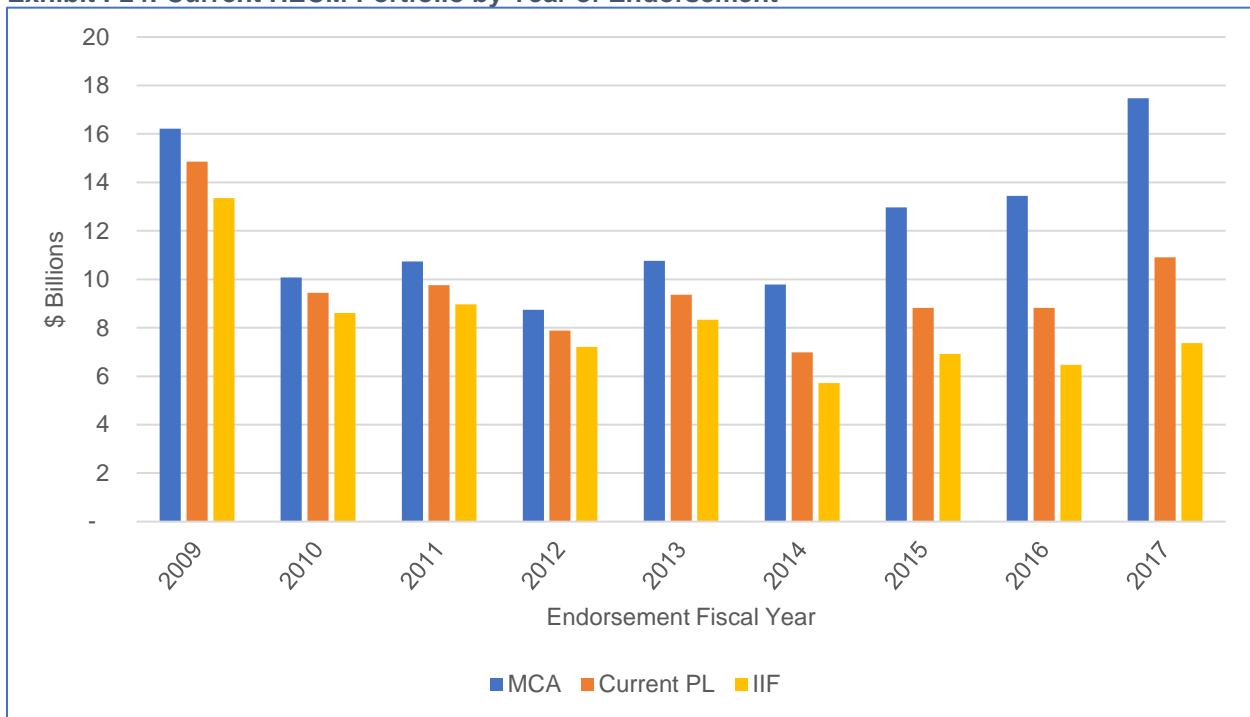
FHA has taken a number of steps to strengthen the financial viability of the HECM program and mitigate the negative impacts of the HECM portfolio on the overall financial health of the MMIF. In FY 2017, FHA revised the HECM PLFs, restructured HECM Mortgage Insurance Premiums, and implemented changes to the program as outlined in FHA's January 2017 final rule. The changes are intended to reduce claims and losses on new HECM endorsements. For more information on changes to the HECM program, see Chapter 3. None of the changes implemented in FY 2017 affect HECMs endorsed during FY 2017 or prior, and the impact of these changes and the ongoing performance of the HECM portfolio will require careful monitoring and management.



**Exhibit I-23: FHA HECM Endorsements Activity**

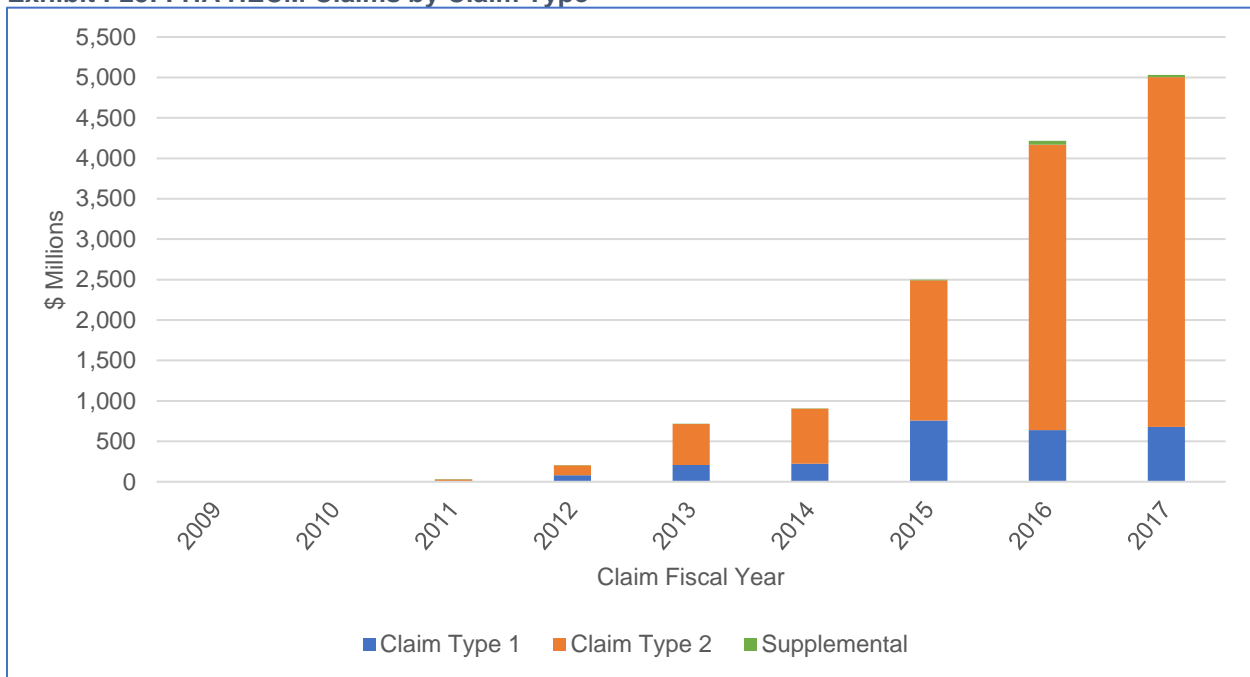
SOURCE: U.S. Department of HUD/FHA, October 2017.  
Refer to data table B-21 in Appendix B.

In FY 2017, as shown in Exhibit I-23 above, FHA endorsed 55,291 HECMs, representing a total MCA of \$17.7 billion. HECM endorsement volumes are at half the volume of the program's all-time peak of 2009, but have risen over the last fiscal year. HECM endorsement volumes have remained relatively stable between FY 2012 and FY 2017, between 45 and 60 thousand endorsements per year.

**Exhibit I-24: Current HECM Portfolio by Year of Endorsement**

SOURCE: U.S. Department of HUD/FHA, October 2017.  
Refer to data table B-22 in Appendix B.

As of the end of FY 2017, the HECM portfolio in the MMIF represented a total MCA of \$110.2 billion, a current principal limit of \$86.8 billion, and a current IIF of \$73.0 billion. Exhibit I-24 above provides a breakdown of the current HECM portfolio by vintage year. For each vintage year, the current outstanding MCA, current total principal limit and current insurance-in-force are shown.

**Exhibit I-25: FHA HECM Claims by Claim Type**

NOTE: The Claim Type 1 category represents the dollar volume of claims generated when the borrower no longer occupies the home, and the property is sold at a loss, with the mortgage never being assigned to the HUD Secretary D. The Claim Type 2 category represents the dollar volume of claims resulting from the assignment of the mortgage to the HUD Secretary when the mortgage reaches 98 percent of the MCA. Supplemental claims are those claims submitted by lenders for other eligible expenses not included on original claims, such as property preservation expenses.

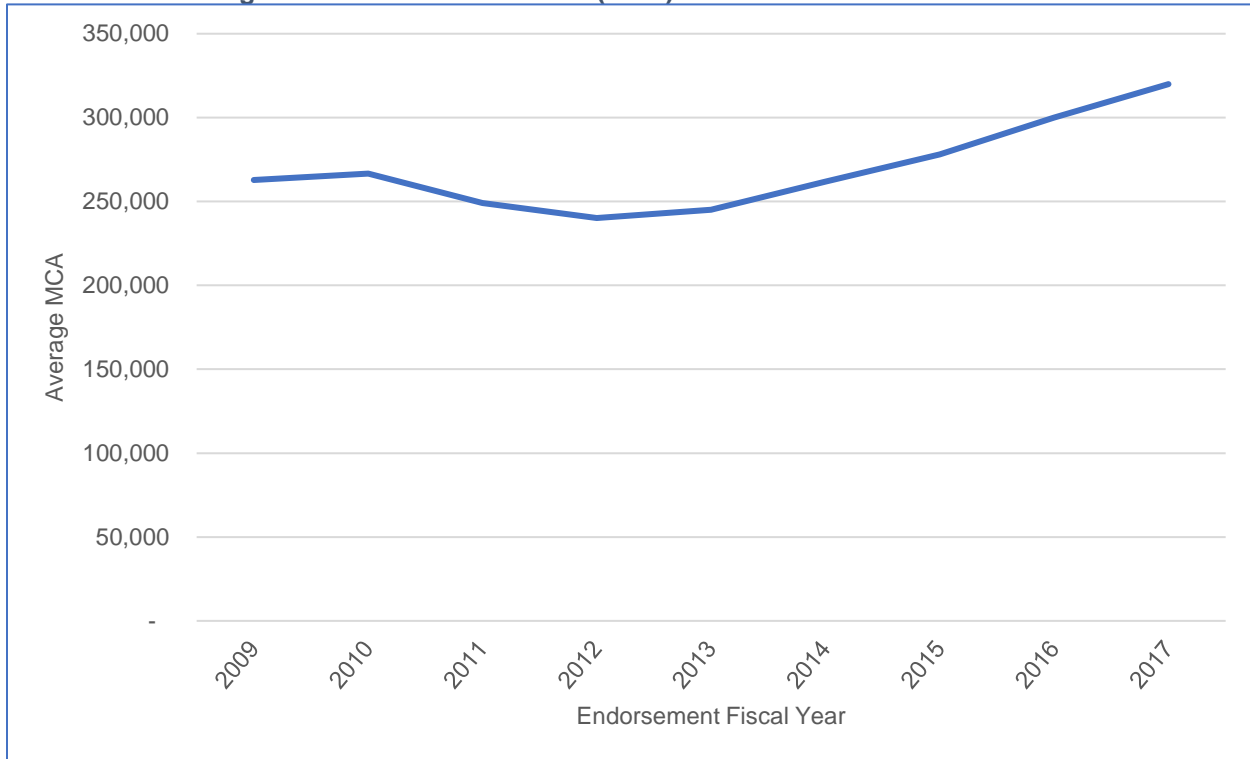
SOURCE: U.S. Department of HUD/FHA, October 2017.

Refer to data table B-23 in Appendix B.

Exhibit I-25 above shows the total amount and distribution of HECM claims by Claim Type. In FY 2017 claims totaled \$5.0 billion, up from \$4.2 billion in FY 2016. Exhibit I-25 demonstrates the rapid increase in claims experienced by the HECM program. The distribution of claims reflects that Type 2 claims, defined as claims where lenders exercise their right to assign HECMs to the Secretary, have been the predominant type of claims paid. Type 2 claims have increased in recent fiscal years primarily due to the seasoning of the HECM portfolio with loan balances reaching 98 percent of the MCA, and the introduction of the Mortgagee Optional Election Assignment for HECMs where the borrower leaves behind an eligible non-borrowing spouse.

## Home Equity Conversion Mortgages (HECM): Endorsement Characteristics

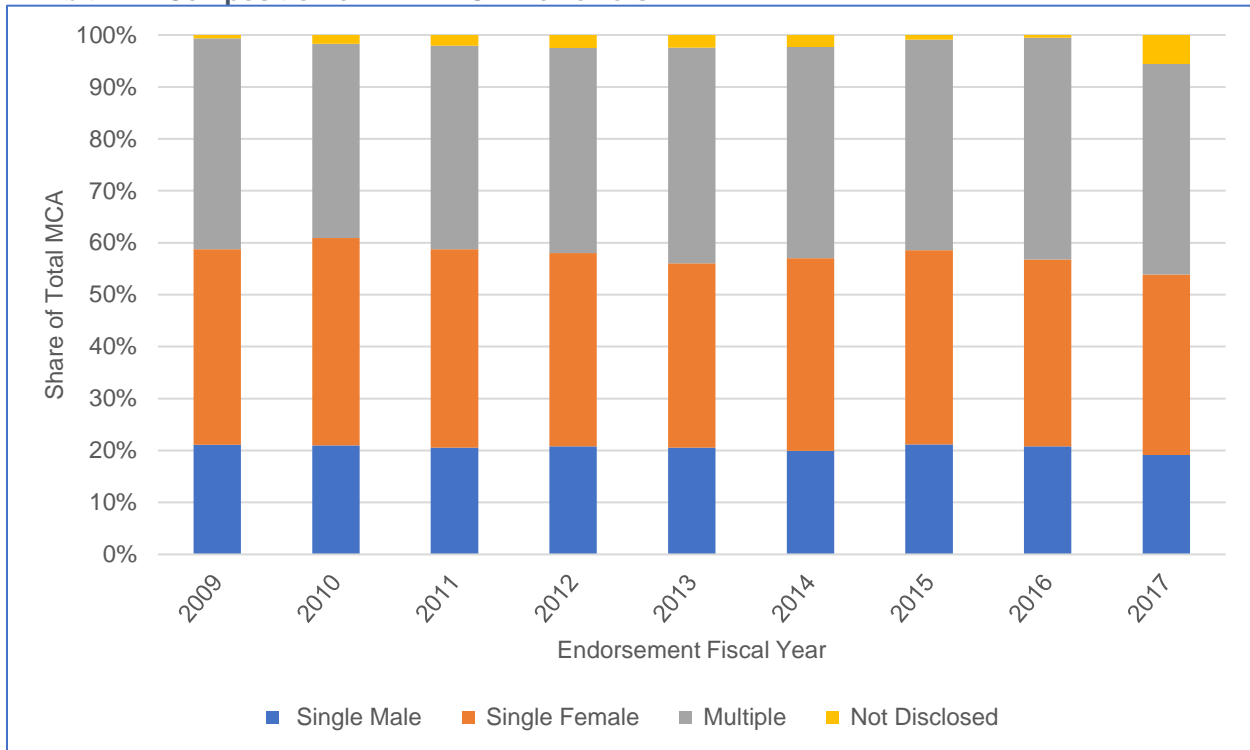
**Exhibit I-26: Average Maximum Claim Amount (MCA) for FHA Endorsed HECMs**



SOURCE: U.S. Department of HUD/FHA, October 2017.  
Refer to data table B-24 in Appendix B.

The average MCA per HECM endorsement has continued to rise since FY 2013, increasing to \$319,955 in FY 2017. Rising average MCAs coincide with the increasing health of the housing market, leading to higher appraised values on homes occupied by HECM borrowers. The current FHA loan limit for HECM loans in FY 2017 was \$636,150, and this limit is applied uniformly across the country, unlike the forward mortgage loan limits which vary based on geographic locations which are subject to minimum and maximum limits.

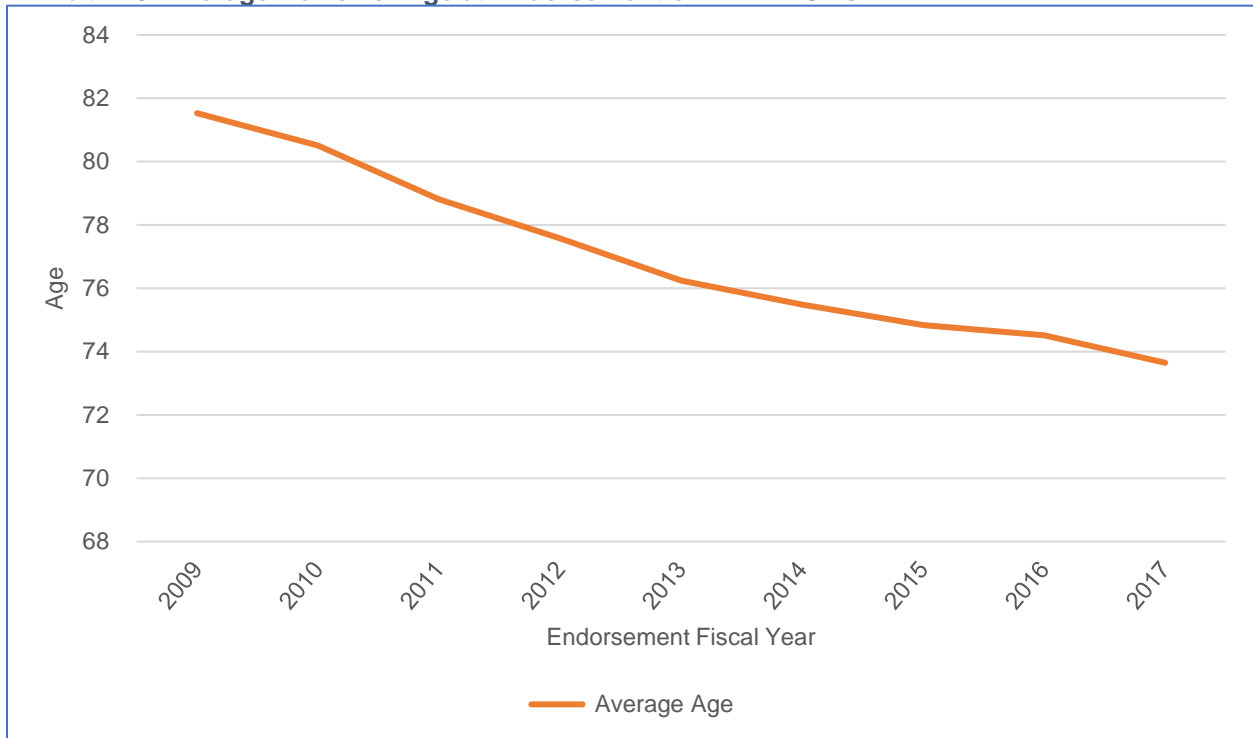
**Exhibit I-27: Composition of FHA HECM Borrowers**



SOURCE: U.S. Department of HUD/FHA, October 2017.  
Refer to data table B-25 in Appendix B.

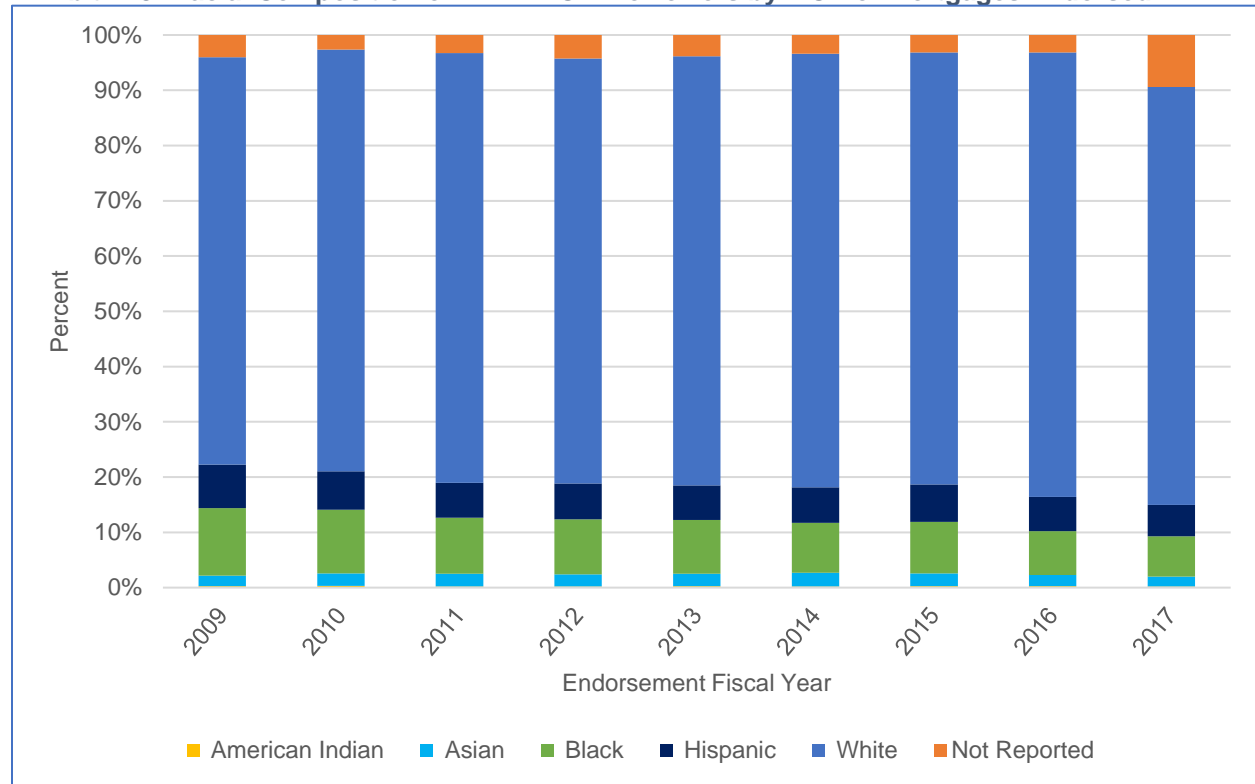
Exhibit I-27 above illustrates the share of HECM endorsement aggregate MCA by borrower composition. In FY 2017, 34.7 percent of HECM aggregate MCA served female borrowers, 19.2 percent served male borrowers, and 40.5 percent served multiple borrowers. The composition of HECM borrowers has remained relatively consistent since FY 2009.

**Exhibit I-28: Average Borrower Age at Endorsement of FHA HECMs**



SOURCE: U.S. Department of HUD/FHA, October 2017.  
Refer to data table B-26 in Appendix B.

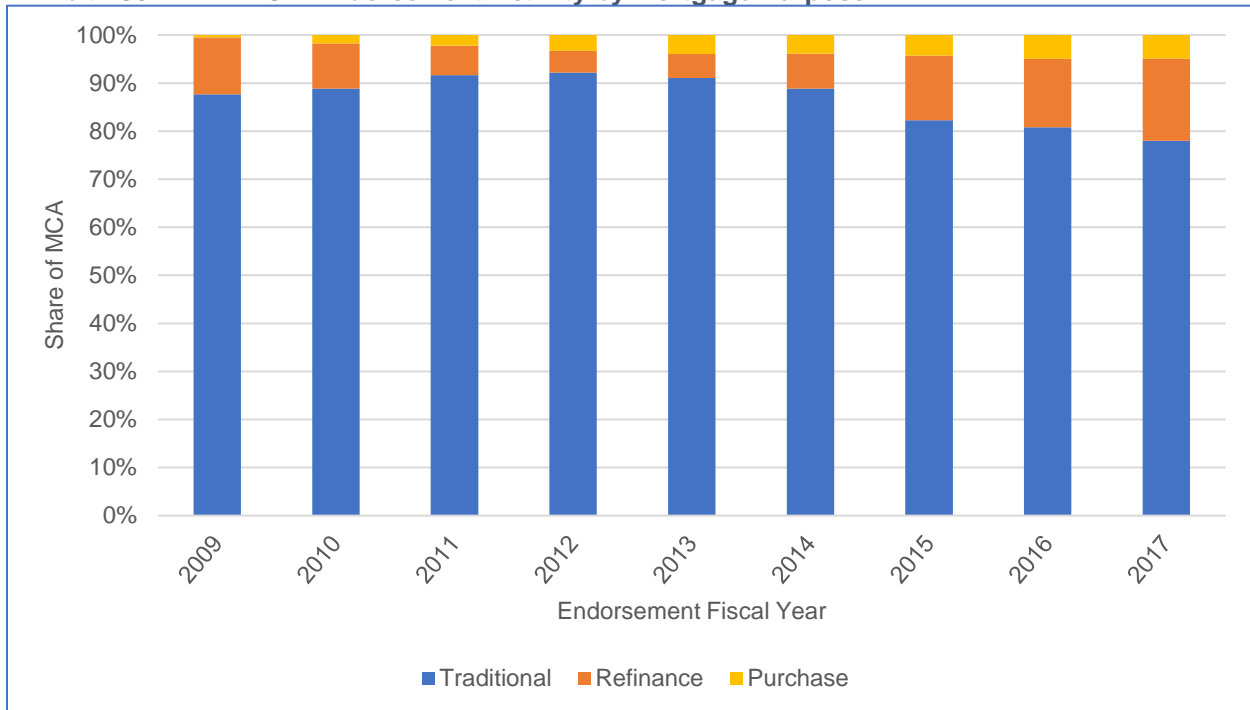
Exhibit I-28 shows the trend in the average age of HECM borrowers, which has been decreasing. In FY 2017, the average borrower age was 74 years, versus 75 years in FY 2016.

**Exhibit I-29: Racial Composition of FHA HECM Borrowers by MCA of Mortgages Endorsed**

SOURCE: U.S. Department of HUD/FHA, October 2017.  
Refer to data table B-27 in Appendix B.

Since joining the MMIF, the racial composition of HECM borrowers has experienced a modest decrease in the share of minority borrowers. In FY 2017, white Americans make up the majority of borrowers, representing approximately 75.7 percent of aggregate MCA. As the table shows the category of Not Reported was 9.4 percent, an increase from 3.2 percent in FY 2016. However, the total MCA for minority borrowers increased from \$2.4 billion in FY 2016 to \$2.6 billion in FY 2017, with black and Hispanic borrowers increasing by \$122 million and \$101.5 million respectively.

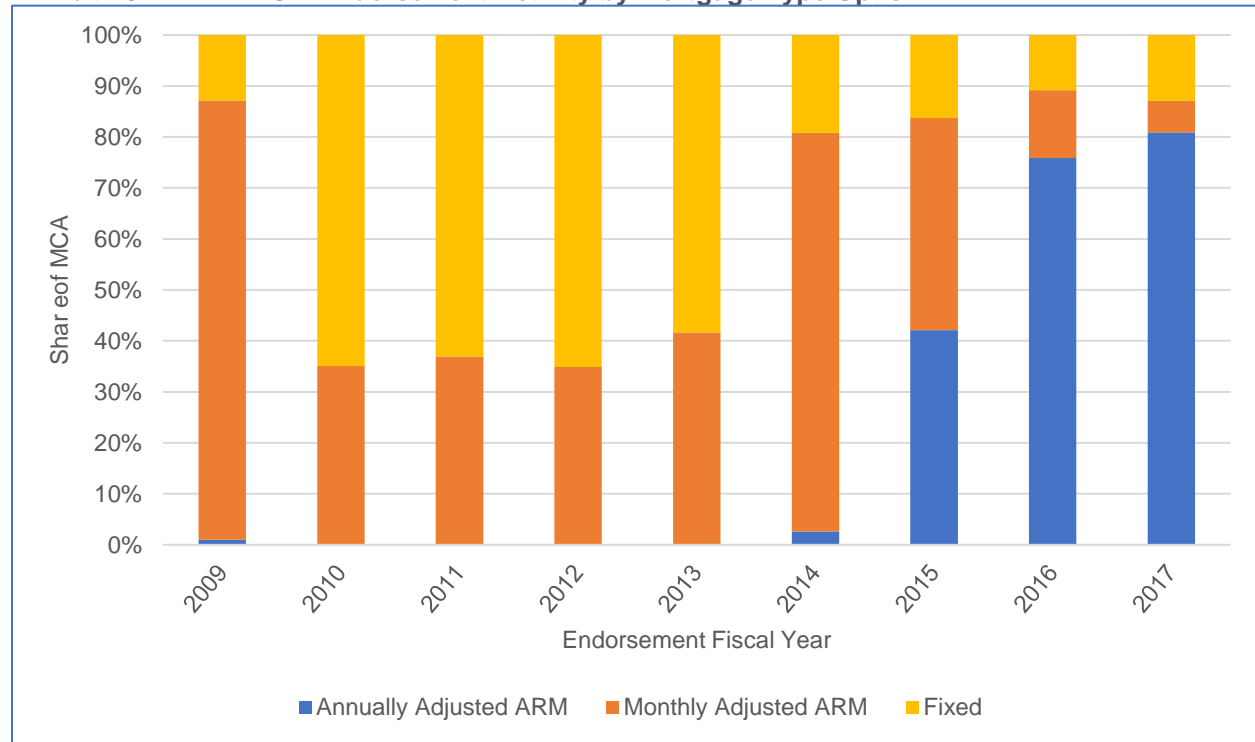
**Exhibit I-30: FHA HECM Endorsement Activity by Mortgage Purpose**



SOURCE: U.S. Department of HUD/FHA, October 2017.  
Refer to data table B-28 in Appendix B.

As shown in Exhibit I-30 above, the share of HECM MCA for refinance transactions has more than tripled since FY 2012, rising to 17.1 percent in FY 2017. This increasing trend coincides with improvements in the housing market; however, FHA continues to closely monitor HECM refinance activity and HECM appraisal quality.

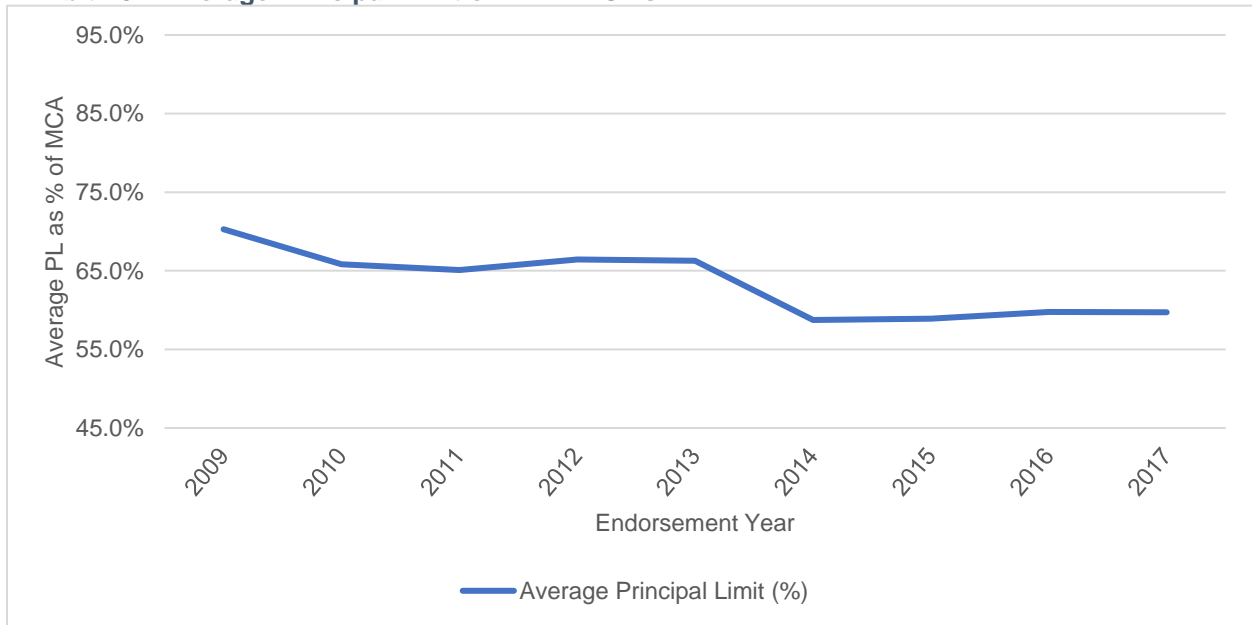


**Exhibit I-31: FHA HECM Endorsement Activity by Mortgage Type Option**

SOURCE: U.S. Department of HUD/FHA, October 2017.  
Refer to data table B-29 in Appendix B.

Exhibit I-31 above illustrates the shift from fixed-rate HECMs to adjustable rate HECMs since FY 2013. In FY 2017, 87 percent of FHA's HECM endorsements were for an adjustable rate mortgage. This change in composition is a result of policies implemented in FY 2014 related to the insurability of fixed-rate HECMs, including eliminating the option of future draws and a reduction in the amount of principal made available to the borrower. For adjustable rate HECMs, should interest rates increase in the future, HECM loan balances will compound more quickly, resulting in faster depletion of borrower equity in the home and increased potential losses to FHA.

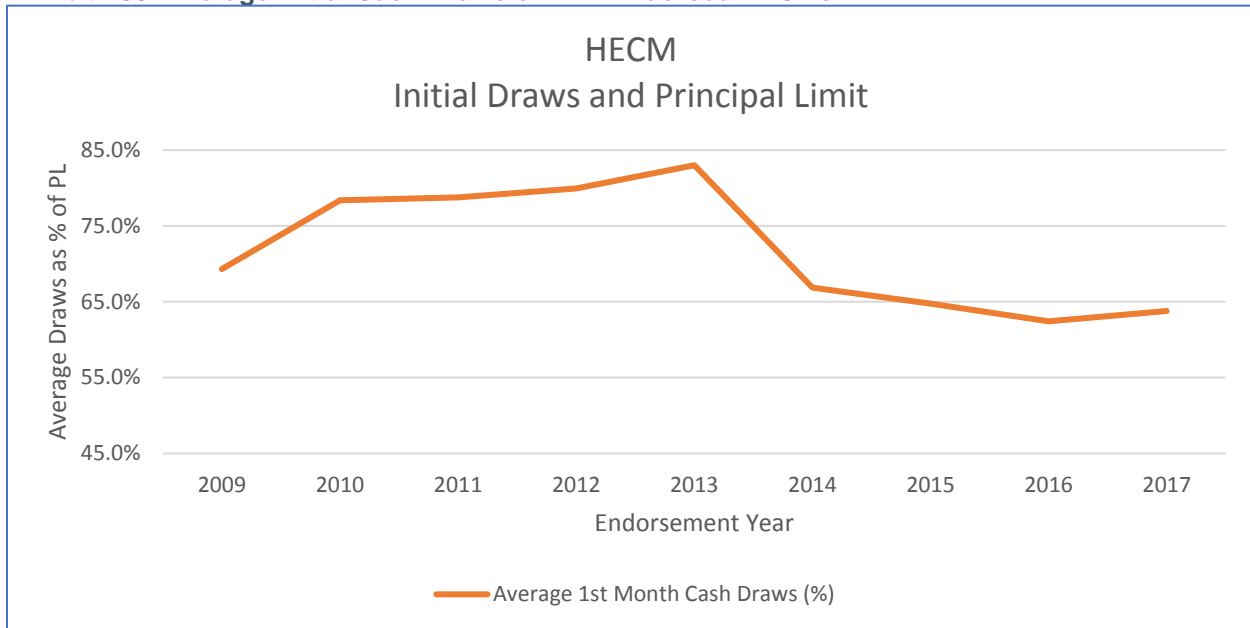
**Exhibit I-32: Average Principal Limit of FHA HECMs**



SOURCE: U.S. Department of HUD/FHA, October 2017.  
Refer to data table B-30 in Appendix B.

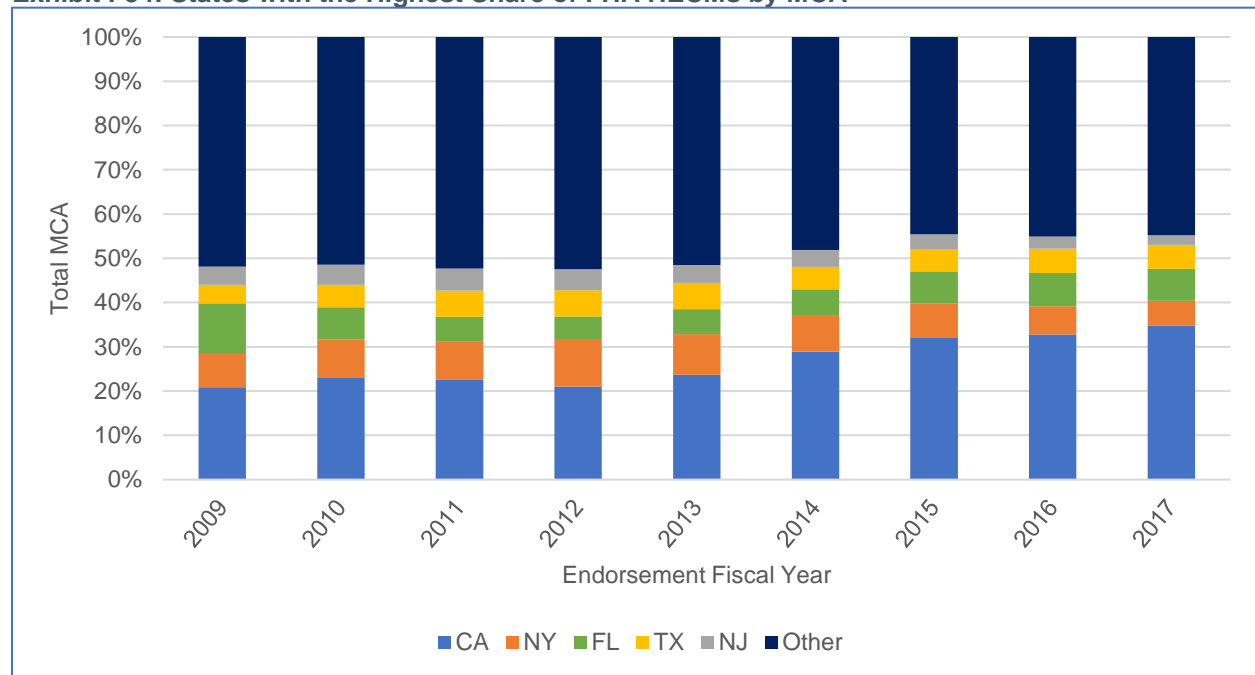
The average Principal Limit on a HECM in FY 2017 was 59.7 percent of the MCA. Exhibit I-32 above shows a consistent average Principal Limit beginning with endorsements in FY 2014.

**Exhibit I-33: Average Initial Cash Draws of FHA Endorsed HECMs**



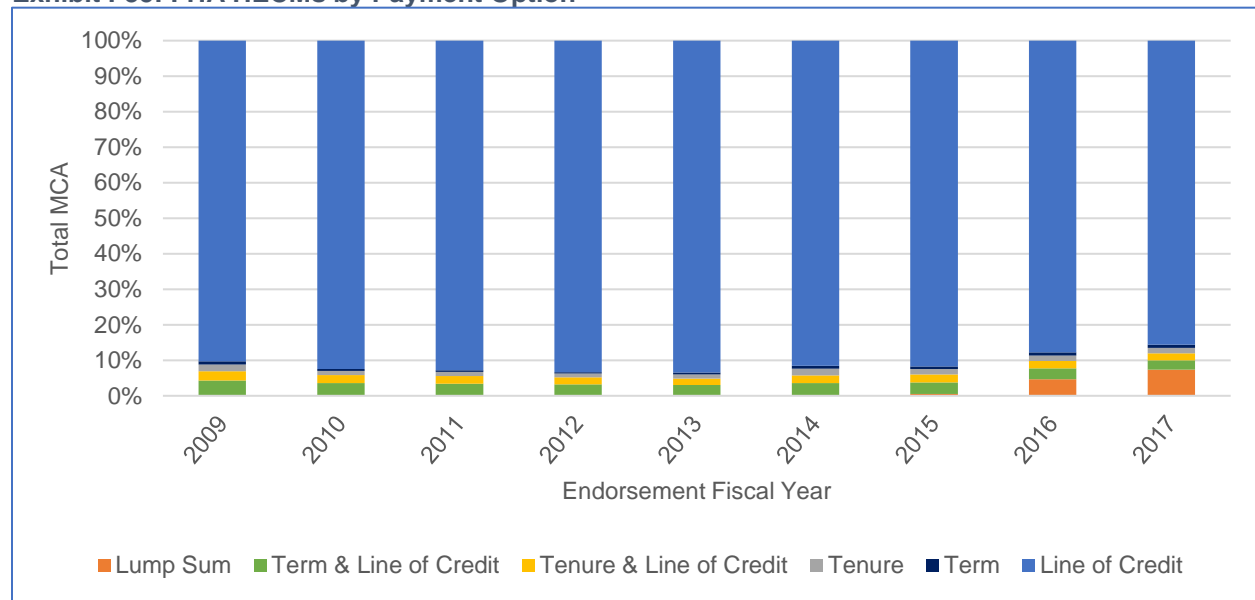
SOURCE: U.S. Department of HUD/FHA, October 2017.  
Refer to data table B-30 in Appendix B.

In FY 2017, HECM borrowers withdrew on average 63.8 percent of their available Principal Limit on their initial draw, versus FY 2013, where the HECM borrower's average initial draw was 83 percent of the Principal Limit. Due to policies implemented in FY 2014, initial draw amounts on both fixed-rate and adjustable rate HECMs have decreased significantly since FY 2013 as reflected in Exhibit I-33 above, and have remained stable over the last three fiscal years.

**Exhibit I-34: States with the Highest Share of FHA HECMs by MCA**

SOURCE: U.S. Department of HUD/FHA, October 2017.  
Refer to data table B-31 in Appendix B.

The top three states for HECM endorsements, based on total MCA, were California (34.85 percent), Florida (7.25 percent), and New York (5.53 percent). HECMs are more geographically concentrated than forward mortgages. The top five states represented 53.1 percent of new HECM endorsements in FY 2017. This share has slightly increased over the past four fiscal years, creating a more concentrated geographical risk profile for the program. Future HECM performance will be more reliant on economic factors such as home price appreciation in these concentrated states, particularly California.

**Exhibit I-35: FHA HECMs by Payment Option**

SOURCE: U.S. Department of HUD/FHA, October 2017.  
Refer to data table B-32 in Appendix B.

Exhibit I-36 above summarizes the share of aggregate HECM endorsement MCA by payment plan option. HECM borrowers can choose from several payment plan options to receive funds: Lump Sum; a Term and Line of Credit combination; a Tenure and Line of Credit combination; Tenure only; and Line of Credit only. The borrower may change his or her payment plan at any time, with the exception of fixed-rate Lump Sum Payment plan HECMs originated after 2014.

The HECM Line of Credit (LOC) draw option, where the borrower chooses to access funds at any time until the line of credit is exhausted, remains the predominant payment plan type chosen by HECM borrowers due to its flexibility. This has remained consistent over the previous fiscal years, although there has been an increase in the number of Lump Sum payment plan options, where the borrower chooses to receive the entire Principal Limit at closing in one draw, over the past two fiscal years. The other payment plan options, Term and Tenure, allow the borrower to choose to receive funds for a fixed period of time. With the Tenure option, the borrower will continue to receive payments even when the loan balance exceeds the Principal Limit. The borrower may also choose a combination of Term or Tenure with a Line of Credit. These payment plans segregate a portion of the available principal for a line of credit and then calculate monthly draws based on the borrower's selection of Term or Tenure.

## Chapter II: Condition of the Mutual Mortgage Insurance Fund

### Summary

**Exhibit II-1: Mutual Mortgage Insurance Fund (MMIF)**

Description	2012	2013	2014	2015	2016	2017
<b>Ending Balances - \$ Millions</b>						
Total Capital Resources*	\$31,617	\$29,680	\$28,440	\$30,862	\$35,346	\$39,737
Cash Flow NPV	(\$46,638)	(\$31,010)	(\$23,666)	(\$7,040)	(\$7,795)	(\$14,112)
Economic Net Worth	(\$15,021)	(\$1,330)	\$4,774	\$23,822	\$27,551	\$25,625
Insurance-In-Force	\$1,117,415	\$1,143,583	\$1,137,991	\$1,133,099	\$1,170,421	\$1,226,843
<b>Balances as a Percent of Ending Insurance-In-Force</b>						
Total Capital Resources	2.83%	2.60%	2.50%	2.72%	3.02%	3.24%
Cash Flow NPV	-4.17%	-2.71%	-2.08%	-0.62%	-0.67%	-1.15%
<b>Economic Net Worth - Capital Ratio</b>	-1.34%	-0.12%	0.42%	2.10%	2.35%	2.09%

\*Fiscal years 2013 onward include the \$1,686 million mandatory appropriation  
SOURCE: U.S. Department HUD/FHA, October 2017.

### Total Capital Resources Increased in FY 2017<sup>17</sup>

During FY 2017, Total Capital Resources increased by \$4.4 billion to \$39.7 billion or 3.24 percent of IIF, from \$35.3 billion or 3.02 percent of Insurance-in-Force (IIF) at the end of FY 2016. The added Total Capital Resources will assist the MMIF to better withstand adverse credit, interest rate, home price and mortgage market risks that may develop. Although Total Capital Resources increased 12.4 percent from the prior fiscal year-end, the gain was more than offset by a deterioration in the net present value of future cash flows (Cash Flow NPV) to a negative \$14.1 billion (negative 1.15 percent of IIF), from a negative \$7.8 billion (negative 0.67 percent of IIF) at the end of FY 2016. Cash Flow NPV includes all future cash flows to and from the MMIF, including cash inflows such as premiums and future outflows such as claims, and is dependent on the forecasting assumptions described below. The decrease in Cash Flow NPV was primarily the result of a further decrease in the Cash Flow NPV of the Home Equity Conversion Mortgage (HECM) portfolio. The MMIF's Economic Net Worth is the result of adding Cash Flow NPV to Total Capital

<sup>17</sup> Values for Total Capital Resources, its components and insurance-in-force presented in this Annual Report are consistent with amounts reported in FHA's Financial Statements and supporting materials for FY 2012-2017. These amounts may differ from amounts utilized in prior actuarial reviews.

Resources. Economic Net Worth decreased 7.0 percent in FY 2017 to \$25.6 billion from \$27.6 billion at the end of FY 2016.

### MMIF Capital Ratio Above 2.0 Percent but Decreased in FY 2017

The MMIF Capital Ratio is Economic Net Worth expressed as a percentage of IIF. For FY 2017, Economic Net Worth of \$25.6 billion is divided by total IIF of \$1.227 trillion, resulting in the MMIF Capital Ratio of 2.09 percent of IIF. The FY 2017 MMIF Capital Ratio exceeded the 2.0 percent minimum referenced in statute for the third consecutive year. However, the Capital Ratio decreased from 2.35 percent of IIF at the end of FY 2016.

New in this Annual Report are the stand-alone capital ratios for the forward and HECM portfolios. The capital ratio of the forward program increased to 3.33 percent of forward portfolio IIF at the end of FY 2017 from 3.11 percent of forward portfolio IIF at the end of FY 2016. The HECM portfolio's stand-alone capital ratio decreased to negative 19.84 percent of HECM portfolio IIF at the end of FY 2017 from a negative 11.81 percent of HECM portfolio IIF at the end of FY 2016.

### Capital Adequacy is Tested

Capital adequacy is the ability of the MMIF to meet its statutory obligation of maintaining a minimum 2.0 percent Capital Ratio across a range of economic conditions assuming no new books of business. Because Economic Net Worth includes the result of forecasted Cash Flow NPV, we tested the effects of a variety of economic scenarios on the MMIF Capital Ratio. This Annual Report includes the results of the tests of the capital adequacy of the MMIF to absorb risk under varying economic conditions using 100 economic scenarios, similar to those that have happened in the past. Test results indicated that, with the current insured portfolio and existing Capital Resources, the MMIF Capital Ratio would remain at or above the 2.0 percent statutory minimum requirement in 79 outcomes. In an additional 15 outcomes, the Capital Ratio would fall below 2.0 percent but remain above zero. The remaining six outcomes resulted in capital ratios below zero.

### Cash Flows From Insurance Operations Improved

FY 2017 MMIF net cash flows from insurance operations were \$2.5 billion, a \$1.6 billion increase from the \$0.9 billion reported in FY 2016. Positive cash flow from operations in the forward mortgage portfolio of \$6.1 billion for FY 2017 was partially offset by \$3.6 billion of negative cash

flows from HECM operations in FY 2017. HECM negative cash flow was primarily driven by claims incurred.

For budgetary purposes, MMIF has two components of Total Capital Resources: The Financing Account and the Capital Account. For more detail on these components, please see Exhibits II-3, II-6 and II-8 below.

### New Independent Actuary for FY 2017 Confirms Baseline Projections Reasonable

This year, forecast scenarios of Cash Flow NPV were estimated by FHA, and tested for reasonableness by the independent actuary, Pinnacle Actuarial Resources (“Pinnacle”). In previous Annual Reports, Cash Flow NPV scenario estimates were developed by a financial engineering firm and validated for reasonableness by an independent actuary. This change provides several critical benefits. First, it transitions reliance from one set of estimates to two independently derived estimates that serve to better validate the reasonableness of results. Second, the change enhances the consistency of reported FHA financial results by harmonizing the processes used to produce the estimated Cash Flow NPV with the Liability for Loan Guarantees reported in FHA’s annual audited financial statements. Finally, the independent actuarial study has been realigned to be more consistent with the role of actuaries in the preparation of financial statement estimates for private sector companies by serving as a critically important independent check on FHA’s methodology.

For FY 2017, Pinnacle concluded that FHA’s Cash Flow NPV is reasonable and within Pinnacle’s reasonable range of Actuarial Estimates. Pinnacle’s Actuarial Central Estimate of Cash Flow NPV from the forward portfolio is \$1.9 billion compared with FHA’s baseline estimate of \$1.4 billion. Pinnacle’s Actuarial Central Estimate of HECM Cash Flow NPV is negative \$14.2 billion compared with FHA’s baseline estimate of negative \$15.5 billion. Pinnacle’s Cash Flow NPV estimates for the forward and HECM portfolio combined total negative \$12.3 billion versus the negative \$14.1 billion FHA baseline estimate. The difference between the two estimates of \$1.8 billion is 0.15 percent of IIF.

### Premium Decrease Impact Estimated: Would Have Moved MMIF Capital Ratio Below 2.0 Percent

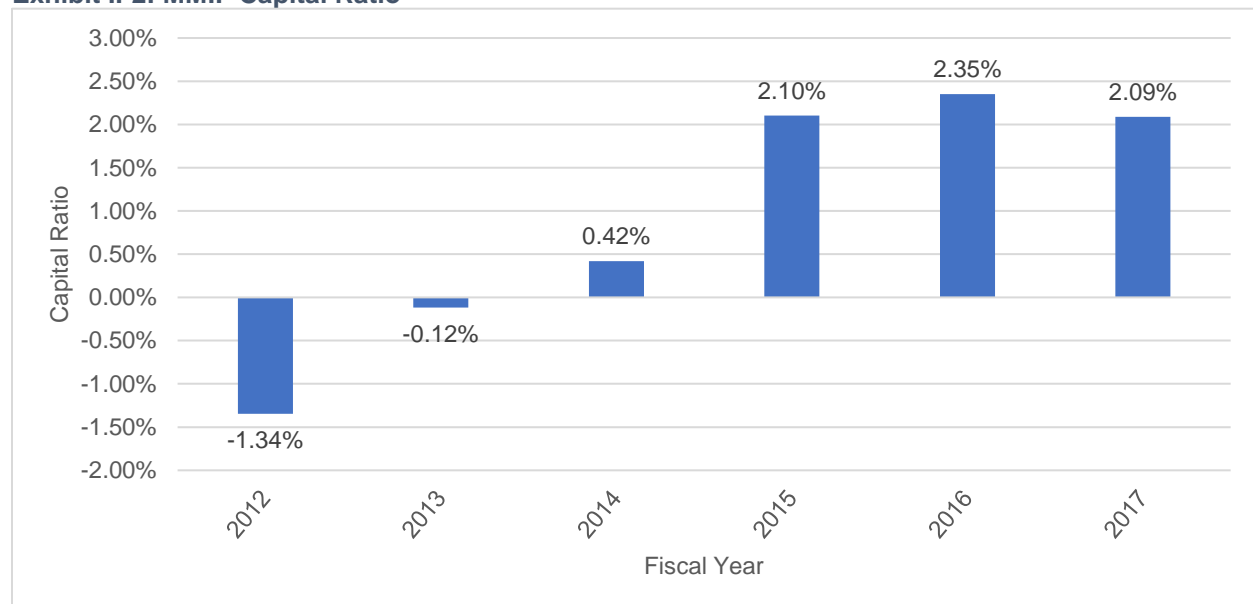
In January 2017, FHA announced and then suspended a reduction in annual Mortgage Insurance Premiums (AMIP) for forward loans closing on or after January 27, 2017. The AMIP decreases proposed varied depending on various factors, including loan term, base loan amount, loan-to-value (LTV) ratio and loan purpose. For FHA’s most common loan type of a 30-year term with an LTV ratio greater than 95 percent and base loan amount less than or equal to \$625,500, the AMIP would have been reduced from 0.85 percent to 0.60 percent. The premium decrease, had it taken effect, would have affected the MMIF in three ways. First, it would have reduced Cash Flow NPV



by reducing annual premiums collected on new forward mortgages endorsed in FY 2017. Second, some existing FHA borrowers would have refinanced into the FY 2017 cohort at lower premiums than currently being paid, further reducing Cash Flow NPV. Third, a partially offsetting impact would have resulted from an incremental increase in new endorsements arising from borrowers utilizing FHA rather than conventional financing. This incremental volume would have had the effect of both increasing Cash Flow NPV and increasing FHA's Insurance-in-Force. The combined impact of these changes would have been to reduce the MMIF Capital Ratio to 1.76 percent as a result of Cash Flow NPV declining by an estimated \$3.2 billion and IIF increasing by a projected \$45 billion.

## MMIF Capital Ratio

**Exhibit II-2: MMIF Capital Ratio**



SOURCE: U.S. Department HUD/FHA, October 2017.  
Refer to data table C-1 in appendix C.

As Exhibit II-2 above shows, at 2.09 percent of IIF, the FY 2017 MMIF Capital Ratio exceeded its 2.0 percent statutory capital requirement for the third consecutive year. MMIF Total Capital Resources increased to 3.24 percent of IIF from 3.02 percent of IIF at the end of FY 2016. The increase in Total Capital Resources was more than offset, however, by a Cash Flow NPV of negative \$14.1 billion at the end of FY 2017 (negative 1.15 percent of IIF). The decrease in the MMIF Capital Ratio from 2.35 percent of IIF at the end of FY 2016, to 2.09 percent of IIF at the end of FY 2017, was the first decrease since the end of FY 2012.

**Exhibit II-3: MMIF Capital Ratio Components**

Description	2012	2013	2014	2015	2016	2017
<b>Ending Balances (\$ millions)</b>						
Capital Account Balance	\$3,309	\$0	\$7,331	\$15,992	\$37,240	\$31,638
Plus: Financing Account Balances	\$28,308	\$29,680	\$21,110	\$14,870	(\$1,894)	\$8,099
Equals: Total Capital Resources	\$31,617	\$29,680	\$28,440	\$30,862	\$35,346	\$39,737
Plus: Cash Flow NPV	(\$46,638)	(\$31,010)	(\$23,666)	(\$7,040)	(\$7,795)	(\$14,112)
Equals: Economic Net Worth	(\$15,021)	(\$1,330)	\$4,774	\$23,822	\$27,551	\$25,625
Insurance-In-Force	\$1,117,415	\$1,143,583	\$1,137,991	\$1,133,099	\$1,170,421	\$1,226,843
<b>Balances as a Percent of Ending Insurance-In-Force</b>						
Capital Account	0.30%	0.00%	0.64%	1.41%	3.18%	2.58%
Plus: Financing Account Balances	2.53%	2.60%	1.85%	1.31%	-0.16%	0.66%
Equals: Total Capital Resources	2.83%	2.60%	2.50%	2.72%	3.02%	3.24%
Plus: Cash Flow NPV	-4.17%	-2.71%	-2.08%	-0.62%	-0.67%	-1.15%
<b>Equals: Economic Net Worth - Capital Ratio</b>	<b>-1.34%</b>	<b>-0.12%</b>	<b>0.42%</b>	<b>2.10%</b>	<b>2.35%</b>	<b>2.09%</b>
Insurance-In-Force	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

SOURCE: U.S. Department HUD/FHA, October 2017.

## Recovery in the Capital Account

The MMIF Capital Account balance stood at \$31.6 billion at the end of FY 2017. This marks a significant recovery from FY 2013 when a mandatory appropriation was required to prevent a deficit in the account. By the start of FY 2013, upward budget re-estimates had reduced the balance of the Capital Account to \$3.3 billion, as show in Exhibit II-3 above. This amount was insufficient to cover subsequent budget re-estimates<sup>18</sup> despite \$17.4 billion in subsidy transfers to the MMIF in FY 2013. As a result, a \$1.686 billion mandatory appropriation was required to fund the re-estimate, which occurred on Sep. 30, 2013, and the balance of the Capital Account ended FY 2013 at \$0. Since then, the balance increased to \$37.2 billion in FY 2016 before falling back to \$31.6 billion in FY 2017. Since the start FY 2014, the forward program has made net contributions to the Capital Account of \$37.0 billion, comprised of \$43.0 billion in subsidy transfers partially offset by \$6.0 billion in upward budget re-estimates. Over the same period, the HECM program has made net withdrawals from the Capital Account of \$5.7 billion, comprised of \$279 million in subsidy transfers which were more than offset by \$6.0 billion in upward budget

<sup>18</sup> During each cohort's first policy year, the initial estimate of Cash Flow NPV is deposited to the Capital Account as loans are endorsed. Cash Flow NPV is then re-estimated annually. Upward budget re-estimates transfer funds from the Capital Account to the forward or HECM programs to ensure that MMIF insurance obligations will be met. Likewise, downward re-estimates transfer funds not needed to meet insurance obligations to the Capital Account.

re-estimates. \$405 million of the Capital Account's recovery was the result of interest income earned.

#### Exhibit II-4: Recovery in the MMIF Capital Account

Description	Fiscal Year					
	2013	2014	2015	2016	2017	Totals for 2014 - 2017
	\$ millions					
<b>Beginning Balance</b>	<b>\$3,309</b>	<b>\$0</b>	<b>\$7,331</b>	<b>\$15,992</b>	<b>\$37,240</b>	
Forward Negative Subsidy Collected	\$17,079	\$9,794	\$13,021	\$9,084	\$11,093	\$42,992
Forward Budget Re-estimates	(\$16,915)	(\$3,234)	(\$3,665)	\$6,616	(\$5,757)	(\$6,040)
<b>Net Forward Contribution</b>	<b>\$164</b>	<b>\$6,560</b>	<b>\$9,356</b>	<b>\$15,700</b>	<b>\$5,336</b>	<b>\$36,952</b>
HECM Negative Subsidy Collected	\$365	\$54	\$65	\$101	\$59	\$279
HECM Budget Re-estimates	(\$5,517)	\$715	(\$790)	\$5,335	(\$11,257)	(\$5,997)
<b>Net HECM Contribution</b>	<b>(\$5,152)</b>	<b>\$769</b>	<b>(\$725)</b>	<b>\$5,436</b>	<b>(\$11,198)</b>	<b>(\$5,718)</b>
<b>Mandatory Appropriation</b>	<b>\$1,686<sup>19</sup></b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	
<b>Interest Income and Transfer to Liquidating Account</b>	<b>(\$6)</b>	<b>\$2</b>	<b>\$31</b>	<b>\$112</b>	<b>\$260</b>	<b>\$405</b>
<b>Ending Balance</b>	<b>\$0</b>	<b>\$7,331</b>	<b>\$15,993</b>	<b>\$37,240</b>	<b>\$31,638</b>	

SOURCE: U.S. Department HUD/FHA, October 2017.

## Stand-Alone Capital Ratios for Forwards and HECM

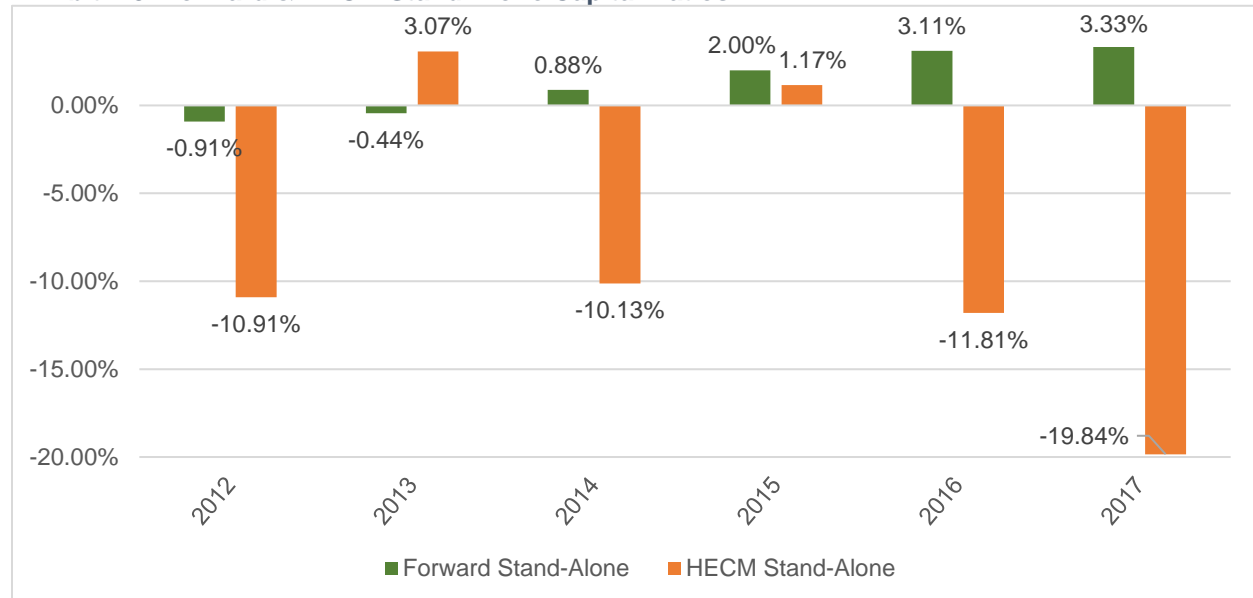
To better reflect their actual financial performance and full cumulative net contributions to the Capital Account, FHA is providing stand-alone capital ratios for the forward and HECM programs in this Annual Report. Prior Annual Reports did not adjust forward and HECM capital resources for cross-program subsidies; rather, they simply assigned to the forward program the balance remaining in the Capital Account after cross-program subsidies were transferred to HECM. This practice, while consistent with the Capital Account's purpose as a repository for the accumulated surplus of FHA's Single Family insurance operations, resulted in cross-program subsidization because budget re-estimates transfer funds from the Capital Account to ensure each program has sufficient funds to meet all remaining obligations.

Since joining the MMIF in FY 2009, HECM has deposited \$1.3 billion in initial credit subsidies to the Capital Account and withdrawn \$13.0 billion in net upward re-estimates, resulting in a net withdrawal of \$11.7 billion. HECM's net withdrawal resulted in a cross-program subsidy from the forward program to HECM. To adjust the FY 2017 program level capital ratios for the cross-

<sup>19</sup> A mandatory appropriation is required when an upward budget re-estimate exceeds the balance in the Capital Account rather than when the Capital Ratio falls below zero.

subsidization, the \$11.7 billion was subtracted from HECM's capital resources and added to the capital resources of the forward program, net of the \$1.7 billion mandatory appropriation in FY 2013. Corresponding adjustments were made to prior year's forward and HECM capital ratios to more accurately reflect each program's true stand-alone capital resources and capital ratio for prior periods.

**Exhibit II-5: Forward & HECM Stand-Alone Capital Ratios**



SOURCE: U.S. Department HUD/FHA, October 2017.  
Refer to data table C-2 in appendix C.

As shown in Exhibit II-5 above, the stand-alone capital ratio of the forward program increased to 3.33 percent in FY 2017 from 3.11 percent in FY 2016, exceeding the 2.0 percent statutory minimum requirement for the third consecutive year. Forward capital resources increased to 3.21 percent of IIF, up from 2.75 percent in FY 2016. Forward capital resources were supplemented by a positive Cash Flow NPV of 0.12 percent of IIF, which was down from 0.36 percent a year earlier. Forward IIF increased to \$1.15 trillion in FY 2017 from \$1.1 trillion in FY 2016.

**Exhibit II-6: Forward Mortgage Insurance Program Stand-Alone Capital Ratio Components**

Description	2012	2013	2014	2015	2016	2017
<b>Balances (\$ millions) As of September 30</b>						
Net Cross-Program Subsidy Paid*	\$991	\$3,107	\$3,568	\$4,303	(\$1,097)	\$10,010
Plus: Capital Account Balance	\$3,309	\$0	\$7,331	\$15,992	\$37,240	\$31,638
Plus: Financing Account Balance	\$25,015	\$20,561	\$12,285	\$5,238	(\$5,916)	(\$4,593)
Equals: Total Capital Resources	\$29,315	\$23,668	\$23,183	\$25,533	\$30,227	\$37,056
Plus: Cash Flow NPV	(\$39,052)	(\$28,432)	(\$13,684)	(\$4,186)	\$3,948	\$1,357
Equals: Economic Net Worth	(\$9,737)	(\$4,764)	\$9,499	\$21,347	\$34,175	\$38,413
Insurance-In-Force	\$1,069,003	\$1,086,647	\$1,074,732	\$1,065,360	\$1,100,046	\$1,153,875
<b>Balances as a Percent of Insurance-In-Force</b>						
Net Cross-Program Subsidy Paid	0.09%	0.29%	0.33%	0.40%	-0.10%	0.87%
Capital Account	0.31%	0.00%	0.68%	1.50%	3.39%	2.74%
Plus: Financing Account Balance	2.34%	1.89%	1.14%	0.49%	-0.54%	-0.40%
Equals: Total Capital Resources	2.74%	2.18%	2.16%	2.40%	2.75%	3.21%
Plus: Cash Flow NPV	-3.65%	-2.62%	-1.27%	-0.39%	0.36%	0.12%
<b>Equals: Economic Net Worth - Capital Ratio</b>	<b>-0.91%</b>	<b>-0.44%</b>	<b>0.88%</b>	<b>2.00%</b>	<b>3.11%</b>	<b>3.33%</b>
Insurance-In-Force	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

NOTE: Net Cross-Program Subsidy Paid excludes the \$1,686 million mandatory appropriation in FY 2013 through FY 2017.

SOURCE: U.S. Department HUD/FHA, October 2017.

Exhibit II-7 on the following page provides cohort-level capital ratios for forward mortgages. As evidenced by the table, the estimated stand-alone capital ratios of forward mortgages have turned solidly positive beginning with FY 2010. Post-crisis cohorts, beginning in FY 2010, now represent 86.5 percent of forward program IIF.

The forward stand-alone capital ratios by cohort shown in Exhibit II-7 should be viewed in light of the evolution over time of Capital Resources and Cash Flow NPV, the components of economic net worth. Capital Resources are known and audited at the end of each fiscal year, whereas Cash Flow NPV is uncertain and estimated. The net present value of the expected ending Capital Resources of each cohort, the negative credit subsidy, is deposited to the Capital Account in the first policy year but is subject to the risk that actual future cash inflows and outflows may not perform as projected. These variances cause capital ratios to change and the variances are larger at the cohort level than for the MMIF. The potential for variance generally declines over time as actual cash inflows and outflows replace projections. Readers may thus place more confidence in the capital ratios of older forward cohorts than newer ones.

Cohort level capital ratios are also impacted by the change in cohort IIF over time. IIF, the denominator of the Capital Ratio, is defined by statute as the amortized balance of insured loans. The amortized balance of forward mortgages decreases with each monthly mortgage payment and with each prepayment. Declining amortized balances leverage up capital ratio values. For

example, with 26 years of seasoning and four years of remaining life, the FY 1992 cohort has FY 2017 Economic Net Worth of \$1.672 billion, of which 99.66 percent has been received and 0.34 percent is Cash Flow NPV. FY 2017 IIF on the FY 1992 cohort is \$285 million compared with \$43.4 billion in FY 1992. The capital ratio of the FY 1992 forward cohort is 588 percent when calculated using its FY 2017 IIF and 3.85 percent when calculated using its IIF at origination.

The cohort capital ratios shown in Exhibit II-7 generally reflect U.S. economic conditions during the critical early years of cohort life. The FY 1992 through FY 2000 cohorts generally had the benefit of a long period of U.S. economic expansion. The cohorts from FY 2001 through FY 2009 suffered initially from a recession in 2001, followed by an extended home price expansion that turned into a housing bubble and ultimately into steep declines in house prices from the Great Recession<sup>20</sup>. Cohorts from FY 2010 and beyond have benefited from the stabilization and recovery of house prices and an economic recovery.

**Exhibit II-7: Forward Mortgage Insurance Program Insurance-In-Force and Stand-Alone Capital Ratios by Cohort**

Cohort	Insurance-In-Force (\$ millions)	Percent of Insurance-In-Force	Stand-Alone Capital Ratio
<b>1992 - 2000</b>	\$11,098	0.96%	53.26%
<b>2001</b>	\$2,615	0.23%	-41.58%
<b>2002</b>	\$4,995	0.43%	-31.45%
<b>2003</b>	\$10,869	0.94%	1.20%
<b>2004</b>	\$11,869	1.03%	-36.93%
<b>2005</b>	\$9,333	0.81%	-48.14%
<b>2006</b>	\$8,299	0.72%	-63.19%
<b>2007</b>	\$8,976	0.78%	-74.80%
<b>2008</b>	\$24,971	2.16%	-59.70%
<b>2009</b>	\$62,743	5.44%	-13.16%
<b>2010</b>	\$80,836	7.01%	3.03%
<b>2011</b>	\$67,572	5.86%	8.49%
<b>2012</b>	\$85,594	7.42%	11.22%
<b>2013</b>	\$125,277	10.86%	10.54%
<b>2014</b>	\$56,718	4.92%	13.58%
<b>2015</b>	\$134,498	11.66%	13.91%
<b>2016</b>	\$203,969	17.68%	5.92%
<b>2017</b>	\$243,643	21.12%	4.03%
<b>Total</b>	<b>\$1,153,875</b>	<b>100.00%</b>	<b>3.33%</b>

SOURCE: U.S. Department HUD/FHA, October 2017.

As shown in Exhibit II-8 below, HECM's stand-alone capital ratio decreased to negative 19.84 percent in FY 2017 from negative 11.81 percent in FY 2016. HECM's capital resources decreased

<sup>20</sup> The Great Recession refers to a period of economic contraction in the United States which the National Bureau of Economic Research (NBER) identifies as beginning in December 2007 and ending in June 2009, a duration of 18 months. The Great Recession is the longest period of U.S. economic contraction since the Great Depression, which lasted 43 months.

to 1.36 percent of IIF from 4.88 percent in FY 2016. The positive capital resources of the HECM program were more than offset by the negative Cash Flow NPV of negative 21.20 percent, compared with negative 16.69 percent in FY 2016. HECM IIF increased to \$73.0 billion in FY 2017 from \$70.4 billion in FY 2016.

**Exhibit II-8: HECM Insurance Program Stand-Alone Capital Ratio Components**

Description	2012	2013	2014	2015	2016	2017
<b>Balances (\$ millions) As of September 30</b>						
Net Cross-Program Subsidy Received	(\$991)	(\$4,793)	(\$5,254)	(\$5,989)	(\$589)	(\$11,696)
Plus: Capital Account Balance	\$0	\$0	\$0	\$0	\$0	\$0
Plus: Financing Account Balance	\$3,293	\$9,119	\$8,825	\$9,632	\$4,022	12,691
Equals: Total Capital Resources	\$2,302	\$4,326	\$3,571	\$3,643	\$3,433	\$995
Plus: Cash Flow NPV	(\$7,586)	(\$2,578)	(\$9,982)	(\$2,854)	(\$11,743)	(\$15,469)
Equals: Economic Net Worth	(\$5,284)	\$1,748	(\$6,411)	\$789	(\$8,310)	(\$14,474)
Insurance-In-Force	\$48,412	\$56,936	\$63,259	\$67,739	\$70,375	\$72,968
<b>Balances as a Percent of Insurance-In-Force</b>						
Net Cross-Program Subsidy Received	-2.05%	-8.42%	-8.31%	-8.84%	-0.84%	-16.03%
Capital Account	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Plus: Financing Account Balance	6.80%	16.02%	13.95%	14.22%	5.72%	17.39%
Equals: Total Capital Resources	4.76%	7.60%	5.65%	5.38%	4.88%	1.36%
Plus: Cash Flow NPV	-15.67%	-4.53%	-15.78%	-4.21%	-16.69%	-21.20%
<b>Equals: Economic Value - Capital Ratio</b>	<b>-10.91%</b>	<b>3.07%</b>	<b>-10.13%</b>	<b>1.17%</b>	<b>-11.81%</b>	<b>-19.84%</b>
Insurance-In-Force	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

NOTE: Net Cross-Program Subsidy Received excludes the \$1,686 million mandatory appropriation in FY 2013 through FY 2017.

SOURCE: U.S. Department HUD/FHA, October 2017.

Exhibit II-9 on the next page provides cohort-level capital ratios for HECM. The estimated stand-alone capital ratios for the HECM program are negative for every vintage. Due to the nature of HECM loans where IIF tends to grow over time, older HECM vintages still represent a substantial portion of the program's IIF.

As with forwards, the HECM stand-alone capital ratios shown in Exhibit II -9 below should be viewed in light of the evolution over time of Capital Resources and Cash Flow NPV, the components of economic net worth. Each additional year of seasoning replaces projected cash flows with actual results. Unlike forward mortgages, however, the IIF on surviving HECM mortgages increases with the accrual of interest, AMIP and servicing fees on the outstanding balance and with each additional borrower cash draw. Increasing HECM IIF means increasing risk to the MMIF. At origination, for example, IIF on the 114,423 loans in the 2009 HECM cohort was \$14.65 billion and averaged \$128,052 per loan. At the end of FY 2017 insurance was still in force

on 62,874 of these mortgages. Even though 45 percent of the loans in HECM's 2009 cohort had terminated or were assigned to FHA, IIF stood at \$13.36 billion and averaged \$212,437 per surviving loan. After eight years of seasoning, IIF on HECM's 2009 cohort was more than 91 percent of its initial value but was concentrated in 45 percent fewer loans. Accruals of interest and AMIP on the surviving loans will continue to increase IIF. The MMIF remains at economic risk until the last assigned note or the acquired property is liquidated.

The stand-alone capital ratios of all HECM cohorts from FY 2009 through FY 2017 are negative and range in size from negative 3.76 percent to negative 43.12 percent. The FY 2009 HECM cohort shares a negative capital ratio with the forward cohort of the same year, suggesting that the shared economic environment may have played a significant role in both results. The forward and HECM programs have continued to share a common economic environment since FY 2010. Despite this, all HECM cohort capital ratios are negative from FY 2010 and on, while all forward capital ratios are positive for the same fiscal years. The financial performance of forward and HECM portfolios is addressed more fully in the section titled Capital Adequacy: Capital Ratio Outcomes.

**Exhibit II-9: HECM Insurance Program Insurance-In-Force and Stand-Alone Capital Ratios By Cohort**

<b>Cohort</b>	<b>Insurance-In-Force (\$ millions)</b>	<b>Percent of Insurance-In-Force</b>	<b>Stand-Alone Capital Ratio</b>
<b>2009</b>	\$13,357	18.30%	-28.42%
<b>2010</b>	\$8,618	11.81%	-43.12%
<b>2011</b>	\$8,976	12.30%	-19.25%
<b>2012</b>	\$7,219	9.89%	-13.86%
<b>2013</b>	\$8,329	11.41%	-9.95%
<b>2014</b>	\$5,712	7.83%	-3.76%
<b>2015</b>	\$6,920	9.48%	-8.33%
<b>2016</b>	\$6,476	8.87%	-14.64%
<b>2017</b>	\$7,362	10.09%	-22.63%
<b>Total</b>	<b>\$72,968</b>	<b>100.00%</b>	<b>-19.84%</b>

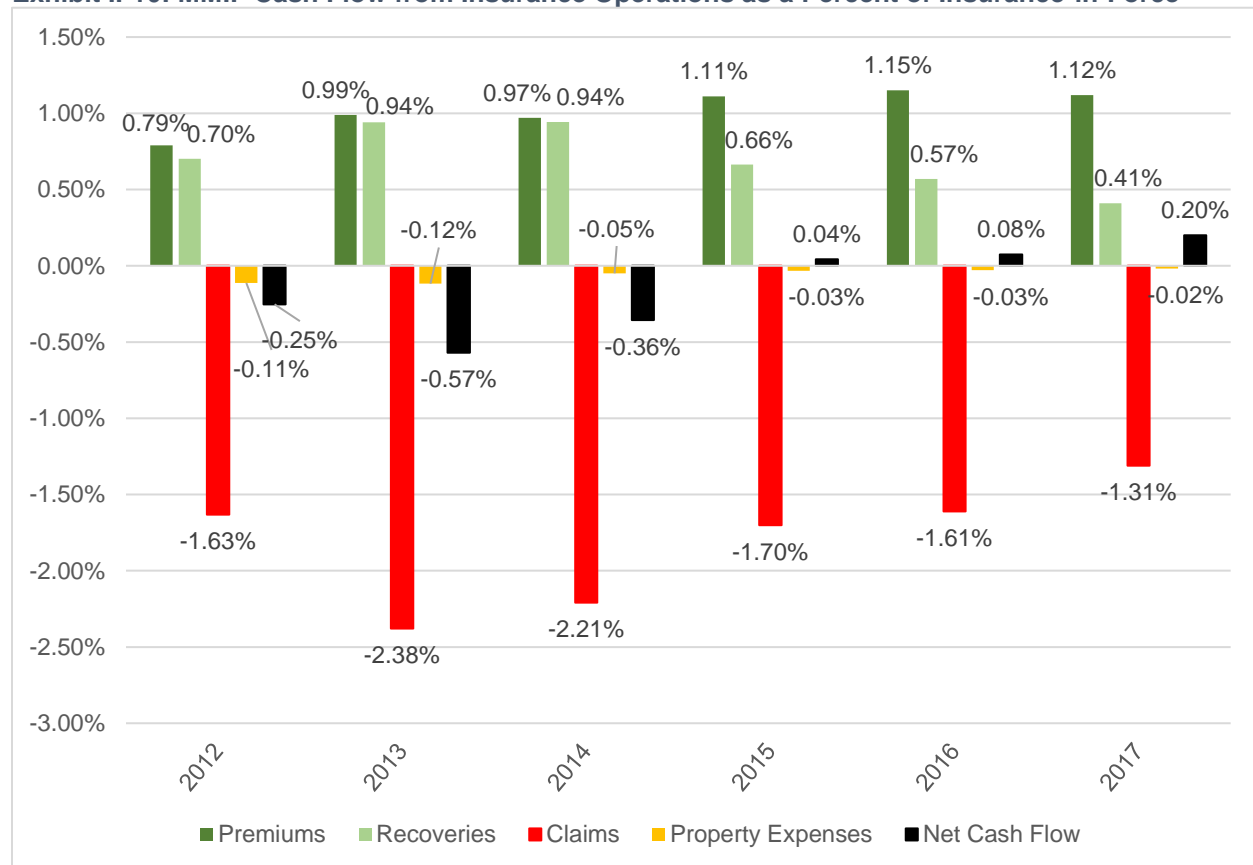
SOURCE: U.S. Department HUD/FHA, October 2017.



## Cash Flow from Insurance Operations

As shown in Exhibit II-10 below, MMIF net cash flow from insurance operations increased to 0.20 percent of average IIF in FY 2017, up from 0.08 percent in FY 2016, marking the fourth consecutive year of improvement and the third year of positive net cash inflows. The changes in net cash flows resulted from improvements in forward mortgage net cash inflows partially offset by continued deterioration in HECM net cash flows. Premium inflows were 1.12 percent of IIF, down slightly from 1.15 percent in FY 2016. Inflows from recoveries on acquired notes and properties decreased to 0.41 percent of IIF from 0.57 percent a year earlier. Cash outflows from claims were negative 1.31 percent of IIF in FY 2017, down from negative 1.61 percent a year ago, making 2017 the fifth consecutive year of smaller claim outflows. Property expenses decreased to negative 0.02 percent of IIF from negative 0.03 percent in FY 2016.

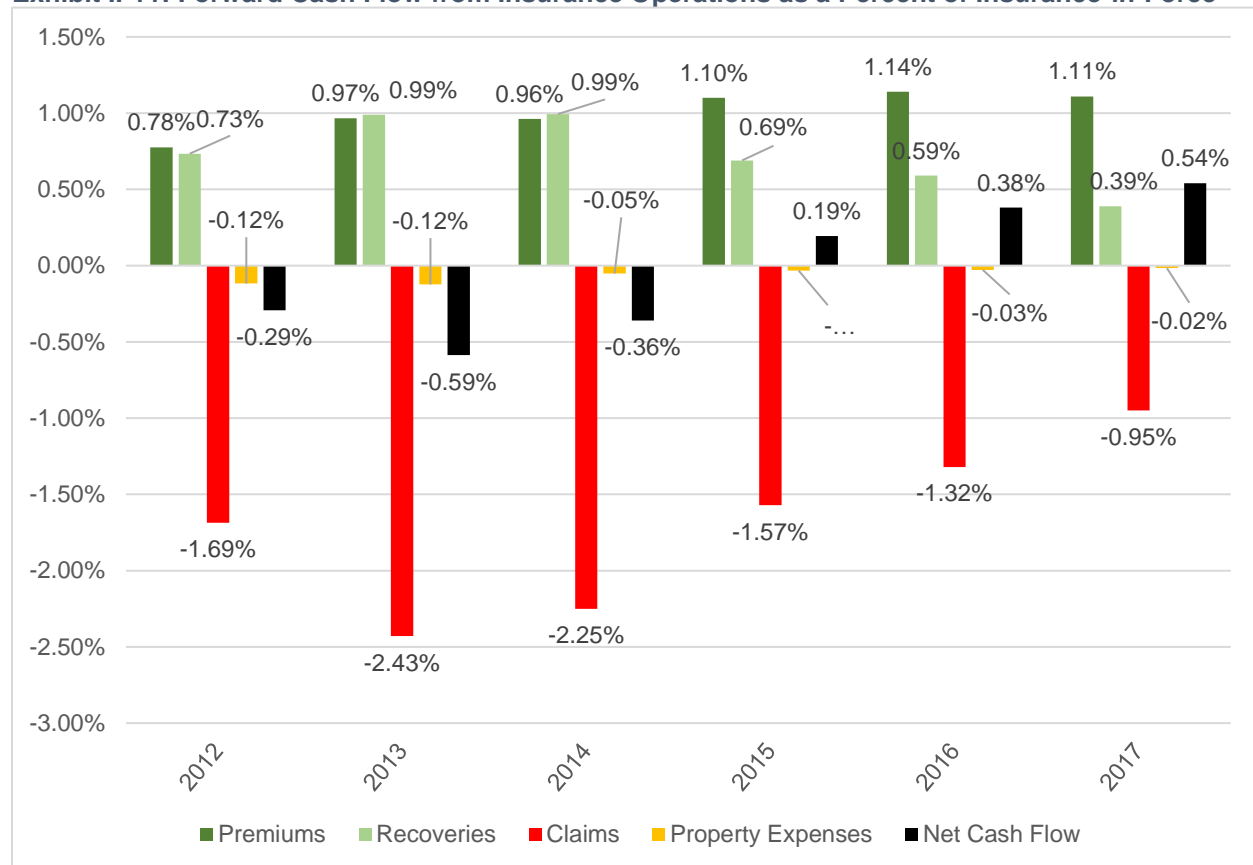
**Exhibit II-10: MMIF Cash Flow from Insurance Operations as a Percent of Insurance-in-Force**



SOURCE: U.S. Department HUD/FHA, October 2017.  
Refer to data table C-3 in appendix C.

As shown in Exhibit II-11 below, forward net cash flow from insurance operations increased to 0.54 percent of IIF in FY 2017, up from 0.38 percent in FY 2016. Premium inflows were 1.11 percent of IIF, down from 1.14 percent in FY 2016. Inflows from recoveries on acquired notes and properties decreased to 0.39 percent of IIF from 0.59 percent a year earlier. Cash outflows from claims were negative 0.95 percent of IIF in FY 2017, improving from negative 1.32 percent a year ago. Property expenses also improved to negative 0.02 percent of IIF from negative 0.03 percent in FY 2016.

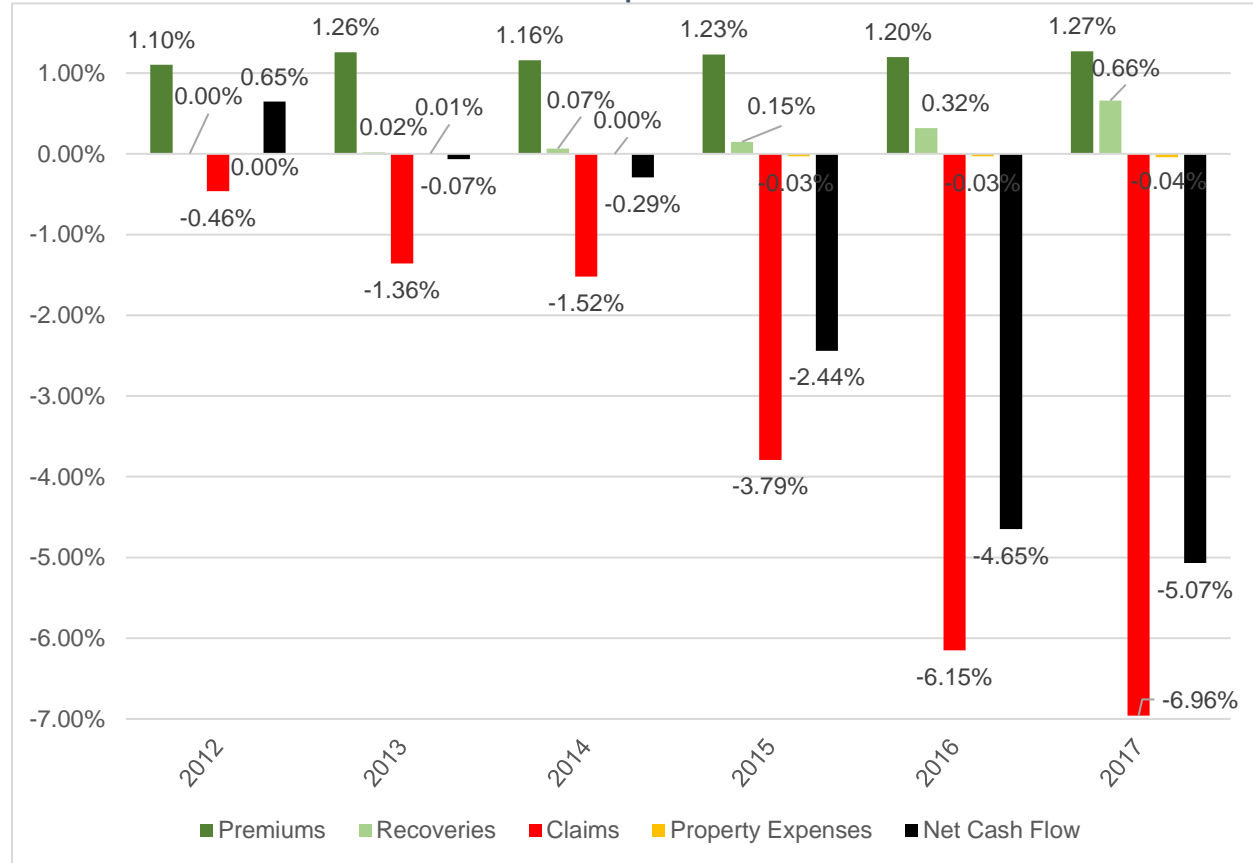
**Exhibit II-11: Forward Cash Flow from Insurance Operations as a Percent of Insurance-in-Force**



SOURCE: U.S. Department HUD/FHA, October 2017.  
Refer to data table C-4 in appendix C.

As shown in Exhibit II-12 below, HECM net cash flow from insurance operations fell to negative 5.07 percent of IIF in FY 2017, from negative 4.65 percent in FY 2016. Premium inflows were 1.27 percent of IIF, up from 1.20 percent in FY 2016. Inflows from recoveries on acquired notes and properties increased to 0.66 percent of IIF from 0.32 percent a year earlier. Cash outflows from HECM claims grew to negative 6.96 percent of IIF in FY 2017, from negative 6.15 percent in FY 2016. Property expenses grew to negative 0.04 percent of IIF from negative 0.03 percent in 2016.

**Exhibit II-12: HECM Cash Flow from Insurance Operations as a Percent of Insurance-in-Force**



SOURCE: U.S. Department HUD/FHA, October 2017.  
Refer to data table C-5s in appendix C.

## Capital Ratio Sensitivity to Assumptions

As required by implementation of the Federal Credit Reform Act of 1990 (FCRA), the NPV of future MMIF cash flows was estimated using the underlying economic assumptions in the President's FY 2018 budget. These assumptions set the future path of interest rates and house price appreciation, both of which influence future cash flows to and from the MMIF insurance operations. Changes in these critical assumptions revise the estimated NPV of future cash flows and therefore the Economic Net Worth of the MMIF. Economic Net Worth of the MMIF in FY 2017 totaled \$25.6 billion, comprised of \$39.7 billion in Total Capital Resources offset by negative \$14.1 billion in Cash Flow NPV.

One method used to test the sensitivity of the MMIF Capital Ratio to changing economic conditions is to shift the future path of home prices and interest rates upward and downward by equal amounts. This analysis, summarized in Exhibit II-13 on the next page, shows that a one percent parallel upward shift in future interest rates would increase the MMIF Capital Ratio to 2.12 percent from 2.09 percent and a one percent downward shift in interest rates would reduce the capital ratio to 2.04 percent. Compared with interest rates, the MMIF Capital Ratio is relatively more sensitive to changes in house prices. A one percent upward shift in the long-term rate of house price appreciation would increase the MMIF Capital Ratio to 3.13 percent. Conversely, a one percent downward shift in the long-term rate of house price appreciation would cause the MMIF Capital Ratio to fall to 0.84 percent, well below the 2.0 percent minimum requirement. These results reflect the relatively greater sensitivity of the MMIF to changes in house price appreciation.

On a stand-alone basis, the forward program is less sensitive to changes in assumptions than the MMIF overall. A one percent parallel upward shift in future interest rates would increase the forward portfolio capital ratio to 3.47 percent from 3.37 percent and a one percent downward shift in interest rates would reduce the forward portfolio capital ratio to 3.14 percent. A one percent upward shift in the long-term rate of house price appreciation would increase the forward portfolio capital ratio to 3.97 percent. Conversely, a one percent downward shift in the long-term rate of house price appreciation would cause the forward portfolio capital ratio to fall to 2.43 percent, remaining above the 2.0 percent minimum requirement referenced in statute.

On a stand-alone basis, HECM is considerably more sensitive to changes in assumptions than the MMIF overall. A one percent parallel upward shift in future interest rates would shift the HECM stand-alone capital ratio to negative 21.41 percent from negative 19.84 percent, and a one percent downward shift in interest rates would improve the HECM portfolio capital ratio to negative 17.74 percent. The greater sensitivity of the HECM portfolio to a change in interest rates than the forward portfolio reflects the fact that many HECMs have adjustable rates. Higher interest rates increase the rate at which HECM loan balances grow, reducing equity in the home at a faster rate and increasing losses to FHA. A one percent upward shift in the long-term rate of

house price appreciation would improve the HECM capital ratio to negative 12.47 percent. Conversely, a one percent downward shift in the long-term rate of house price appreciation would cause the HECM capital ratio to deteriorate to negative 26.65 percent.

**Exhibit II-13: Sensitivity of Capital Ratios to Changes in Assumptions - MMIF, Forwards, and HECM - FY 2017**

Assumption	Change from Baseline	Impact on Capital Ratio - Change in Net Present Value as a Percent of Insurance-In-Force			Stand-Alone Capital Ratios After Changes in Assumptions		
		MMIF	Forward	HECM	MMIF	Forward	HECM
<b>Baseline</b>	0%	0.00%	0.00%	0.00%	2.09%	3.33%	-19.84%
<b>Interest Rates</b>	+1%	0.03%	0.14%	-1.57%	2.12%	3.47%	-21.41%
<b>Interest Rates</b>	-1%	-0.05%	-0.19%	2.10%	2.04%	3.14%	-17.74%
<b>House Price Appreciation</b>	+1%	1.04%	0.64%	7.37%	3.13%	3.97%	-12.47%
<b>House Price Appreciation</b>	-1%	-1.25%	-0.90%	-6.81%	0.84%	2.43%	-26.65%

SOURCE: U.S. Department HUD/FHA, October 2017.

## Comparison to Independent Actuary's Results

12 USC 1708(a)(4) requires FHA to annually provide for an independent actuarial study of the MMIF and to submit a report to Congress describing the results of such study. For this Annual Report, FHA engaged Pinnacle to test the reasonableness of its FY 2017 estimates of forward and HECM Cash Flow NPVs. In previous Annual Reports, Cash Flow NPV estimates were developed by a financial engineering firm and validated for reasonableness by an independent actuary. This change provides critical benefits by: ending reliance on a single set of estimated forward and HECM Cash Flow NPVs in favor of two independently derived sets of estimates to validate the reasonableness of results; enhancing the consistency of reported FHA financial results by harmonizing the processes used to produce the estimated Cash Flow NPVs reported in this Annual Report with the Liability for Loan Guarantees reported in FHA's annual audited financial statements; and, realigning the independent actuarial study to be more consistent with the role of actuaries in the preparation of financial statement estimates for private sector mortgage insurance companies by serving as a critically important independent check on FHA's methodology. FHA's and Pinnacle's estimates were prepared in accordance with the Federal Credit Reform Act and Actuarial Standards of Practice.

Pinnacle concluded that FHA's \$1.4 billion estimate of forward Cash Flow NPV is reasonable. Pinnacle independently estimated forward Cash Flow NPV at \$1.9 billion. Pinnacle independently estimated the range of reasonable estimates for forward Cash Flow NPV as negative \$5.0 billion to \$8.5 billion.

Pinnacle also concluded that FHA's negative \$15.5 billion estimate of HECM Cash Flow NPV is reasonable. Pinnacle independently estimated HECM's Cash Flow NPV at negative \$14.2 billion. Pinnacle independently estimated the range of reasonable estimates for HECM Cash Flow NPV as negative \$20.4 billion to negative \$7.6 billion. Pinnacle's Cash Flow NPV estimates for forwards and HECM combined total negative \$12.3 billion versus negative \$14.1 billion for FHA's baseline estimate. The difference between the two estimates of \$1.8 billion is 0.15 percent of IIF.

Pinnacle's Actuarial Reviews for the forward and HECM portfolios are included in this report as appendices E and F. Pinnacle's MMIF Actuarial Reviews, including appendices, are available on FHA's website at: [https://www.hud.gov/program\\_offices/housing/rmra/oe/rpts/actr/actrmenu](https://www.hud.gov/program_offices/housing/rmra/oe/rpts/actr/actrmenu)

## Capital Adequacy

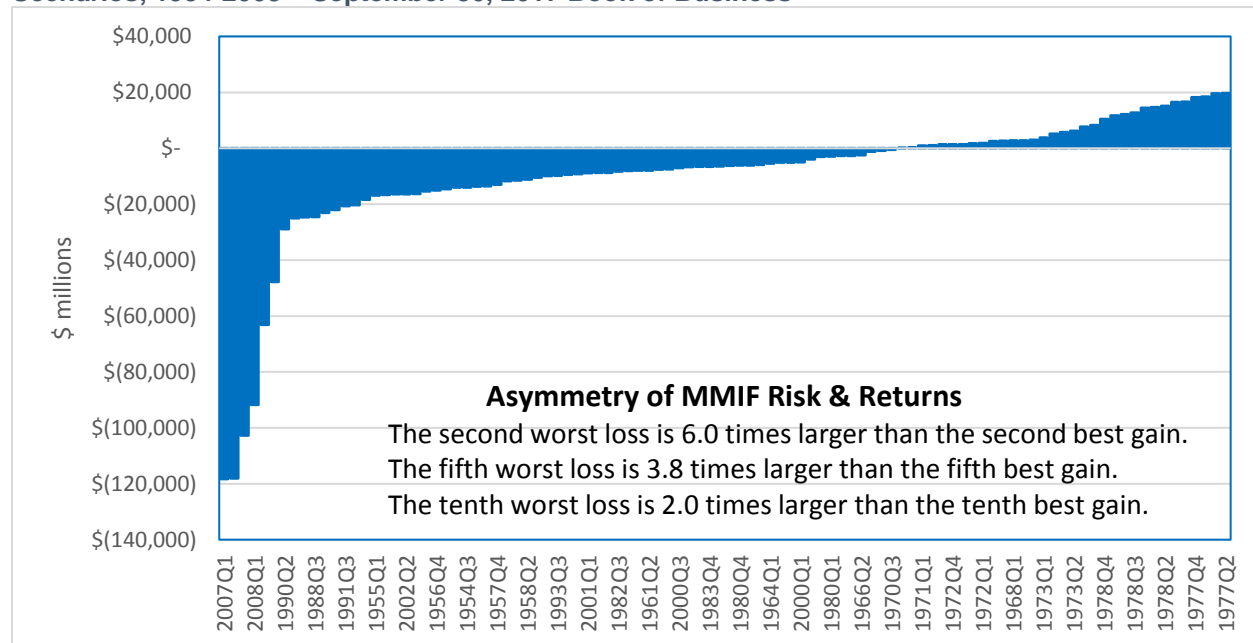
### Capital Adequacy Testing: Distribution of Cash Flow NPV

The baseline value of the MMIF's Economic Net Worth presented in Exhibit II-1 on page 54 of this report is estimated using a single economic scenario. The purpose of the MMIF capital adequacy tests reported in this section is to assess the MMIF's capacity to absorb risk under varying economic conditions, including scenarios that are more stressful than those reflected in the baseline assumptions. The MMIF Economic Net Worth and Capital Ratio depend critically upon Cash Flow NPV, which is uncertain because Cash Flow NPV varies with the performance of the insured mortgages which, in turn, varies with economic conditions. The distribution of the resulting gains and losses compared with current Capital Resources determines the adequacy of the MMIF's current capital to bear risk. Understanding this distribution is a step toward understanding the MMIF's capital adequacy.

To analyze Cash Flow NPV and the resulting impact on MMIF Capital Ratios, historical 30-year economic scenarios were constructed from actual coincident quarterly changes in interest rates and house prices starting in 1954 and continuing through 2008. Scenarios with less than 30 years of actual results were completed using the President's FY 2018 budget assumptions, but no scenario has less than eight years of actual historical data. Generally, the economic conditions experienced by a mortgage during its initial three to seven years are most impactful to how that mortgage will perform. One hundred of these scenarios were selected randomly and used to test changes in Cash Flow NPV and the resulting MMIF Capital Ratio. Testing was carried out by substituting the actual quarter-by-quarter changes in interest rates and house prices of each scenario for the economic assumptions underlying the President's FY 2018 budget.

The results of the scenarios tested reveals that the MMIF faces an asymmetrical distribution of risk and return as shown in Exhibit II-14 below. Potential gains in Cash Flow NPV are limited by mortgage pre-payments, but decreases in Cash Flow NPV may be catastrophic. In the 100 historical scenarios tested, the second worst loss is six times larger than the second best gain, the fifth worst loss is almost four times larger than the fifth best gain and the tenth worst loss is double the tenth best gain.

**Exhibit II-14: Mutual Mortgage Insurance Fund Distribution of Cash Flow NPV through 100 Historic Scenarios, 1954-2008 – September 30, 2017 Book of Business**

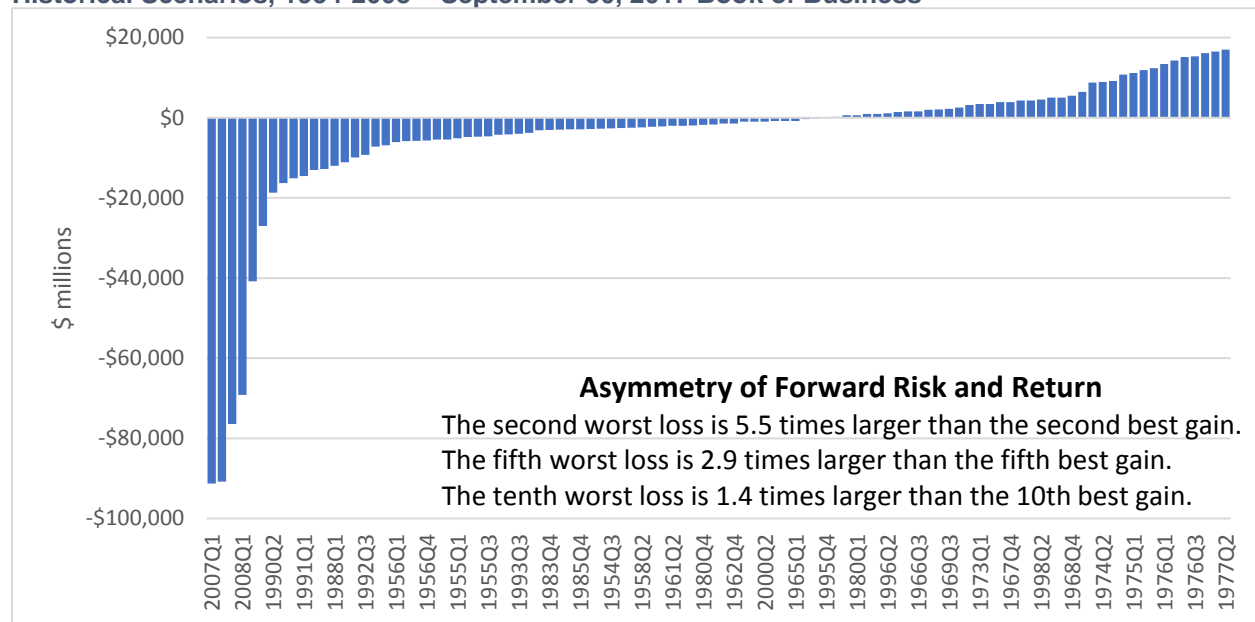


NOTE: The quarters are ordered sequentially from the worst to the best.

SOURCE: U.S. Department HUD/FHA, October 2017.

The imbalance of risk and returns of the forward book of business is less pronounced than that of the overall MMIF. As shown in Exhibit II-15 below, for the forward book, the second worst loss is 5.5 times larger than the second-best gain, the fifth worst loss is 2.9 times larger than the fifth best gain and the tenth worst loss is 1.35 times larger than the tenth best gain.

**Exhibit II-15: Forward Mortgage Insurance Program Distribution of Cash Flow NPV through 100 Historical Scenarios, 1954-2008 – September 30, 2017 Book of Business**



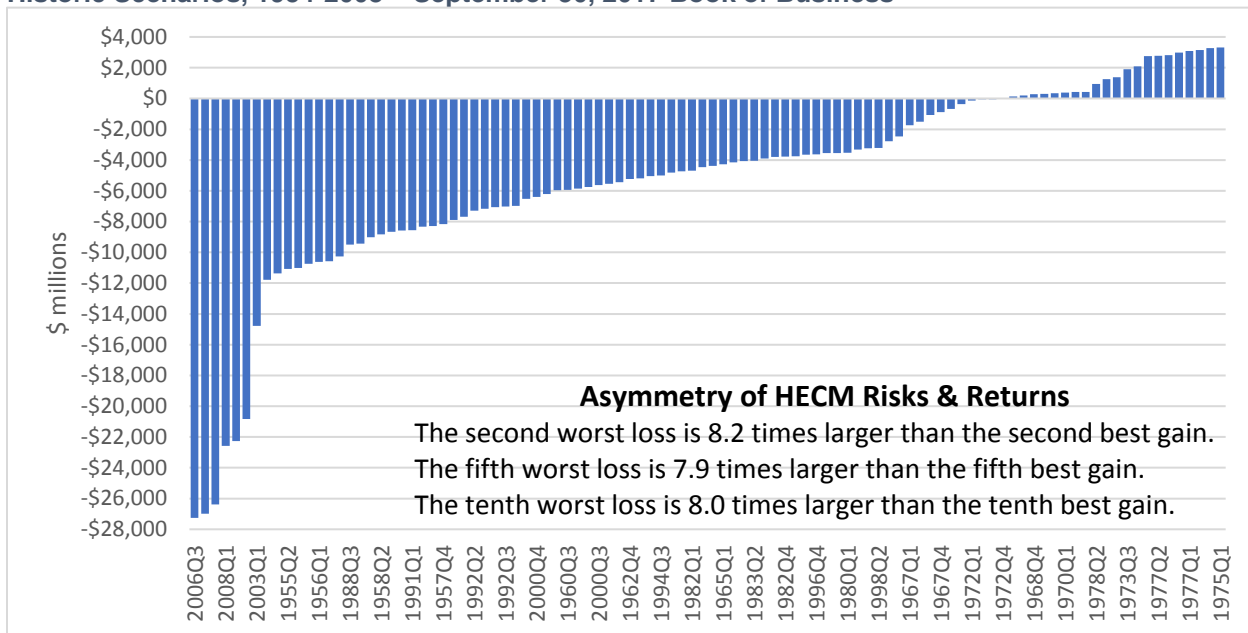
NOTE: The quarters are ordered sequentially from the worst to the best.

SOURCE: U.S. Department HUD/FHA, October 2017.



The imbalance of risk and returns to the HECM book of business is significantly greater than that of the MMIF or the forward books, as reflected in Exhibit II-16 below. For the HECM book, the second worst loss is 8.2 times larger than the second best gain, the fifth worst loss is 7.9 times larger than the fifth best gain and the tenth worst loss is 8.0 times larger than the tenth best gain.

**Exhibit II-16: HECM Mortgage Insurance Program Distribution of Cash Flow NPV through 100 Historic Scenarios, 1954-2008 – September 30, 2017 Book of Business**



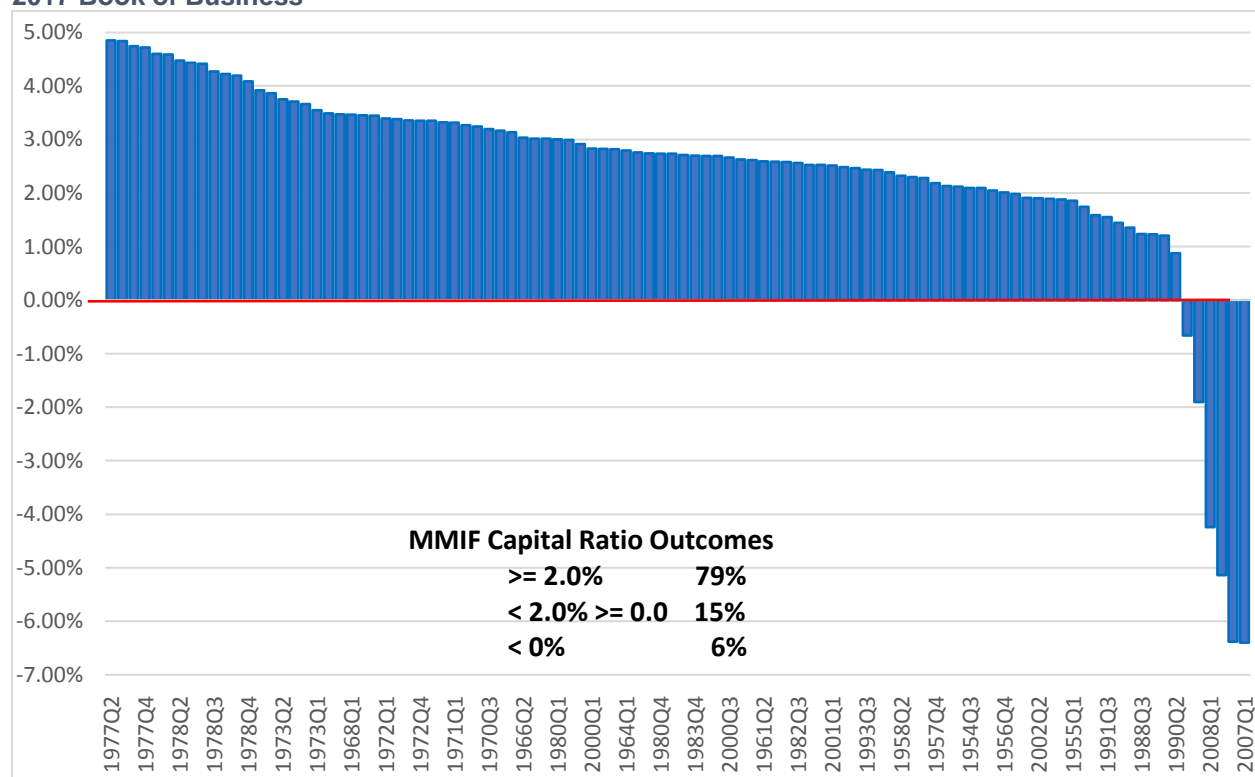
NOTE: The quarters are ordered sequentially from the worst to the best.  
SOURCE: U.S. Department HUD/FHA, October 2017.

## Capital Adequacy Testing: MMIF Capital Ratio Outcomes

In addition to examining the range of outcomes for Cash Flow NPV, capital adequacy testing evaluated the MMIF's capacity to maintain capital at or above two key thresholds – the 2.0 percent statutory minimum capital requirement and zero, the point at which the MMIF is at extreme risk of requiring a mandatory appropriation<sup>21</sup>.

Test results indicate that with its current book of business and existing capital resources, the MMIF has sufficient Total Capital Resources to absorb the risks inherent in the 100 historical scenarios and maintain its Capital Ratio at or above the 2.0 percent statutory minimum in 79 outcomes. As shown in Exhibit II-17 below, the MMIF Capital Ratio would fall below 2.0 percent but remain at or above zero in 15 outcomes and fall below zero in 6 outcomes.

**Exhibit II-17: MMIF Capital Adequacy through 100 Historical Scenarios, 1954-2008 - September 30, 2017 Book of Business**



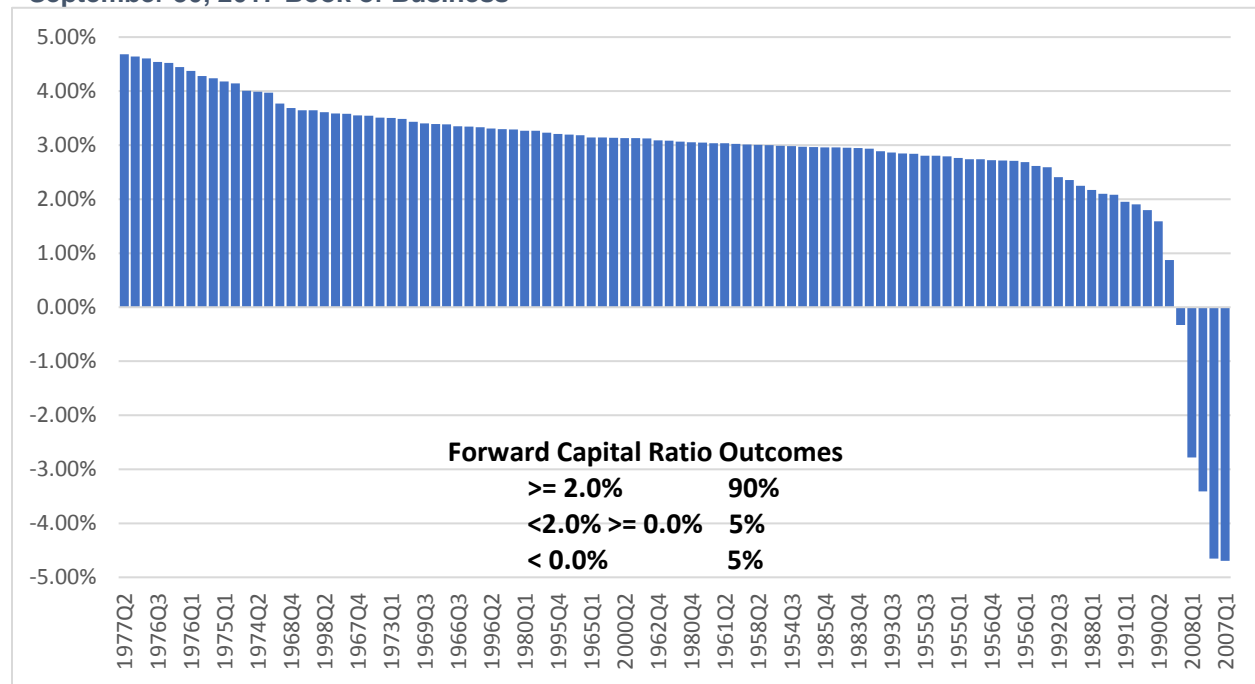
NOTE: The quarters are ordered sequentially from the best to the worst.

SOURCE: U.S. Department HUD/FHA, October 2017.

<sup>21</sup> A mandatory appropriation is required when an upward budget re-estimate exceeds the balance in the Capital Account rather than when the Capital Ratio falls below zero.

Exhibit II-18 shows that the forward program has enough stand-alone capital to absorb the risks inherent in the 100 historical scenarios and maintain its capital ratio at or above the statutory minimum requirement of 2.0 percent in 90 outcomes. The capital ratio would fall below 2.0 percent but remain at or above zero in five outcomes and fall below zero in five outcomes.

**Exhibit II-18: Forward Stand-Alone Capital Adequacy through 100 Historical Scenarios, 1954-2008  
- September 30, 2017 Book of Business**

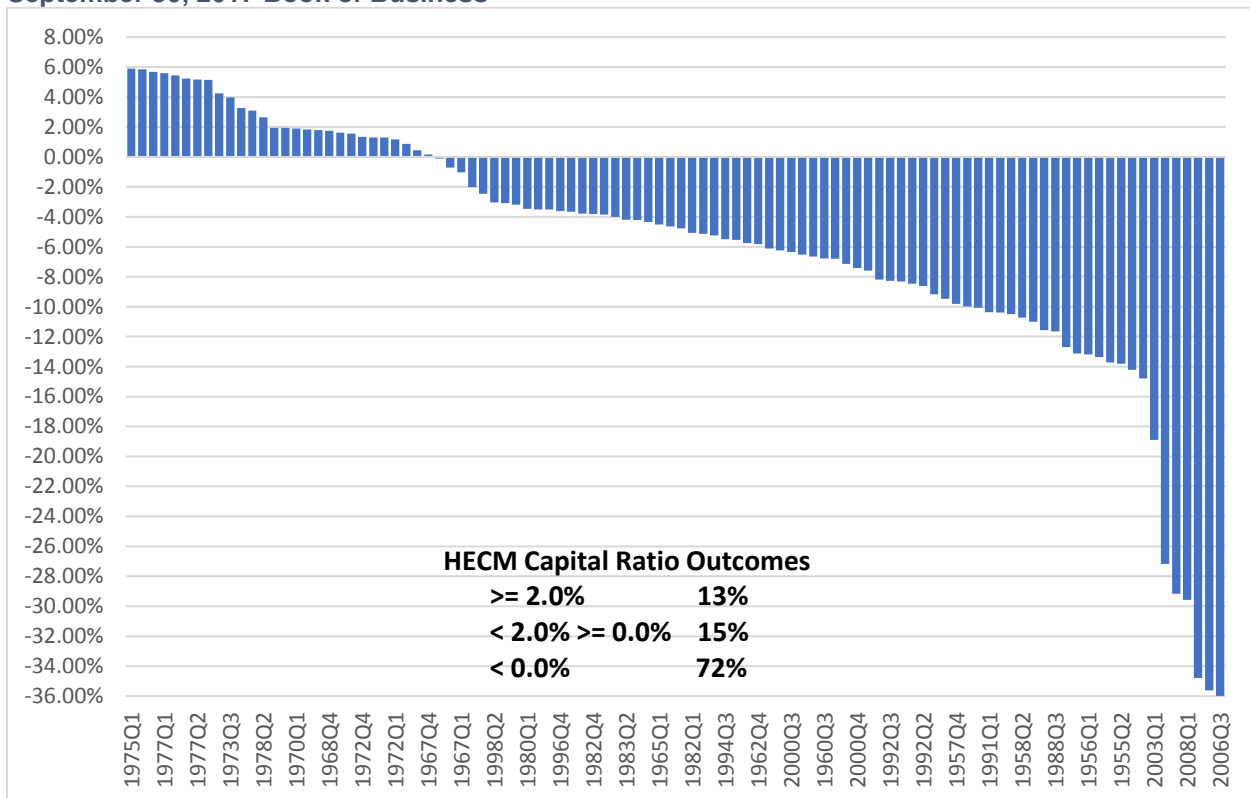


NOTE: The quarters are ordered sequentially from the best to the worst.

SOURCE: U.S. Department HUD/FHA, October 2017.

Exhibit II-19 illustrates that, as tested by 100 historical scenarios, the HECM program has enough capital to absorb risks and maintain its capital ratio above the statutory minimum 2.0 percent requirement in 13 outcomes. The capital ratio would fall below 2 percent but remain at or above zero in 15 outcomes and fall below zero in 72 outcomes.

**Exhibit II-19: HECM Stand-Alone Capital Adequacy through 100 Historical Scenarios, 1954-2008 - September 30, 2017 Book of Business**



NOTE: The quarters are ordered sequentially from the best to the worst.

SOURCE: U.S. Department HUD/FHA, October 2017.

## Chapter III: Federal Housing Administration Objectives

The Federal Housing Administration will work on multiple objectives during FY 2018 that will focus on managing the Mutual Mortgage Insurance Fund (MMIF) and protecting American taxpayers, while continuing to provide affordable, sustainable homeownership opportunities. FHA's efforts in FY 2018 will build on significant progress and momentum regarding a number of key objectives, as outlined below.

### Play a Significant Role in Disaster Recovery

In the wake of Hurricanes Irma, Harvey, and Maria, and wildfires in California, in FY 2017 and the first part of FY 2018, FHA has played a significant role in relief and recovery efforts in affected areas, while taking immediate actions to protect its Single Family assets and financial exposure. To assist homeowners with FHA-insured mortgages who live or work in Presidentially-Declared Major Disaster Areas (PDMDAs), FHA provided an initial 90-day moratorium on foreclosures, and subsequently extended the moratorium for an additional 90 days for properties located in Individual Assistance Areas within the Hurricane Harvey, Irma, and Maria PDMDAs. FHA also reinforced to mortgage servicers that they must extend to eligible homeowners with FHA-insured mortgages forbearance and other appropriate loss mitigation options. FHA continues to actively review additional options to provide relief to borrowers who wish to remain in their homes while assessing the impact to the MMIF.

To assist both lenders and borrowers with mortgages in process who have been unable to complete the closing and endorsement of mortgages due to the extended period of time before the closing of the incident period by FEMA, FHA waived its requirement in Florida, Puerto Rico, and certain counties in California affected by wildfires, that property inspections be performed after the incident period closes. FHA is currently reviewing its policy to determine whether an alternative date should be used in the future to determine when property inspections can be conducted in PDMDAs. For HUD Real-Estate Owned (REO) assets in affected areas, FHA moved quickly to conduct inspections and continues these efforts to secure properties, assess damage and safeguard these assets.

To assist in longer-term recovery efforts, FHA continues to educate homeowners, homebuyers, and lenders about FHA products available for borrowers impacted by disasters, including the 203(h) Mortgage Insurance for Disaster Victims program, which allows for 100 percent mortgage financing for disaster victims whose previous residence – whether owned or rented – was located in a PDMDA and was destroyed or damaged to such an extent that reconstruction or replacement is necessary. FHA also anticipates that its 203(k) Rehabilitation Mortgage Insurance Program,

which insures mortgage financing or refinancing for a range of repairs, will continue to play a role in recovery efforts in PDMDAs and other areas affected by severe events.

## Make Necessary Changes to the Home Equity Conversion Program (HECM)

During FY 2017, FHA revised the HECM initial and annual Mortgage Insurance Premiums (MIPs), and Principal Limit Factors (PLFs). These revisions were necessary to enable FHA to continue to endorse HECM loans in FY 2018, protect the program for seniors, and balance serving FHA's mission with taxpayer protection. FHA also published and implemented policies contained in its HECM final rule. The HECM final rule codified significant changes to FHA's HECM program previously issued and implemented under the authority granted to HUD in the Housing and Economic Recovery Act of 2008 and the Reverse Mortgage Stabilization Act of 2013. The final rule also announced numerous changes in origination policy, HECM servicing policy, and the assignment and claims processes. The HECM changes implemented in FY 2017 did not affect existing loans, and the impact of these program changes and performance of the existing portfolio require ongoing monitoring and management.

## Clarity and Consistency for Mortgagees

### Implementation of the Loan Review System (LRS)

As part of its quality control processes, FHA seeks to provide clarity and consistency to lenders. FHA implemented its new Loan Review System (LRS) on May 15, 2017. Lenders interact with FHA through the LRS for a majority of FHA's quality control processes, including post-endorsement loan reviews, Direct Endorsement test cases, lender monitoring reviews, and self-reporting of fraud and violations of FHA policy. This consolidation of multiple quality control processes into a single, unified system allows FHA to better organize and track its interactions with lenders on these critical issues, and significantly enhances loan quality reporting and analytics. This will help FHA better manage its quality control processes and quickly identify risks to its portfolio. FHA intends to further review its loan-level and lender-level certification requirements, and the framework of its Loan Quality Assessment Methodology (Defect Taxonomy), to identify potential areas where FHA can provide lenders with greater clarity and certainty, resulting in increased confidence to make FHA-insured mortgages available to eligible borrowers.

## Continue Updates to the *Single Family Housing Policy Handbook* 4000.1 (SF Handbook)

With a consolidated view of end-to-end FHA policies, the SF Handbook contributes to FHA's goal of transparency, provides a more effective working mechanism to improve both loan quality and compliance, and is a key tool in FHA's monitoring and management of counterparty risk. Over the past few years, FHA has combined hundreds of policy documents, Mortgagee Letters, and Housing Notices into this single source of housing policy. FHA continues to work toward providing a consolidated, consistent, and comprehensive SF Handbook for FHA stakeholders.

## FHA Technology Modernization

FHA is working to update its systems over the coming years to allow the Agency to work more effectively with lenders participating in the program, while operating FHA with greater efficiency and control. The technology systems that support FHA's Single Family business have an average age of more than 18 years, with the Computerized Homes Underwriting Management System (CHUMS) exceeding 40 years. Similarly, the systems supporting the servicing, default, claims and REO areas have an average age of 14 years. FHA's systems have been maintained, modified and enhanced over the years, but it has become fundamentally difficult and exceedingly expensive to maintain systems beyond their usable life. FHA's outdated systems make it more difficult to work with lenders and to collect and manage important data. FHA remains a largely paper-processing entity while the rest of the industry has increasingly migrated to digital processes. FHA needs systems that can capture and effectively process the extensive volumes of data now in use, with enhanced storage and processing capabilities to handle the migration from paper forms to digital ones. Additionally, FHA requires the ability to analyze and manage insured loans comprehensively over the many phases of the mortgage life cycle.

As part of this overall effort, FHA continues to move toward a broad-based electronic case binder (E-Case Binder) solution to replace the paper case binders that FHA has required for decades from the majority of FHA-approved lenders. An E-Case Binder solution will significantly streamline operations for both lenders and FHA, increase efficiencies and reduce operational costs, and will bring FHA processes in line with comparable mortgage industry practices. In FY 2017, FHA accomplished the first component necessary to move forward with E-Case Binder: 100 percent lender migration to its Electronic Appraisal Delivery (EAD) portal. The EAD portal enables electronic transmission of appraisal data and reports from lenders to FHA. This reduced the number of hard copy pages submitted to FHA by an estimated 33 million pages annually. This also reduced FHA's appraisal review cycle timeframes and improved the quality of documentation for reviewers.

Leveraging the progress made with EAD portal automated appraisal submissions, in FY 2018 FHA will continue to build out both the technology and operational components of an E-Case Binder solution. In its end state, E-Case Binder will reduce operational costs and enhance quality control and compliance processes, which in turn will reduce risk to the MMIF.

## Develop FHA's Condominium Project Approval Final Rule

FHA is continuing to develop its Condominium Project Approval final rule after posting a proposed rule for public comment in late FY 2016. When published, the final rule will significantly revise FHA's policies for condominium project approval. FHA anticipates that its updated guidance in the final rule and subsequent policy implementation documents will be more flexible, less prescriptive, and more reflective of the current market than existing condominium project approval provisions. Further, the final rule is intended to ensure the financial soundness and viability of condominium projects submitted for FHA approval, but will allow flexibility in certain instances for FHA to respond quickly to changing market conditions. Consistent, consolidated condominium project approval guidance is anticipated to reduce burdens associated with obtaining approval for condominium projects, while appropriately managing risk to the MMIF. FHA also continued to ease the regulatory burden for lenders in FY 2017 with the issuance of Mortgagee Letter 2017-13, which extended the temporary waiver of certain challenging condominium project approval provisions that were issued in previous years. This extension allows time for FHA to complete and implement the updated condominium project approval guidance and rulemaking process.



## Appendix A:

## Data Tables for Annual Report Overview

**Table A-1: Data Table for Exhibit O-2: FHA Single Family Mortgages-in-Force**

<b>Endorsement Fiscal Year</b>	<b>Insurance-in- Force (\$ billions)</b>	<b>Mortgages In Force (\$ millions)</b>
2000	\$491	6,786
2001	\$499	6,597
2002	\$506	6,318
2003	\$438	5,345
2004	\$412	4,840
2005	\$359	4,238
2006	\$339	3,892
2007	\$343	3,738
2008	\$474	4,376
2009	\$697	5,528
2010	\$899	6,629
2011	\$1,015	7,288
2012	\$1,083	7,712
2013	\$1,097	7,810
2014	\$1,014	7,250
2015	\$1,073	7,742
2016	\$1,106	7,838
2017	\$1,159	7,982

SOURCE: U.S. Department of HUD/FHA, October 2017.

**Table A-2: Data Table for Exhibit O-3: FHA Market Share (Percentage of Dollar Volume)**

<b>Calendar Year</b>	<b>Purchase</b>	<b>Refinance</b>	<b>All</b>
2000	13.9	3.9	11.7
2001	14.3	7.4	11.0
2002	11.5	4.0	7.0
2003	9.1	3.6	5.2
2004	6.9	3.3	5.0
2005	4.5	1.8	3.1
2006	4.5	2.0	3.3
2007	6.1	4.2	5.1
2008	24.1	15.6	19.8
2009	32.6	14.8	21.1
2010	32.3	9.5	17.5
2011	26.8	6.6	14.1
2012	23.6	7.4	12.3
2013	18.0	9.7	13.2
2014	16.0	7.1	12.4
2015	19.6	11.5	15.9
2016	19.9	10.9	15.8
2017*	21.6	12.9	18.0

NOTE: Originations based on beginning amortization dates. Includes all conventional and government single family forward originations. \*2017 Market Share calculated through June 30, 2017

SOURCE: U.S. Department of HUD as of July 31, 2017, Mortgage Bankers Association of America, "MBA Mortgage Finance Forecast," May 2017, and Corelogic TrueStandings ® as of July 31, 2017.

## Appendix B:

### Data Tables for Chapter I

**Table B-1: Data Table for Exhibit I-1 and Exhibit I-2: Historical FHA Forward Mortgage Endorsement Activity**

Endorsement Fiscal Year	Endorsement Volume (\$)	FHA Forward Endorsed Mortgage Counts			
		Purchase	FHA Streamline Refinance	Other FHA Refinance	Conventional-to-FHA Refinance
2000	94.2	839,870	34,443	6,780	32,007
2001	117.7	806,818	188,422	17,230	46,207
2002	148.1	862,899	318,245	28,525	64,475
2003	159.2	658,640	560,891	37,504	62,694
2004	116.0	586,110	291,483	26,147	56,695
2005	62.4	353,845	113,062	11,840	33,580
2006	55.3	313,998	36,374	14,722	60,397
2007	59.8	278,395	22,087	16,504	107,739
2008	181.2	631,655	66,772	28,510	360,455
2009	330.5	995,550	329,436	38,071	468,941
2010	297.6	1,109,581	212,896	39,601	305,531
2011	217.8	777,427	180,265	44,559	195,559
2012	213.3	733,864	274,058	47,596	129,221
2013	240.1	702,415	511,843	39,088	91,500
2014	135.2	594,998	115,039	20,963	55,353
2015	213.1	753,388	232,811	50,019	80,013
2016	245.4	879,514	210,630	60,448	107,461
2017	251.0	882,079	161,311	76,168	126,882

SOURCE: U.S. Department of HUD/FHA, October 2017.

**Table B-2: Data Table for Exhibit I-3: Historical FHA Purchase Mortgage Activity and First-Time Home Buyer Share**

Endorsement Fiscal Year	FHA Forward Mortgages (Thousands)			Percent of First- Time Purchase
	First-Time Buyer	Repeat Buyer	Purchase Total	
2000	622.6	140.4	763.1	81.6
2001	580.9	149.2	730.1	79.6
2002	621.6	165.5	787.1	79.0
2003	475.4	127.1	602.5	78.9
2004	417.4	122.9	540.3	77.3
2005	259.2	69.4	328.5	78.9
2006	231.4	61.9	293.3	78.9
2007	206.8	54.3	261.2	79.2
2008	458.4	132.9	591.3	77.5
2009	781.3	213.8	995.1	78.5
2010	881.8	227.4	1109.2	79.5
2011	584.8	192.3	777.1	75.3
2012	569.7	164.0	733.7	77.7
2013	553.1	149.3	702.4	78.7
2014	483.1	112.0	595.0	81.2
2015	614.3	139.1	753.4	81.5
2016	722.1	157.4	879.5	82.1
2017	725.2	156.9	882.1	82.2

SOURCE: U.S. Department of HUD/FHA, October 2017.

**Table B-3: Data Table for Exhibit I-4: Racial Composition of FHA Forward Endorsed Mortgages**

Endorsement Fiscal Year	Share of FHA Forward Endorsed Mortgages					
	American Indian	Asian	Black	Hispanic	White	Not Reported
2000	0.4	2.0	14.5	19.2	57.7	6.2
2001	0.4	1.9	13.5	18.2	57.7	8.4
2002	0.4	1.8	12.9	17.6	57.2	10.2
2003	0.4	1.7	12.6	16.4	58.5	10.4
2004	0.6	2.2	13.9	16.4	58.6	8.3
2005	0.5	2.9	15.0	15.3	61.9	4.4
2006	0.5	3.1	13.8	12.0	66.0	4.6
2007	0.6	2.1	14.8	11.5	66.0	5.0
2008	0.5	2.1	13.3	11.0	65.7	7.4
2009	0.4	2.7	9.9	11.5	66.8	8.7
2010	0.4	3.4	9.0	12.0	67.2	8.0
2011	0.3	3.6	8.1	13.0	67.3	7.7
2012	0.4	3.7	8.1	13.5	66.8	7.5
2013	0.4	3.4	8.8	14.1	65.7	7.6
2014	0.4	3.3	10.9	17.1	61.3	7.0
2015	0.4	3.3	10.4	17.4	60.2	8.3
2016	0.4	3.1	10.9	17.5	58.8	9.3
2017	0.4	3.0	11.7	18.2	57.1	9.6

SOURCE: U.S. Department of HUD/FHA, October 2017.

**Table B-4: Data Table for Exhibit I-5: Historical FHA Forward Endorsement Activity by Mortgage Purpose**

Endorsement Fiscal Year	FHA Forward Endorsed Mortgages			
	Purchase	No Cash-Out Refinance	Cash-Out	Total
2000	839,870	73,230	na	913,100
2001	806,818	251,859	na	1,058,677
2002	862,899	411,245	na	1,274,144
2003	658,640	661,089	na	1,319,729
2004	586,110	374,325	na	960,435
2005	353,845	158,482	na	512,327
2006	313,998	111,493	na	425,491
2007	278,395	146,330	na	424,725
2008	631,655	455,737	na	1,087,392
2009	995,550	620,858	215,590	1,831,998
2010	1,109,581	431,773	126,255	1,667,609
2011	777,427	341,233	79,150	1,197,810
2012	733,864	396,562	54,313	1,184,739
2013	702,415	599,379	43,052	1,344,846
2014	594,998	154,709	36,646	786,353
2015	753,388	299,063	63,780	1,116,231
2016	879,514	279,590	98,949	1,258,053
2017	882,079	222,475	141,886	1,246,440

NOTE: Cash-Out Refinance data is not available prior to FY 2009.

SOURCE: U.S. Department of HUD/FHA, October 2017.

**Table B-5: Data Table for Exhibit I-6: FHA Endorsement Activity by Refinance Type**

Endorsement Fiscal Year	Share of FHA Forward Refinance Mortgage Count				
	Conventional Cash-Out	FHA Cash-Out	Conventional No Cash-Out	FHA No Cash-Out	Streamline
2009	23.5	2.3	32.6	2.2	39.4
2010	20.2	2.5	34.6	4.6	38.2
2011	16.2	2.6	30.3	8.0	42.9
2012	9.9	2.1	18.7	8.4	60.8
2013	5.1	1.6	9.1	4.5	79.7
2014	12.9	6.2	16.0	4.7	60.1
2015	10.9	6.7	11.2	7.1	64.2
2016	16.5	9.6	11.9	6.3	55.6
2017	23.4	15.6	11.4	5.3	44.3

SOURCE: U.S. Department of HUD/FHA, October 2017.

**Table B-6: Data Table for Exhibit I-7: Average FHA Forward Loan-to-Value Ratio by Mortgage Purpose**

<b>Endorsement Fiscal Year</b>	<b>Purchase</b>	<b>Conventional Loan Refinance</b>	<b>FHA-to-FHA Refinance<sup>1</sup></b>
2000	97.4	83.0	85.2
2001	96.5	82.8	85.9
2002	96.5	82.5	84.9
2003	96.5	81.7	83.8
2004	96.4	81.5	82.1
2005	96.1	81.9	80.5
2006	96.0	85.5	85.0
2007	96.0	87.5	87.3
2008	96.1	89.0	88.2
2009	95.8	88.5	88.0
2010	95.6	86.0	87.0
2011	95.7	85.9	88.0
2012	96.0	83.5	88.2
2013	95.9	84.0	86.9
2014	95.7	81.5	83.5
2015	95.7	80.3	84.4
2016	95.7	79.2	82.3
2017	95.7	78.4	81.5

NOTE: In accordance with statutory requirements for determining eligibility of loans for FHA insurance, HUD measures loan-to-value (LTV) without including any mortgage insurance premium financed in the loan balance.

<sup>1</sup>These include only fully-underwritten loans and exclude streamline refinancing.

SOURCE: US Department of HUD/FHA, October 2017.

**Table B-7: Data Table for Exhibit I-8: Average Borrower Credit Score for FHA Endorsed Mortgages**

<b>Fiscal Year</b>	<b>Purchase</b>	<b>Conventional Loan Refinance</b>	<b>FHA-to-FHA Refinance</b>	<b>Average Borrower Credit Score</b>
2005	642	612	615	639
2006	646	623	627	641
2007	635	618	627	630
2008	656	633	639	647
2009	685	673	667	681
2010	697	696	688	697
2011	700	704	701	701
2012	696	706	707	698
2013	693	694	700	693
2014	683	674	674	682
2015	680	675	675	680
2016	681	677	673	680
2017	678	674	668	676

NOTE: Borrower Credit Score data was not collected prior to FY 2005. This table does not include streamline refinance mortgages.  
 SOURCE: US Department of HUD/FHA, October 2017.

**Table B-8: Data Table for Exhibit I-9: Distribution of FHA Borrower Credit Scores**

<b>Endorsement Fiscal Year</b>	<b>FHA Forward Refinance Mortgage Counts</b>					
	<b>720 or Higher</b>	<b>680-719</b>	<b>620-679</b>	<b>580-619</b>	<b>Less than 579</b>	<b>Missing</b>
2005	11.2	11.3	32.0	21.2	16.9	7.4
2006	12.4	11.6	33.0	21.2	16.4	5.5
2007	9.8	9.7	31.0	23.4	21.4	4.7
2008	14.4	12.9	35.1	21.2	13.8	2.5
2009	27.2	19.9	37.6	11.5	2.7	1.1
2010	34.2	22.6	38.3	3.3	0.5	1.1
2011	35.7	23.7	36.9	2.6	0.2	0.9
2012	32.7	24.3	39.6	2.7	0.2	0.6
2013	27.3	26.9	43.5	1.7	0.2	0.4
2014	18.3	26.5	51.6	3.1	0.2	0.3
2015	18.1	26.2	50.3	5.1	0.2	0.2
2016	18.8	26.0	49.2	5.6	0.3	0.2
2017	17.5	24.8	49.7	7.3	0.4	0.1

NOTE: Borrower Credit Score data was not collected prior to FY 2005. This table does not include streamline refinance mortgages.  
 SOURCE: US Department of HUD/FHA, October 2017.



**Table B-9: Data Table for Exhibit I-10: Borrower Debt-to-Income (DTI) Ratio for FHA Purchase Mortgages**

Endorsement Fiscal Year	Share of FHA Endorsed Purchase Mortgages				
	<=36	>36 - <43	>=43 - <50	>= 50	Average DTI
2000	39.3	35.7	19.2	5.8	37.6
2001	39.4	34.0	20.4	6.3	37.7
2002	38.5	33.8	21.9	5.9	38.0
2003	38.2	33.3	23.5	5.0	38.0
2004	36.8	32.8	24.9	5.5	38.4
2005	37.7	32.6	23.7	6.0	38.2
2006	34.9	31.2	24.8	9.1	39.0
2007	33.6	30.9	26.0	9.5	39.3
2008	30.3	29.1	27.4	13.2	40.3
2009	29.8	25.2	26.0	19.0	41.0
2010	30.6	25.5	27.1	16.8	40.6
2011	30.4	25.2	27.7	16.7	40.7
2012	31.4	25.7	27.4	15.4	40.3
2013	32.1	26.8	27.6	13.5	40.0
2014	29.0	28.6	28.0	14.4	40.6
2015	29.9	28.8	26.7	14.6	40.4
2016	28.7	27.9	27.1	16.3	40.8
2017	25.3	25.6	28.8	20.3	41.9

SOURCE: US Department of HUD/FHA, October 2017.

**Table B-10: Data Table for Exhibit I-11: FHA Purchase Activity by Type of Down Payment Assistance (DPA)**

Endorsement Fiscal Year	Share of FHA Endorsed Forward Mortgages			
	Government	Relative	Non-Government/Non-Relative	No DPA
2011	7.06	22.01	0.46	70.47
2012	7.80	22.19	0.40	69.61
2013	7.07	22.48	0.40	70.05
2014	8.37	25.57	0.66	65.41
2015	9.88	25.91	1.54	62.67
2016	10.27	26.33	1.86	61.55
2017	10.55	26.10	1.70	61.65

NOTE: Data does not account for instances where down payment assistance data was missing from origination data submitted to FHA.

SOURCE: US Department of HUD/FHA, October 2017.

**Table B-11: Data Table for Exhibit I-12: Lender Type for FHA Endorsement Activity**

Endorsement Fiscal Year	Share of FHA Forward Endorsed Mortgages		
	Other	Non-Depository	Depository
2000	1.6	70.6	27.8
2001	1.5	69.7	28.9
2002	1.1	70.2	28.7
2003	1.0	73.5	25.5
2004	0.8	68.6	30.6
2005	1.0	66.2	32.7
2006	0.9	65.9	33.2
2007	0.4	69.9	29.7
2008	0.2	60.6	39.3
2009	0.2	59.5	40.4
2010	0.1	56.3	43.6
2011	0.1	58.2	41.7
2012	0.1	65.4	34.6
2013	0.1	66.1	33.8
2014	0.1	73.7	26.2
2015	0.1	80.4	19.6
2016	0.1	83.5	16.4
2017	0.1	85.8	14.1

NOTE: This table does not include streamline refinance mortgages.

SOURCE: US Department of HUD/FHA, October 2017.

**Table B-12: Data Table for Exhibit I-13: FY 2017 FHA Forward Endorsement Concentration by State**

State	Share of FHA Endorsed Forward Mortgages Endorsement Fiscal Year	
	2016	2017
Alabama	1.5	1.5
Alaska	0.2	0.2
Arizona	3.7	3.4
Arkansas	0.8	0.8
California	10.9	10.5
Colorado	2.7	2.8
Connecticut	1.0	1.0
Delaware	0.4	0.4
District of Columbia	0.1	0.1
Florida	7.3	7.9
Georgia	4.4	4.4
Hawaii	0.1	0.1
Idaho	0.8	0.7
Illinois	3.4	3.5
Indiana	2.6	2.6
Iowa	0.6	0.6
Kansas	0.8	0.8
Kentucky	1.3	1.3
Louisiana	1.2	1.3
Maine	0.3	0.3
Maryland	2.7	2.7
Massachusetts	1.4	1.5
Michigan	3.2	3.1
Minnesota	1.8	1.7
Mississippi	0.7	0.8

Missouri	2.2	2.2
Montana	0.2	0.2
Nebraska	0.5	0.5
Nevada	1.8	1.7
New Hampshire	0.4	0.4
New Jersey	2.7	2.8
New Mexico	0.7	0.7
New York	2.8	2.9
North Carolina	2.6	2.5
North Dakota	0.2	0.2
Ohio	3.7	3.8
Oklahoma	1.2	1.1
Oregon	1.3	1.2
Pennsylvania	3.5	3.6
Puerto Rico	0.6	0.6
Rhode Island	0.4	0.5
South Carolina	1.6	1.7
South Dakota	0.2	0.2
Tennessee	2.4	2.5
Texas	8.5	8.4
Utah	1.7	1.6
Vermont	0.1	0.1
Virgin Islands	0.0	0.0
Virginia	2.9	2.8
Washington	2.5	2.4
West Virginia	0.3	0.3
Wisconsin	1.2	1.2
Wyoming	0.2	0.2
Alabama	1.5	1.5

SOURCE: US Department of HUD/FHA, October 2017.

**Table B-13: Data Table for Exhibit I-14: FHA Endorsement Activity by Property Type**

Endorsement Fiscal Year	FHA Endorsed Forward Mortgages				
	Detached	Townhome	Condominium	2 - 4 Unit	Manufactured Homes
2000	730,121	59,353	68,436	30,783	24,407
2001	853,372	62,492	85,376	32,613	24,824
2002	1,035,291	68,117	95,598	35,436	39,702
2003	1,107,148	56,092	93,493	30,970	32,026
2004	795,712	46,758	61,640	21,271	35,054
2005	414,981	23,962	30,023	9,538	33,823
2006	332,713	22,756	21,811	6,294	41,917
2007	329,680	23,292	18,215	6,647	46,891
2008	904,059	63,729	48,158	14,857	56,589
2009	1,575,889	90,701	97,065	25,252	43,091
2010	1,426,379	92,522	93,365	26,695	28,648
2011	1,044,608	57,806	54,605	21,310	19,481
2012	1,051,071	48,459	44,894	20,838	19,477
2013	1,194,315	45,285	57,498	23,557	24,191
2014	689,422	38,099	23,143	16,366	19,323
2015	984,947	51,727	31,683	23,078	24,796
2016	1,104,889	64,071	34,014	25,451	29,628
2017	1,086,175	69,859	30,702	27,208	32,496

SOURCE: US Department of HUD/FHA, October 2017.

**Table B-14: Data Table for Exhibit I-16: FHA Early Payment Default Rates by Mortgage Purpose**

Endorsement Fiscal Year	FHA Endorsed Forward Mortgages		
	Purchase	Refinance	All
2000	0.2	0.2	0.2
2001	0.9	0.7	0.8
2002	1.1	0.7	1.0
2003	1.0	0.6	0.8
2004	1.3	1.0	1.1
2005	1.6	1.4	1.5
2006	1.5	1.2	1.4
2007	2.4	1.7	2.2
2008	2.0	2.3	2.1
2009	0.8	1.6	1.2
2010	0.4	0.6	0.5
2011	0.4	0.4	0.4
2012	0.4	0.3	0.3
2013	0.3	0.2	0.3
2014	0.4	0.3	0.4
2015	0.4	0.3	0.4
2016	0.4	0.3	0.4
2017	0.4	0.2	0.3

SOURCE: US Department of HUD/FHA, October 2017.

**Table B-15: Data Table for Exhibit I-17: Historical Serious Delinquency Rate (SDQ) for FHA Mortgages**

End of Month	Rate
Sep-11	8.7
Oct-11	9.0
Nov-11	9.4
Dec-11	9.6
Jan-12	9.8
Feb-12	9.7
Mar-12	9.4
Apr-12	9.4
May-12	9.4
Jun-12	9.4
Jul-12	9.5
Aug-12	9.5
Sep-12	9.6
Oct-12	9.5
Nov-12	9.5
Dec-12	9.6
Jan-13	9.5
Feb-13	9.3
Mar-13	8.9
Apr-13	8.6
May-13	8.3
Jun-13	8.4
Jul-13	8.2
Aug-13	8.0
Sep-13	8.0
Oct-13	8.0
Nov-13	8.0
Dec-13	8.0
Jan-14	7.8
Feb-14	7.7
Mar-14	7.4
Apr-14	7.3
May-14	7.2
Jun-14	7.1
Jul-14	7.0
Aug-14	6.9
Sep-14	7.0
Oct-14	6.9

Nov-14	7.0
Dec-14	7.0
Jan-15	7.0
Feb-15	6.8
Mar-15	6.4
Apr-15	6.3
May-15	6.2
Jun-15	6.1
Jul-15	5.8
Aug-15	5.9
Sep-15	5.9
Oct-15	5.8
Nov-15	5.8
Dec-15	5.8
Jan-16	5.8
Feb-16	5.6
Mar-16	5.3
Apr-16	5.2
May-16	5.1
Jun-16	5.0
Jul-16	5.0
Aug-16	5.0
Sep-16	4.9
Oct-16	4.9
Nov-16	4.9
Dec-16	5.0
Jan-17	5.0
Feb-17	4.8
Mar-17	4.5
Apr-17	4.5
May-17	4.4
Jun-17	4.3
Jul-17	4.2
Aug-17	4.2
Sep-17	4.3

NOTE: SDQ Rate is the percentage of FHA-insured mortgages where the borrower is 90 or more days delinquent, including mortgages in foreclosure and bankruptcy.

SOURCE: US Department of HUD/FHA, October 2017.

**Table B-16: Data Table for Exhibit I-18: Serious Delinquency Rate (SDQ) of FHA Purchase Mortgages by Down Payment Assistance (DPA) Type, as of September 30, 2017**

Endorsement Fiscal Year	Seriously Delinquent Rate of FHA Endorsed Purchase Mortgages			
	Source of Down Payment Assistance			No Down Payment Assistance
	Government	Non-Government0020/ Non-Relative	Eligible Family member	
2011	12.08	9.53	7.26	4.94
2012	9.54	8.45	5.96	4.12
2013	7.41	5.26	5.01	3.73
2014	6.41	5.02	4.94	3.69
2015	4.79	3.48	4.32	3.10
2016	2.72	2.48	2.85	1.79
2017	0.54	0.51	0.59	0.34

NOTE: SDQ Rate is the percentage of FHA-insured mortgages where the borrower is 90 or more days delinquent, including mortgages in foreclosure and bankruptcy.

SOURCE: US Department of HUD/FHA, October 2017.

**Table B-17: Data Table for Exhibit I-19: Claim Development of FHA Endorsed Mortgages by Vintage**

Months Since Origination	Vintage											
	2006	2007	2008	2009-1	2009-2	2010	2011	2012	2013	2014	2015	2016
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.01	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.02	0.04	0.03	0.01	0.01	0.00	0.01	0.01	0.00	0.00	0.00	0.01
8	0.04	0.07	0.04	0.02	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.02
9	0.07	0.11	0.07	0.04	0.02	0.01	0.02	0.02	0.01	0.01	0.02	0.03
10	0.12	0.17	0.10	0.06	0.04	0.02	0.02	0.03	0.02	0.02	0.02	0.05
11	0.17	0.25	0.15	0.09	0.06	0.03	0.03	0.04	0.03	0.03	0.03	0.07
12	0.24	0.34	0.21	0.13	0.08	0.04	0.04	0.05	0.03	0.04	0.05	0.09
13	0.31	0.45	0.29	0.17	0.12	0.06	0.06	0.06	0.05	0.05	0.06	0.12
14	0.39	0.57	0.37	0.23	0.15	0.08	0.08	0.08	0.06	0.07	0.08	0.15
15	0.50	0.71	0.62	0.30	0.20	0.10	0.10	0.10	0.07	0.09	0.10	0.17
16	0.61	0.87	0.59	0.38	0.25	0.13	0.12	0.12	0.09	0.11	0.12	0.20
17	0.73	1.05	0.72	0.48	0.30	0.16	0.14	0.14	0.11	0.13	0.15	0.22

Months Since Origination	Vintage											
	2006	2007	2008	2009-1	2009-2	2010	2011	2012	2013	2014	2015	2016
18	0.87	1.23	0.86	0.58	0.35	0.19	0.17	0.16	0.13	0.16	0.18	0.24
19	1.01	1.42	1.02	0.71	0.41	0.23	0.20	0.19	0.15	0.18	0.21	0.26
20	1.16	1.62	1.18	0.84	0.47	0.27	0.24	0.21	0.17	0.22	0.25	0.28
21	1.32	1.82	1.37	0.97	0.54	0.31	0.28	0.24	0.20	0.25	0.29	0.30
22	1.48	2.04	1.58	1.10	0.61	0.35	0.32	0.27	0.22	0.29	0.33	0.31
23	1.66	2.27	1.79	1.24	0.69	0.40	0.37	0.30	0.25	0.33	0.39	0.31
24	1.85	2.50	2.02	1.37	0.77	0.45	0.42	0.33	0.28	0.37	0.44	
25	2.05	2.75	2.27	1.51	0.85	0.51	0.47	0.36	0.31	0.41	0.49	
26	2.25	3.02	2.53	1.64	0.94	0.57	0.52	0.40	0.34	0.46	0.54	
27	2.45	3.27	2.78	1.78	1.02	0.64	0.57	0.43	0.37	0.51	0.58	
28	2.66	3.55	3.04	1.92	1.10	0.72	0.63	0.47	0.41	0.57	0.62	
29	2.88	3.82	3.30	2.06	1.19	0.79	0.69	0.50	0.45	0.62	0.66	
30	3.11	4.12	3.56	2.20	1.28	0.87	0.75	0.54	0.49	0.67	0.68	
31	3.33	4.42	3.81	2.33	1.37	0.95	0.81	0.58	0.53	0.73	0.71	
32	3.56	4.72	4.07	2.47	1.47	1.04	0.88	0.62	0.57	0.79	0.73	
33	3.79	5.03	4.32	2.60	1.59	1.13	0.94	0.66	0.62	0.86	0.74	
34	4.02	5.34	4.57	2.74	1.71	1.22	1.01	0.70	0.66	0.92	0.75	
35	4.26	5.67	4.80	2.88	1.84	1.33	1.07	0.74	0.70	0.99	0.76	
36	4.52	6.01	5.03	3.03	1.97	1.44	1.13	0.79	0.75	1.06		
37	4.77	6.38	5.26	3.19	2.11	1.55	1.19	0.83	0.79	1.13		
38	5.03	6.72	5.47	3.37	2.25	1.66	1.26	0.87	0.84	1.19		
39	5.28	7.04	5.68	3.56	2.40	1.77	1.32	0.91	0.89	1.24		
40	5.52	7.35	5.88	3.75	2.56	1.89	1.38	0.96	0.93	1.29		
41	5.79	7.67	6.07	3.96	2.72	2.01	1.44	1.00	0.98	1.33		
42	6.07	7.99	6.29	4.18	2.87	2.14	1.51	1.05	1.02	1.36		
43	6.35	8.28	6.52	4.40	3.04	2.27	1.58	1.11	1.07	1.40		
44	6.63	8.56	6.76	4.61	3.22	2.38	1.65	1.16	1.12	1.42		
45	6.89	8.83	7.01	4.83	3.41	2.50	1.72	1.21	1.17	1.44		
46	7.17	9.11	7.27	5.05	3.60	2.61	1.78	1.26	1.23	1.46		
47	7.45	9.37	7.54	5.27	3.83	2.72	1.84	1.31	1.28	1.46		
48	7.74	9.62	7.81	5.49	4.05	2.83	1.91	1.36	1.34			
49	8.01	9.85	8.09	5.72	4.27	2.95	1.97	1.41	1.39			
50	8.30	10.08	8.39	5.99	4.45	3.06	2.03	1.46	1.44			
51	8.59	10.29	8.68	6.26	4.64	3.17	2.09	1.51	1.48			
52	8.85	10.52	8.99	6.55	4.80	3.28	2.15	1.56	1.52			
53	9.12	10.73	9.29	6.85	4.95	3.38	2.21	1.61	1.56			
54	9.37	10.99	9.58	7.16	5.12	3.49	2.28	1.66	1.59			
55	9.62	11.26	9.88	7.45	5.27	3.60	2.34	1.71	1.61			
56	9.86	11.55	10.22	7.69	5.42	3.71	2.41	1.75	1.63			



Months Since Origination	Vintage											
	2006	2007	2008	2009-1	2009-2	2010	2011	2012	2013	2014	2015	2016
57	10.10	11.82	10.55	7.94	5.57	3.82	2.48	1.80	1.65			
58	10.34	12.13	10.92	8.16	5.71	3.92	2.54	1.85	1.66			
59	10.58	12.42	11.29	8.39	5.85	4.02	2.59	1.91	1.66			
60	10.79	12.70	11.65	8.59	5.99	4.13	2.65	1.95				
61	11.01	12.98	12.01	8.77	6.15	4.22	2.72	2.00				
62	11.24	13.27	12.35	8.96	6.31	4.31	2.78	2.04				
63	11.44	13.57	12.68	9.16	6.46	4.39	2.84	2.08				
64	11.64	13.89	13.01	9.33	6.59	4.49	2.89	2.11				
65	11.85	14.20	13.33	9.52	6.71	4.58	2.95	2.14				
66	12.07	14.51	13.64	9.70	6.84	4.67	3.01	2.16				
67	12.30	14.82	13.92	9.89	6.94	4.76	3.07	2.18				
68	12.52	15.16	14.18	10.09	7.04	4.86	3.12	2.20				
69	12.74	15.54	14.42	10.28	7.15	4.95	3.18	2.21				
70	12.96	15.93	14.64	10.44	7.25	5.04	3.23	2.22				
71	13.19	16.31	14.87	10.58	7.36	5.12	3.29	2.22				
72	13.41	16.67	15.10	10.72	7.48	5.21	3.35					
73	13.63	17.02	15.34	10.85	7.59	5.29	3.40					
74	13.85	17.34	15.57	10.97	7.71	5.37	3.45					
75	14.08	17.65	15.79	11.09	7.82	5.46	3.49					
76	14.32	17.98	15.99	11.22	7.93	5.53	3.53					
77	14.53	18.31	16.19	11.35	8.03	5.61	3.57					
78	14.76	18.60	16.38	11.49	8.14	5.69	3.60					
79	14.99	18.89	16.57	11.61	8.24	5.76	3.63					
80	15.23	19.14	16.75	11.74	8.35	5.83	3.66					
81	15.48	19.38	16.92	11.88	8.45	5.91	3.68					
82	15.73	19.62	17.08	12.02	8.55	5.99	3.69					
83	15.97	19.85	17.24	12.15	8.65	6.06	3.70					
84	16.22	20.09	17.40	12.27	8.75	6.14						
85	16.47	20.33	17.55	12.40	8.85	6.20						
86	16.70	20.56	17.71	12.52	8.95	6.27						
87	16.93	20.78	17.87	12.64	9.05	6.33						
88	17.14	20.99	18.01	12.76	9.14	6.38						
89	17.37	21.18	18.17	12.88	9.23	6.43						
90	17.59	21.38	18.32	13.00	9.33	6.47						
91	17.79	21.56	18.47	13.12	9.40	6.50						
92	17.98	21.74	18.62	13.24	9.49	6.54						
93	18.16	21.92	18.78	13.37	9.57	6.56						
94	18.34	22.09	18.93	13.47	9.65	6.58						
95	18.51	22.25	19.08	13.56	9.73	6.58						

Months Since Origination	Vintage											
	2006	2007	2008	2009-1	2009-2	2010	2011	2012	2013	2014	2015	2016
96	18.68	22.41	19.22	13.66	9.81							
97	18.86	22.57	19.37	13.76	9.88							
98	19.02	22.74	19.52	13.85	9.93							
99	19.18	22.91	19.65	13.95	9.98							
100	19.34	23.07	19.78	14.04	10.00							
101	19.49	23.24	19.90	14.12	10.02							
102	19.64	23.41	20.03	14.22								
103	19.80	23.57	20.16	14.30								
104	19.95	23.71	20.27	14.36								
105	20.11	23.88	20.38	14.40								
106	20.25	24.05	20.49	14.43								
107	20.39	24.21	20.61	14.44								
108	20.53	24.37	20.71									
109	20.67	24.52	20.80									
110	20.80	24.67	20.89									
111	20.93	24.81	20.96									
112	21.07	24.95	21.02									
113	21.20	25.09	21.07									
114	21.33	25.21	21.10									
115	21.45	25.34	21.14									
116	21.58	25.47	21.16									
117	21.71	25.59	21.18									
118	21.83	25.72	21.19									
119	21.95	25.84	21.16									
120	22.07	25.96										
121	22.19	26.06										
122	22.31	26.13										
123	22.42	26.22										
124	22.52	26.28										
125	22.62	26.34										
126	22.70	26.38										
127	22.81	26.42										
128	22.91	26.45										
129	23.00	26.47										
130	23.09	26.49										
131	23.18	26.49										
132	23.26											
133	23.34											
134	23.42											

Months Since Origination	Vintage											
	2006	2007	2008	2009-1	2009-2	2010	2011	2012	2013	2014	2015	2016
135	23.48											
136	23.53											
137	23.58											
138	23.62											
139	23.66											
140	23.68											
141	23.70											
142	23.72											
143	23.73											

NOTE: The FY 2009 cohort is separated into two parts representing mortgage originations from October through March in 2009-1 and mortgage originations from April through September 2009-2. A mortgage that is in foreclosure processing or has gone to claim is deemed to be a failure for this illustration. The failure rate is the sum of Cumulative Claim Rate and Cumulative Active Foreclosure Rate divided by Total Mortgages.

SOURCE: US Department of HUD/FHA, October 2017.

**Table B-18: Data Table for Exhibit I-20: FHA Loss Severity and Claim Count by Disposition Type**

Claim Fiscal Year	Insurance-in-Force	FHA Claim Disposition Type				Loss Severity Rate
		REO	Note Sales/ Distressed Asset Sales Program	Third Party Sales	Pre- Foreclosure Sales	
2007	3,892,440	47,558		0	3,814	42.2
2008	3,737,757	53,635		6	3,825	50.2
2009	4,375,866	66,411		63	6,051	64.2
2010	5,527,609	94,853	120	1	14,239	61.0
2011	6,883,859	87,310	1,557	0	23,716	63.7
2012	7,288,440	98,086	1,137	2,557	35,024	62.2
2013	7,711,684	108,343	33,570	8,302	33,154	58.0
2014	7,810,422	61,695	39,530	23,198	23,871	52.9
2015	7,787,092	66,194	19,537	18,250	13,614	52.0
2016	7,742,143	54,947	12,044	27,556	12,410	54.8
2017	7,838,495	29,944	5,525	34,092	8,099	51.5

SOURCE: US Department of HUD/FHA, October 2017.

**Table B-19: Data Table for Exhibit I-21: Annual FHA Claims as a Share of Initial Insurance-in-Force (IIF)**

Claim Fiscal Year	FHA Forward Mortgage Count		Share of Mortgage Count	Insurance-in-Force (\$ billions)		Share of IIF
	Mortgage Claims	Active Mortgages (Beginning-of-FY)		Mortgage Claims	Active Mortgages (End-of FY)	
2007	51,372	3,892,440	1.32	4.95	342.6	1.44
2008	57,466	3,737,757	1.54	5.99	474.4	1.26
2009	72,525	4,375,866	1.66	8.38	697.3	1.20
2010	109,213	5,527,609	1.98	14.24	947.8	1.50
2011	112,583	6,883,859	1.64	15.78	1,015.20	1.55
2012	136,804	7,288,440	1.88	19.90	1,083.30	1.84
2013	183,369	7,711,684	2.38	27.05	1,097.40	2.46
2014	148,294	7,810,422	1.90	22.32	1,083.50	2.06
2015	117,595	7,787,092	1.51	16.05	1,072.80	1.50
2016	106,957	7,742,143	1.38	14.34	1,106.30	1.30
2017	77,660	7,838,495	0.99	10.35	1,158.80	0.89

SOURCE: US Department of HUD/FHA, October 2017.

**Table B-20: Data Table for Exhibit I-22: Recent FHA Loss Mitigation Activity**

Assisted Cure Fiscal Year	Type of FHA Loss Mitigation Assistance		
	Deeper Assistance	Limited Assistance	All Assisted Cures
2010	162,892	128,790	291,682
2011	163,838	215,396	379,234
2012	102,596	251,037	353,633
2013	169,704	290,891	460,595
2014	181,960	291,990	473,950
2015	150,419	287,612	438,031
2016	118,963	289,776	408,739
2017	117,448	242,110	359,558

SOURCE: US Department of HUD/FHA, October 2017.

**Table B-21: Data Table for Exhibit I-23: Trend of FHA HECM Endorsement Activity**

Endorsement Fiscal Year	Home Equity Conversion Mortgages (HECM)					Maximum Claim Amount (\$ billions)
			Mortgage Product Type		All Mortgages	
	Fixed Rate	Adjustable Rate	Purchase	Refinance		
2009	13,311	101,108	105,451	8,968	114,419	30.1
2010	54,470	24,589	74,222	4,837	79,059	21.1
2011	49,739	23,371	70,373	2,737	73,110	18.2
2012	38,047	16,770	53,369	1,448	54,817	13.2
2013	36,331	23,593	58,090	1,834	59,924	14.7
2014	9,638	41,978	49,210	2,406	51,616	13.5
2015	9,133	48,857	52,419	5,571	57,990	16.1
2016	5,207	43,661	43,470	5,398	48,868	14.7
2017	5,726	49,565	47,277	8,014	55,291	17.7

SOURCE: US Department of HUD/FHA, October 2017.

**Table B-22: Data Table for Exhibit I-24: Current HECM Portfolio by Year of Endorsement**

Endorsement Fiscal Year	HECM	Maximum Claim Amount	Current Principal Limit	Insurance-in-Force
2009	62,837	\$ 16,213,690,821	\$ 14,851,716,931	\$ 13,348,406,121
2010	39,001	\$ 10,079,834,097	\$ 9,445,566,098	\$ 8,612,481,708
2011	43,748	\$ 10,734,071,325	\$ 9,763,227,904	\$ 8,966,994,576
2012	37,089	\$ 8,743,248,270	\$ 7,885,314,595	\$ 7,212,613,164
2013	44,809	\$ 10,763,543,451	\$ 9,357,059,780	\$ 8,327,451,243
2014	38,310	\$ 9,789,978,264	\$ 6,978,386,558	\$ 5,711,174,798
2015	47,461	\$ 12,972,356,328	\$ 8,821,403,581	\$ 6,920,106,308
2016	44,983	\$ 13,447,531,483	\$ 8,818,385,406	\$ 6,475,641,706
2017	54,584	\$ 17,464,410,219	\$ 10,904,187,079	\$ 7,361,798,915
<b>Total</b>	412,822	\$ 110,208,664,258	\$ 86,825,247,932	\$ 72,936,668,539

SOURCE: US Department of HUD/FHA, October 2017.

**Table B-23: Data Table for Exhibit I-25: FHA HECM Claims by Claim Type**

Endorsement Fiscal Year	Claim Amount Paid in Fiscal Year			
	Claim Type 1	Claim Type 2	Supplemental	Total
2009	\$ 5,818	\$ 280,946		\$ 286,764
2010	\$ 2,429,944	\$ 511,603	\$ 6,088	\$ 2,947,635
2011	\$ 10,978,684	\$ 17,521,063	\$ 47,061	\$ 28,546,808
2012	\$ 81,388,271	\$ 123,075,291	\$ 5,479	\$ 204,469,041
2013	\$ 207,878,309	\$ 504,113,042	\$ 1,274,019	\$ 713,265,370
2014	\$ 224,753,044	\$ 676,818,962	\$ 644,761	\$ 902,216,767
2015	\$ 755,559,943	\$ 1,734,143,242	\$ 8,884,318	\$ 2,498,587,503
2016	\$ 636,743,616	\$ 3,530,157,601	\$ 47,312,056	\$ 4,214,213,273
2017	\$ 676,517,889	\$ 4,325,779,547	\$ 27,631,534	\$ 5,029,928,970

NOTE: Claim Type 1 category represents the dollar volume of claims generated when the borrower no longer occupies the home and the property is sold at a loss, with the mortgage never being assigned to the Secretary. Claim Type 2 category represents the dollar volume of claims resulting from the assignment of the mortgage to the Secretary of HUD when the mortgage reaches 98 percent of the MCA. Supplemental claims are those claims submitted by lenders for other eligible expenses not included on original claims, such as property preservation expenses.

SOURCE: US Department of HUD/FHA, October 2017.

**Table B-24: Data Table for Exhibit I-26: Average Maximum Claim Amount (MCA) for FHA-Endorsed HECM**

Endorsement Fiscal Year	HECM	Average MCA	Total MCA Endorsed
2009	114,416	262,839	30,072,957,060
2010	79,055	266,561	21,073,012,164
2011	73,109	249,132	18,213,788,353
2012	54,817	240,148	13,164,197,360
2013	59,924	245,002	14,681,501,392
2014	51,616	261,948	13,520,699,285
2015	57,990	278,147	16,129,726,170
2016	48,868	300,000	14,660,376,431
2017	55,291	319,955	17,690,646,482

SOURCE: US Department of HUD/FHA, October 2017.

**Table B-25: Data Table for Exhibit I-27: Composition of FHA HECM Borrowers**

Endorsement Fiscal Year	Share of Total Maximum Claim Amount (MCA)			
	Male Borrower	Female Borrower	Multiple Borrowers	Not Disclosed
2009	\$ 6,341,000,000	\$ 11,300,000,000	\$ 12,197,000,000	\$ 196,940,000
2010	\$ 4,424,000,000	\$ 8,406,000,000	\$ 7,890,000,000	\$ 352,400,000
2011	\$ 3,745,000,000	\$ 6,953,000,000	\$ 7,142,000,000	\$ 374,400,000
2012	\$ 2,742,000,000	\$ 4,893,000,000	\$ 5,201,000,000	\$ 328,500,000
2013	\$ 3,016,000,000	\$ 5,216,000,000	\$ 6,094,000,000	\$ 355,800,000
2014	\$ 2,697,000,000	\$ 5,011,000,000	\$ 5,499,000,000	\$ 313,500,000
2015	\$ 3,415,000,000	\$ 6,027,000,000	\$ 6,548,000,000	\$ 139,510,000
2016	\$ 3,046,000,000	\$ 5,274,000,000	\$ 6,264,000,000	\$ 75,640,000
2017	\$ 3,391,000,000	\$ 6,144,000,000	\$ 7,167,000,000	\$ 989,400,000

SOURCE: US Department of HUD/FHA, October 2017.

**Table B-26: Data Table for Exhibit I-28: Average Borrower Age at Endorsement for FHA HECMs**

Endorsement Fiscal Year	HECM	Average Borrower Age
2009	114,416	81.53
2010	79,055	80.51
2011	73,109	78.81
2012	54,817	77.58
2013	59,924	76.25
2014	51,616	75.49
2015	57,990	74.84
2016	48,868	74.51
2017	55,291	73.65

SOURCE: US Department of HUD/FHA, October 2017.

**Table B-27: Data Table for Exhibit I-29: Racial Composition of FHA HECM Borrowers**

Endorsed Fiscal Year	Share of Total Maximum Claim Amount (MCA)					
	American Indian	Asian	Black	Not Reported	Hispanic	White
2009	0.3	1.9	12.2	4.0	7.9	73.7
2010	0.3	2.3	11.5	2.6	7.0	76.3
2011	0.2	2.3	10.2	3.3	6.3	77.8
2012	0.2	2.2	9.9	4.3	6.5	76.9
2013	0.2	2.3	9.7	3.8	6.3	77.6
2014	0.2	2.5	9.0	3.4	6.4	78.5
2015	0.2	2.3	9.3	3.1	6.8	78.2
2016	0.2	2.0	8.0	3.2	6.2	80.4
2017	0.2	1.8	7.3	9.4	5.7	75.7

SOURCE: US Department of HUD/FHA, October 2017.



**Table B-28: Data Table for Exhibit I-30: FHA HECM Endorsement Activity by Mortgage Purpose**

Endorsement Fiscal Year	Share of Total Maximum Claim Amount (MCA)		
	Purchase	Traditional	Refinance
2009	0.5	87.7	11.9
2010	1.7	88.8	9.4
2011	2.2	91.6	6.2
2012	3.3	92.1	4.6
2013	3.9	91.0	5.0
2014	3.9	88.8	7.3
2015	4.3	82.2	13.4
2016	5.0	80.8	14.2
2017	4.9	78.0	17.1

SOURCE: US Department of HUD/FHA, October 2017.

**Table B-29: Data Table for Exhibit I-31: FHA HECM Endorsement Activity by Mortgage Type Option**

Endorsement Fiscal Year	Share of Total Maximum Claim Amount (MCA)		
	Annual Adjustable Rate Mortgage	Monthly Adjustable Rate Mortgage	Fixed Rate Mortgage
2009	1.0	86.2	12.8
2010	0.1	35.0	64.9
2011	0.1	36.8	63.1
2012	0.0	34.8	65.1
2013	0.1	41.6	58.3
2014	2.6	78.2	19.2
2015	42.1	41.6	16.3
2016	75.8	13.3	10.9
2017	80.9	6.2	12.9

SOURCE: US Department of HUD/FHA, October 2017.

**Table B-30: Data Table for Exhibits I-32 and I-33: Average Principal Limit and Initial Draws for FHA HECMs**

Endorsement Fiscal Year	HECM	Average Principal Limit as a Share of Maximum Claim Amount	Average 1st Month Cash Draw as a Share of Principal Limit
2009	114,416	70.3	69.3
2010	79,055	65.8	78.4
2011	73,109	65.1	78.8
2012	54,817	66.5	80.0
2013	59,924	66.3	83.0
2014	51,616	58.7	66.9
2015	57,990	58.9	64.8
2016	48,868	59.8	62.4
2017	55,291	59.7	63.8

SOURCE: US Department of HUD/FHA, October 2017.

**Table B-31: Data Table for Exhibit I-34: States with the Highest Share by MCA of FHA HECMs**

Endorsement Fiscal Year	Share of Total Maximum Claim Amount (MCA) by FHA HECM Endorsement Fiscal Year					
	California	New York	Florida	Texas	New Jersey	Other States
2009	20.87	7.53	11.41	4.22	4.07	51.89
2010	23.08	8.60	7.30	5.04	4.58	51.41
2011	22.54	8.73	5.52	5.95	4.95	52.32
2012	21.03	10.54	5.25	5.99	4.77	52.42
2013	23.70	9.14	5.69	5.88	4.06	51.53
2014	28.87	8.08	6.04	5.05	3.83	48.12
2015	31.98	7.84	7.25	4.86	3.47	44.60
2016	32.78	6.39	7.52	5.48	2.79	45.04
2017	34.85	5.53	7.25	5.45	2.17	44.76

SOURCE: US Department of HUD/FHA, October 2017.

**Table B-32: Data Table for Exhibit I-35: FHA HECMs by Payment Option**

Endorsement Fiscal Year	Share of Maximum Claim Amount (MCA) (\$ millions)					
	HECM Payment Options					
	Term	Line of Credit	Tenure	Term & Line of Credit	Tenure & Line of Credit	Lump Sum
2009	0.9	90.3	1.8	4.3	2.7	na
2010	0.6	92.4	1.1	3.6	2.3	na
2011	0.5	92.8	1.2	3.4	2.1	na
2012	0.3	93.4	1.1	3.2	2.0	na
2013	0.5	93.5	1.2	3.0	1.8	na
2014	0.8	91.6	1.9	3.5	2.2	0.0
2015	0.7	91.7	1.5	3.2	2.3	0.5
2016	0.9	87.8	1.5	3.0	2.1	4.7
2017	0.9	85.6	1.5	2.6	2.0	7.4

SOURCE: US Department of HUD/FHA, October 2017.

## Appendix C: Data Tables for Chapter II

**Table C-1: Data Table for Exhibit II-2: MMIF Capital Ratio**

Year	MMIF
2012	-1.34%
2013	-0.12%
2014	0.42%
2015	2.10%
2016	2.35%
2017	2.09%

SOURCE: US Department of HUD/FHA, October 2017.

**Table C-2: Data Table for Exhibit II-5: Forward & HECM Stand-Alone Capital Ratios**

Year	Forward Stand-Alone	HECM Stand-Alone
2012	-0.91%	-10.91%
2013	-0.44%	3.07%
2014	0.88%	-10.13%
2015	2.00%	1.17%
2016	3.11%	-11.81%
2017	3.33%	-19.84%

SOURCE: US Department of HUD/FHA, October 2017.

**Table C-3: Data Table for Exhibit II-10: Cash Flow History for MMIF Insurance Operations**

Type of Cash Flow	Fiscal Year				
	2013	2014	2015	2016	2017
<b>Dollars in Millions</b>					
<b>Cash Inflows</b>					
<b>Premiums</b>	11,174	11,036	12,587	13,196	13,425
<b>Recoveries</b>	10,654	10,726	7,522	6,574	4,904
<b>Total Inflows</b>	21,828	21,762	20,109	19,770	18,329
<b>Cash Outflows</b>					
<b>Claims</b>	(26,894)	(25,255)	(19,269)	(18,569)	(15,657)
<b>Property Expenses</b>	(1,340)	(562)	(367)	(325)	(218)
<b>Total Outflows</b>	(28,234)	(25,817)	(19,636)	(18,894)	(15,875)
<b>Net Cash Flow</b>					
<b>Net Cash Flow</b>	(6,406)	(4,055)	473	876	2,454
<b>Average Insurance-In-Force</b>					
<b>Average Insurance-In-Force</b>	1,130,499	1,140,788	1,135,545	1,151,760	1,198,633
<b>Cash Flows as a Percent of Insurance-In-Force</b>					
<b>Cash Inflows</b>					
<b>Premiums</b>	0.99%	0.97%	1.11%	1.15%	1.12%
<b>Recoveries</b>	0.94%	0.94%	0.66%	0.57%	0.41%
<b>Total Inflows</b>	1.93%	1.91%	1.77%	1.72%	1.53%
<b>Cash Outflows</b>					
<b>Claims</b>	-2.38%	-2.21%	-1.70%	-1.61%	-1.31%
<b>Property Expenses</b>	-0.12%	-0.05%	-0.03%	-0.03%	-0.02%
<b>Total Outflows</b>	-2.50%	-2.26%	-1.73%	-1.64%	-1.32%
<b>Net Cash Flow as a Percent of Insurance-In-Force</b>					
<b>Net Cash Flow</b>	<b>-0.57%</b>	<b>-0.36%</b>	<b>0.04%</b>	<b>0.08%</b>	<b>0.20%</b>

SOURCE: US Department of HUD/FHA, October 2017.

**Table C-4: Data Table for Exhibit II-11: Cash Flow History MMIF Forward Mortgage Insurance Operations**

Type of Cash Flow	Fiscal Year				
	2013	2014	2015	2016	2017
<b>Dollars in Millions</b>					
<b>Cash Inflows</b>					
<b>Premiums</b>	10,508	10,341	11,783	12,364	12,514
<b>Recoveries</b>	10,644	10,684	7,426	6,353	4,433
<b>Total Inflows</b>	21,152	21,025	19,209	18,717	16,947
<b>Cash Outflows</b>					
<b>Claims</b>	(26,177)	(24,344)	(16,789)	(14,323)	(10,671)
<b>Property Expenses</b>	(1,343)	(560)	(347)	(304)	(188)
<b>Total Outflows</b>	(27,520)	(24,904)	(17,136)	(14,627)	(10,859)
<b>Net Cash Flow</b>					
<b>Net Cash Flow</b>	(6,368)	(3,879)	2,073	4,090	6,088
<b>Average Insurance-In-Force</b>					
<b>Insurance-In-Force</b>	1,077,825	1,080,690	1,070,046	1,082,703	1,126,961
<b>Cash Flows as a Percent of Insurance-In-Force</b>					
<b>Cash Inflows</b>					
<b>Premiums</b>	0.97%	0.96%	1.10%	1.14%	1.11%
<b>Recoveries</b>	0.99%	0.99%	0.69%	0.59%	0.39%
<b>Total Inflows</b>	1.96%	1.95%	1.80%	1.73%	1.50%
<b>Cash Outflows</b>					
<b>Claims</b>	-2.43%	-2.25%	-1.57%	-1.32%	-0.95%
<b>Property Expenses</b>	-0.12%	-0.05%	-0.03%	-0.03%	-0.02%
<b>Total Outflows</b>	-2.55%	-2.30%	-1.60%	-1.35%	-0.96%
<b>Net Cash Flow as a Percent of Insurance-In-Force</b>					
<b>Net Cash Flow</b>	<b>-0.59%</b>	<b>-0.36%</b>	<b>0.19%</b>	<b>0.38%</b>	<b>0.54%</b>

SOURCE: US Department of HUD/FHA, October 2017.

**Table C-8: Data Table for Exhibit II-12: Cash Flow History MMIF HECM Insurance Operations**

Type of Cash Flow	Fiscal Year				
	2013	2014	2015	2016	2017
<b>Dollars in Millions</b>					
<b>Cash Inflows</b>					
Premiums	666	695	804	832	911
Recoveries	10	42	96	221	471
<b>Total Inflows</b>	<b>676</b>	<b>737</b>	<b>900</b>	<b>1,053</b>	<b>1,382</b>
<b>Cash Outflows</b>					
Claims	(717)	(911)	(2,480)	(4,246)	(4,986)
Property Expenses	3	(2)	(20)	(21)	(30)
<b>Total Outflows</b>	<b>(714)</b>	<b>(913)</b>	<b>(2,500)</b>	<b>(4,267)</b>	<b>(5,016)</b>
<b>Net Cash Flow</b>					
<b>Net Cash Flow</b>	<b>(38)</b>	<b>(176)</b>	<b>(1,600)</b>	<b>(3,214)</b>	<b>(3,634)</b>
<b>Average Insurance-In-Force</b>					
<b>Average Insurance-In-Force</b>	<b>52,674</b>	<b>60,098</b>	<b>65,499</b>	<b>69,057</b>	<b>71,672</b>
<b>Cash Flows as a Percent of Insurance-In-Force (UPB)</b>					
<b>Cash Inflows</b>					
Premiums	1.26%	1.16%	1.23%	1.20%	1.27%
Recoveries	0.02%	0.07%	0.15%	0.32%	0.66%
<b>Total Inflows</b>	<b>1.28%</b>	<b>1.23%</b>	<b>1.37%</b>	<b>1.52%</b>	<b>1.93%</b>
<b>Cash Outflows</b>					
Claims	-1.36%	-1.52%	-3.79%	-6.15%	-6.96%
Property Expenses	0.01%	0.00%	-0.03%	-0.03%	-0.04%
<b>Total Outflows</b>	<b>-1.36%</b>	<b>-1.52%</b>	<b>-3.82%</b>	<b>-6.18%</b>	<b>-7.00%</b>
<b>Net Cash Flow as a Percent of Insurance-In-Force</b>					
<b>Net Cash Flow</b>	<b>-0.07%</b>	<b>-0.29%</b>	<b>-2.44%</b>	<b>-4.65%</b>	<b>-5.07%</b>

SOURCE: US Department of HUD/FHA, October 2017.

## Appendix D:

### FHA Single Family Housing Mortgagee Letters Published Fiscal Year 2017

The Federal Housing Administration's (FHA) Office of Single Family Housing issues new, and revises existing, policy and guidance by publishing Mortgagee Letters and/or publishing updates to its *Single Family Housing Policy Handbook* 4000.1 (SF Handbook).

In fiscal year 2017, FHA published the following Mortgagee Letters and SF Handbook updates:

ML #	Publication Date	Title
2017-13	8/30/17	Extension of Temporary Approval Provisions for the Federal Housing Administration (FHA) Condominium Project Approval Process
2017-12	8/29/17	Home Equity Conversion Mortgage (HECM) Program: Mortgage Insurance Premium Rates and Principal Limit Factors
2017-11	8/24/17	Implementation of HUD's January 2017 Home Equity Conversion Mortgage (HECM) Final Rule
2017-10	4/26/17	Additional Period of Eligibility for 203(h) Mortgage Insurance for Disaster Victims of Specific Presidentially-Declared Major Disaster Areas (PDMDA) in Louisiana
2017-08	3/23/17	Effective Date of Implementation of the Federal Housing Administration's Loan Review System, and Change in Effective Date for Timeframe for Conducting Pre-Endorsement Mortgage Reviews for Unconditional DE Authority
2017-07	1/20/17	Suspension of Mortgagee Letter 2017-01 - Reduction of Federal Housing Administration (FHA) Annual Mortgage Insurance Premium (MIP) Rates
2017-06	1/19/17	Servicing of FHA-insured Mortgages on Properties Encumbered with a Property Assessed Clean Energy (PACE) Obligation
2017-05	1/18/17	Home Equity Conversion Mortgage (HECM) Claim Type 22 (CT-22) Assignment Requests
2017-03	1/11/17	Federal Housing Administration (FHA) Loan Review System - Implementation and Process Changes



2017-01	1/9/17	Reduction of Federal Housing Administration (FHA) Annual Mortgage Insurance Premium (MIP) Rates
-----	12/30/16	SF Handbook December 2016 Update*
2016-21	12/14/16	<u>Direct Endorsement Program - Timeframe for Conducting Pre-Endorsement Mortgage Reviews for Unconditional Direct Endorsement Authority</u>
2016-19	12/1/16	<u>2017 Nationwide Home Equity Conversion Mortgage (HECM) Limits</u>
2016-17	11/2/16	<u>National Servicing Center Address Change for the Tulsa, Oklahoma Office</u>
2016-16	10/27/16	<u>Home Equity Conversion Mortgage Program: Source for 10-Year LIBOR Swap Rate</u>
2016-15	10/26/16	<u>Federal Housing Administration (FHA) Condominium Project Approval – Owner Occupancy Requirement</u>

The following Mortgagee Letters were published in fiscal year 2017, and were incorporated into the SF Handbook on December 30, 2016:

ML #	Publication Date	Title
2016-25	12/22/16	2017 Nationwide Forward Mortgage Limits – Correction for Special Exception Areas (Alaska, Hawaii, Guam, and the Virgin Islands)
2016-24	12/7/16	Processing Fee for Assumptions
2016-22	12/1/16	Extension of Implementation Date of Selected Sections of Handbook 4000.1
2016-20	12/1/16	2017 Nationwide Forward Mortgage Limits
2016-18	11/28/16	Mortgagee Use of Professional Employer Organizations

Appendix E:  
Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage  
Insurance Fund: Cash Flow Net Present Value from Forward Mortgage  
Insurance-in-Force

November 10, 2017

Dana Wade  
General Deputy Assistant Secretary  
Office of Housing  
U.S. Department of Housing and Urban Development  
451 Seventh Street, S.W., Room 9100  
Washington, D.C. 20410

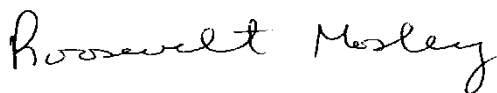
Dear Ms. Wade:

Pinnacle Actuarial Resources, Inc. (Pinnacle) has completed the final report for the Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund Forward Loans. The attached report details our estimate of the Cash Flow Net Present Value for fiscal year 2017.

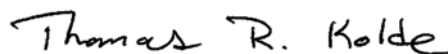
Roosevelt C. Mosley, Jr., FCAS, MAAA and Thomas R. Kolde, FCAS, MAAA are responsible for the content and conclusions set forth in the report. We are Fellows of the Casualty Actuarial Society and Members of the American Academy of Actuaries, and are qualified to render the actuarial opinion contained herein.

It has been a pleasure working with you and your team to complete this study. We are available for any questions or comments you have regarding the report and its conclusions.

Respectfully Submitted,



Roosevelt C. Mosley, Jr. FCAS, MAAA  
Principal and Consulting Actuary



Thomas R. Kolde, FCAS, MAAA  
Consulting Actuary

# Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Forward Mortgage Insurance- In-Force

---

November 10, 2017



3109 Cornelius Drive  
Bloomington, IL 61704  
309.807.2300  
pinnacleactuaries.com

## Table of Contents

Summary of Findings .....	1
Executive Summary .....	5
Impact of Economic Forecasts.....	5
Distribution and Use .....	7
Reliances and Limitations .....	7
Section 1: Introduction .....	9
Scope .....	9
Background.....	10
Report Structure .....	10
Section 2: Summary of Findings .....	11
Fiscal Year 2017 Cash Flow NPV Estimate .....	11
Section 3: Cash Flow NPV Based on Alternative Scenarios .....	14
Moody's Baseline Assumptions.....	14
Stronger Near-Term Growth Scenario .....	15
Slower Near-Term Growth Scenario .....	15
Moderate Recession Scenario .....	15
Protracted Slump.....	15
Below-Trend Long-Term Growth.....	15
Stagflation.....	16
Next-Cycle Recession.....	16
Low Oil Price .....	16
Summary of Alternative Scenarios .....	16
Stochastic Simulation .....	17
Sensitivity Tests of Economic Variables.....	19
Section 4: Summary of Methodology.....	22
Data Sources.....	22
Data Processing – Mortgage Level Modeling (Appendix A) .....	22

# **Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Forward Mortgage Insurance-In-Force**

November 10, 2017

Page ii

Data Reconciliation.....	23
Specification of Mortgage Transition Models (Appendix B) .....	27
Estimation Sample .....	28
Loss Severity Model (Appendix C) .....	29
Cash Flow Projections (Appendix E) .....	29
Appendices .....	31
Appendix A: Data – Sources, Processing and Reconciliation.....	32
Data Sources.....	32
Data Processing – Mortgage Level Modeling .....	33
Data Reconciliation.....	33
Appendix B: Transition Models .....	38
Section 1: Model Specification .....	38
Multinomial Logistic Regression Theory and Model Specification.....	39
Section 2: Transition Model Explanatory Variables.....	41
Section 3: Model Validation .....	42
Current Transition Models .....	43
Default Transition Models .....	46
Appendix C: Loss Severity Models .....	51
Model Specifications .....	51
Net Loss Severity Model Specification .....	53
Estimation Sample .....	55
Explanatory Variables .....	56
Model Validation .....	56
Appendix D: Economic Scenarios .....	63
Alternative Scenarios.....	63
Graphical Depiction of the Scenarios .....	64
Stochastic Simulations.....	66
Historical Data .....	67
Modeling Techniques .....	70
1-Year CMT Rate .....	70

# **Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Forward Mortgage Insurance-In-Force**

November 10, 2017

Page iii

Additional Interest Rate Models .....	72
HPA .....	73
Unemployment Rate .....	75
Gross Domestic Product .....	76
Final Simulation Selection .....	76
Appendix E: Cash Flow Analysis.....	77
Introduction.....	77
Definitions .....	77
Cash Flow Components .....	78
MIP .....	78
Upfront MIP.....	80
Annual Premium.....	81
Refunded MIP .....	81
Losses Associated with Claims.....	81
Loss Mitigation Expenses.....	82
Net Present Value.....	82

## Summary of Findings

This report presents the results of Pinnacle Actuarial Resources, Inc.'s (Pinnacle's) independent actuarial review of the Cash Flow Net Present Value (NPV) associated with forward mortgages insured by the Mutual Mortgage Insurance Fund (MMIF) for fiscal year 2017. The Cash Flow NPV associated with Home Equity Conversion Mortgages (HECMs) are analyzed separately and are excluded from this report. In the remainder of this report, the term MMIF refers to forward mortgages and excludes HECMs.

Below we summarize the findings associated with each of the required deliverables.

**Deliverable 1: The Actuary's conclusion regarding the reasonableness of Federal Housing Administration's (FHA's) estimate of Cash Flow Net Present Value from Forward Mortgage Insurance-In-Force as presented in FHA's Annual Report to Congress and the Actuary's best estimate of the range of reasonable estimates, including the 90th, 95th and 99th percentiles.**

As of the end of Fiscal Year 2017, Pinnacle's Actuarial Central Estimate (ACE) of the MMIF Cash Flow NPV is \$1.893 billion.

Pinnacle's ACE is based on the Economic Assumption for the 2018 Budget Fall Baseline from the Office of Management and Budget (OMB Economic Assumptions). Pinnacle also estimated Cash Flow NPV outcomes based on economic scenarios from Moody's Analytics (Moody's). The Cash Flow NPV results based on these scenarios are shown in Table 1.

*Table 1: Range of Cash Flow NPV Outcomes Based on Moody's Scenarios*

<b>Economic Scenario</b>	<b>Fiscal Year 2017 Cash Flow NPV</b>
Pinnacle ACE	1,892,909,014
Moody's Baseline	6,003,059,790
Moody's Stronger Near Term Growth	8,699,780,859
Moody's Slower Near Term Growth	1,834,075,258
Moody's Moderate Recession	-13,243,008,137
Moody's Protracted Slump	-36,309,405,864
Moody's Below-Trend Long-Term Growth	-204,715,004
Moody's Stagflation	-8,214,525,624
Moody's Next Cycle Recession	-1,801,986,274
Moody's Low Oil Price	5,665,577,819

The range of results based on the Moody's estimates is negative \$36.31 billion to positive \$8.70 billion.

In addition, Pinnacle has estimated a range of outcomes based on 100 randomly generated stochastic simulations of key economic variables. Based on these simulations, we estimate that the range of reasonable Cash Flow NPV estimates is negative \$5.0 billion to positive \$8.5 billion. This range is based on an 80% likelihood



## **Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Forward Mortgage Insurance-In-Force**

November 10, 2017

Page 2

that the ultimate Cash Flow NPV will fall within the lower and upper bound of the range.

The 90<sup>th</sup>, 95<sup>th</sup> and 99<sup>th</sup> percentiles of the stochastic simulations are shown below:

- 90<sup>th</sup> percentile: \$8.5 billion
- 95<sup>th</sup> percentile: \$11.9 billion
- 99<sup>th</sup> percentile: \$13.7 billion

The Cash Flow NPV estimate provided by FHA to be used in the FHA's Annual Report to Congress is \$1.4 billion. Based on Pinnacle's Actuarial Central Estimate and range of reasonable estimates, we conclude that the FHA estimate of Cash Flow NPV to be used in the FHA's Annual Report to Congress is reasonable.

**Deliverable 2: The Actuary's best estimate and range of reasonable estimates of Cash Flow Net Present Value by cohort from Forward (Home Equity Conversion) Mortgage Insurance-In-Force as presented in FHA's Annual Report to Congress.**

Pinnacle's range of reasonable estimates of the Cash Flow NPV by cohort are shown below. The range of estimates are based on the stochastic simulation results.

# Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Forward Mortgage Insurance-In-Force

November 10, 2017

Page 3

Table 2: Range of Reasonable Cash Flow NPV Estimates – Forward Portfolio

Cohort	10th Percentile	90th Percentile	Pinnacle ACE
1992	-1,906,956	-1,746,653	-2,510,064
1993	-2,371,960	-1,688,818	-2,587,302
1994	-4,580,119	-3,189,831	-6,483,734
1995	-3,939,164	-2,759,241	-5,998,983
1996	-8,923,993	-5,319,929	-11,976,154
1997	-13,185,713	-7,451,770	-19,158,651
1998	-22,915,694	-13,328,571	-31,623,846
1999	-38,745,528	-19,210,096	-49,412,869
2000	-40,628,914	-21,986,375	-52,489,704
2001	-99,064,250	-63,251,762	-129,956,227
2002	-164,822,389	-105,502,037	-205,837,102
2003	-247,414,669	-159,321,261	-290,254,163
2004	-397,544,640	-245,860,927	-458,386,429
2005	-379,568,136	-226,727,363	-438,741,118
2006	-411,332,460	-243,440,736	-484,933,531
2007	-500,103,398	-290,730,486	-628,461,485
2008	-1,267,113,133	-733,480,868	-1,672,216,832
2009	-1,885,337,601	-988,195,126	-2,277,550,884
2010	-1,911,328,910	-747,758,761	-1,911,996,837
2011	-958,442,763	-166,809,657	-904,394,273
2012	-442,033,701	560,370,195	-126,950,483
2013	-2,384,120	1,391,930,042	674,180,337
2014	523,887,918	1,436,894,167	1,320,408,633
2015	1,334,256,456	2,818,195,082	2,941,476,574
2016	1,064,695,471	3,063,683,900	3,167,486,685
2017	870,489,901	3,246,590,819	3,501,277,456
Total	-5,010,358,466	8,469,903,938	1,892,909,014

**Deliverable 3: Reconciliation of the data used to prepare Pinnacle’s estimates with data used by FHA to prepare its estimated MMIF Cash Flow NPV.**

Section 4 shows the reconciliation of the data used by Pinnacle with the data used by FHA. Please see the section titled [Data Reconciliation](#).

**Deliverable 4: Assumptions and judgments on which estimates are based, support for the assumptions and sensitivity of the estimates to alternative assumptions and judgments.**

The assumptions and judgments on which the Cash Flow NPV estimates are based are summarized in Section 4 of this report. The sections titled [Specification of Mortgage Transition Models](#) and [Estimation Sample](#) show the specifications and assumptions related to the transition models. The [Loss Severity Model](#) section details the loss severity models. Section 3 describes the economic assumptions incorporated into the Cash Flow NPV estimates

## **Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Forward Mortgage Insurance-In-Force**

November 10, 2017

Page 4

and the sensitivity of the estimates to alternative economic scenarios. Lastly, the Cash Flow Projections section of Section 4 summarizes the assumptions associated with the cash flow analysis.

**Deliverable 5: Narrative component that provides detail to explain to FHA and HUD management and auditors, OMB and Congressional offices the findings and their significance, and technical component that traces the analysis from the data to the conclusions.**

Sections 1 and 2 provide an explanation of the findings and discusses the significance of the findings. Also, Section 4 traces the analysis from data to conclusions.

**Deliverable 6: Commentary on the likelihood of risks and uncertainties that could result in material adverse changes in the condition of the MMIF as measured by the Cash Flow NPV.**

Section 3 provides a discussion of the economic conditions that could result in material adverse change to the Cash Flow NPV.

# **Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Forward Mortgage Insurance-In-Force**

November 10, 2017

Page 5

## **Executive Summary**

---

The 1990 Cranston-Gonzalez National Affordable Housing Act (NAHA) requires an independent actuarial analysis of the economic value of the FHA and Department of Housing and Urban Development's (HUD's) MMIF. Enacted on July 30, 2008, the Housing and Economic Recovery Act of 2008 (HERA) moved the requirement for an independent actuarial review into 12 USC 1708(a)-(4).

HERA also moved several additional programs into the MMIF. One of them, Home Equity Conversion Mortgages, which are reverse mortgages, are analyzed separately and are excluded from this report. In the remainder of this report, the term MMIF refers to forward mortgages and excludes HECMs.

The primary purpose of this actuarial analysis is to estimate the Cash Flow NPV of the current book of business.

We have calculated a range of estimates using economic projections from the OMB Economic Assumptions for Fiscal Year 2018, nine economic projection scenarios from Moody's and a stochastic simulation approach to test variation around economic scenarios.

Based on our analysis, we estimate that the Cash Flow NPV as of the end of fiscal year 2017 is \$1.893 billion. We also estimate that the reasonable range of Cash Flow NPV is between negative \$5.0 billion and positive \$8.5 billion.

### Impact of Economic Forecasts

The Cash Flow NPV of the MMIF depends on many factors. One of the most important set of factors is the prevailing economic conditions over the next 30 years, and most critically during the next 10 years. We incorporate the most significant factors in the U.S. economy affecting the performance of the mortgages insured by the MMIF through the use of the following variables in our models:

- 30-year fixed-rate home mortgage effective rates
- 10-year Constant Maturity Treasury (CMT) rates
- 1-year CMT rates
- Housing price index (HPI)
- Unemployment rates
- Gross Domestic Product (GDP)

The projected Cash Flow NPV of FHA's books of business is affected by changes in these economic variables. The ACE results in this report is derived from using the OMB Economic Assumptions.

We also estimated the Cash Flow NPV of the MMIF under nine additional economic scenarios from Moody's. These scenarios are:

- Moody's Baseline
- Stronger Near-Term Growth
- Slower Near-Term Growth

## Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Forward Mortgage Insurance-In-Force

November 10, 2017

Page 6

- Moderate Recession
- Protracted Slump
- Below-Trend Long-Term Growth
- Stagflation
- Next-Cycle Recession
- Low Oil Price

These scenarios do not represent the full range of possible future economic paths. They represent a considerable variation of economic conditions. Therefore they provide insights into the projected Cash Flow NPV of the MMIF under a range of economic environments.

The summary of estimated Cash Flow NPV resulting from each approach is shown in Table 3.

*Table 3: Projected Forward Cash Flow NPV Using Alternative Economic Scenarios*

<b>Economic Scenario</b>	<b>Fiscal Year 2017 Cash Flow NPV</b>
Pinnacle ACE	1,892,909,014
Moody's Baseline	6,003,059,790
Moody's Stronger Near Term Growth	8,699,780,859
Moody's Slower Near Term Growth	1,834,075,258
Moody's Moderate Recession	-13,243,008,137
Moody's Protracted Slump	-36,309,405,864
Moody's Below-Trend Long-Term Growth	-204,715,004
Moody's Stagflation	-8,214,525,624
Moody's Next Cycle Recession	-1,801,986,274
Moody's Low Oil Price	5,665,577,819

We also randomly generated 100 stochastic simulations of key economic variables. Based on these simulations, we estimate that the range of reasonable Cash Flow NPV estimates is negative \$5.0 billion to positive \$8.5 billion. This range is based on an 80% likelihood that the ultimate Cash Flow NPV will fall within the lower and upper bound of the range.

## **Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Forward Mortgage Insurance-In-Force**

November 10, 2017

Page 7

### **Distribution and Use**

---

This report is being provided to FHA for its use and the use of makers of public policy in evaluating the Cash Flow NPV of the MMIF. Permission is hereby granted for its distribution on the condition that the entire report, including the exhibits and appendices, is distributed rather than any excerpt. Pinnacle also acknowledges that excerpts of this report will be used in preparing summary comparisons for FHA's Annual Report to Congress, and permission is granted for this purpose as well. We are available to answer any questions that may arise regarding this report.

Any third parties receiving the report should recognize that the furnishing of this report is not a substitute for their own due diligence and should place no reliance on this report or the data contained herein that would result in the creation of any duty or liability by Pinnacle to the third party.

Our conclusions are predicated on a number of assumptions as to future conditions and events. These assumptions, which are documented in subsequent sections of the report, must be understood in order to place our conclusions in their appropriate context. In addition, our work is subject to inherent limitations, which are also discussed in this report.

### **Reliances and Limitations**

---

Listed in Section 4 are the data sources Pinnacle has relied on in our analysis. We have relied on the accuracy of these data sources in our calculations. If it is subsequently discovered that the underlying data or information is erroneous, then our calculations would need to be revised accordingly.

We have relied on a significant amount of data and information from external sources without audit or verification. This includes economic data projected over the next 30 years from Moody's and the OMB. However, we did review as many elements of the data and information as practical for reasonableness and consistency with our knowledge of the mortgage insurance industry. It is possible that the historical data used to develop our estimates may not be predictive of future default and loss experience. We have not anticipated any extraordinary changes to the legal, social or economic environment which might affect the number or cost of mortgage defaults beyond those contemplated in the economic scenarios described in this report. To the extent that the realized experience deviates significantly from these assumptions, the actual results may differ, perhaps significantly, from projected results.

The predictive models used in this analysis are based on a theoretical framework and certain assumptions. This model structure predicts the rates of default, claim, loss and prepayment based on a number of individual mortgage characteristics and economic variables. The models are built using predictive modeling techniques, analyzing data from actual historical experience of FHA-insured mortgages. The parameters of the predictive models are estimated over a wide variety of mortgages originated since 1975 and their performance under the range of economic conditions and mortgage market environments experienced during the past 40 years. The predictive models are combined with assumptions about future behavior of current mortgage endorsements and certain key economic assumptions to produce future projections of the performance of the existing

**Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow  
Net Present Value from Forward Mortgage Insurance-In-Force**

November 10, 2017

Page 8

mortgages insured by the MMIF.

Pinnacle is not qualified to provide formal legal interpretation of federal legislation or FHA policies and procedures. The elements of this report that require legal interpretation should be recognized as reasonable interpretations of the available statutes, regulations and administrative rules.

# **Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Forward Mortgage Insurance-In-Force**

November 10, 2017

Page 9

## **Section 1: Introduction**

---

### Scope

FHA has engaged Pinnacle to perform the annual independent actuarial study of the MMIF. This study is required by 12 USC 1708(a)-(4) and must be completed in compliance with the Federal Credit Reform Act as implemented and all applicable Actuarial Standards of Practice (ASOPs). This study provides an analysis of the Cash Flow NPV of the MMIF as of September 30, 2017.

The MMIF is a group of accounts of the federal government which records transactions associated with the FHA's guarantee programs for single family mortgages. Currently, the FHA insures approximately 7.83 million forward mortgages under the MMIF and 440,000 reverse mortgages under the HECM program.

Per 12 USC 1711-(f), the FHA must endeavor to ensure that the MMIF maintains a capital ratio of not less than 2.0%. The capital ratio is defined as the ratio of capital to the MMIF obligations on outstanding mortgages (insurance-in-force, or IIF). Capital is defined as cash available to the MMIF plus the Cash Flow NPV of all future cash outflows and inflows that are expected to result from the mortgages currently insured by the MMIF.

The deliverables included in this study are:

1. The Actuary's conclusion regarding the reasonableness of FHA's estimate of Cash Flow Net Present Value from Forward (Home Equity Conversion) Mortgage Insurance-In-Force as presented in FHA's Annual Report To Congress and the Actuary's best estimate of the range of reasonable estimates, including the 90<sup>th</sup>, 95<sup>th</sup> and 99<sup>th</sup> percentiles.
2. The Actuary's best estimate and range of reasonable estimates of Cash Flow Net Present Value by cohort from Forward (Home Equity Conversion) Mortgage Insurance-In-Force as presented in FHA's Annual Report to Congress.
3. Reconciliation of the data used to prepare Pinnacle's estimates with data used by FHA to prepare its estimated MMIF Cash Flow NPV.
4. Assumptions and judgments on which estimates are based, support for the assumptions and sensitivity of the estimates to alternative assumptions and judgments.
5. Narrative component that provides detail to explain to FHA and HUD management and auditors, OMB and Congressional offices the findings and their significance, and technical component that traces the analysis from the data to the conclusions.
6. Commentary on the likelihood of risks and uncertainties that could result in material adverse changes in the condition of the MMIF as measured by the Cash Flow NPV.



## Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Forward Mortgage Insurance-In-Force

November 10, 2017

Page 10

### Background

The MMIF provides guarantees for traditional forward mortgages and HECMs. This report focuses on Cash Flow NPV projections for forward mortgages. Cash Flow NPV projections for HECMs are discussed in a separate report.

Congress created FHA in 1934. The FHA “provides mortgage insurance on mortgages provided by FHA-approved lenders throughout the United States and its territories. FHA insures mortgages on single family and multifamily homes including manufactured homes and hospitals. It is the largest insurer of mortgages in the world, insuring over 34 million properties since its inception in 1934.”<sup>1</sup> The mortgage insurance provided was done so through the establishment of the MMIF.

NAHA, enacted in 1990, introduced a minimum capital requirement for the MMIF<sup>2</sup>. By 1992, the capital ratio was to be at least 1.25%, and by 2000 the capital ratio was to be no less than 2.0%. The capital ratio is defined by NAHA as the ratio of capital plus Cash Flow NPV to unamortized IIF. NAHA also implemented the requirement that an independent actuarial study of the MMIF be completed annually. HERA moved the requirement for the annual actuarial study to 12 USC 1708(a)-(4).

### Report Structure

The remainder of this report is divided into the following sections:

- **Section 2. Summary of Findings** – presents the MMIF estimated Cash Flow NPV for fiscal year 2017. This section also shows the projected Cash Flow NPV by cohort and product.
- **Section 3. Cash Flow NPV Based on Alternative Scenarios** – presents estimates of the MMIF Cash Flow NPV using a range of alternative economic assumptions.
- **Section 4. Summary of Methodology** – presents an overview of the data processing, transition, loss severity and cash flow models used in the analysis.

---

<sup>1</sup> [https://portal.hud.gov/hudportal/HUD?src=/program\\_offices/housing/fhahistory](https://portal.hud.gov/hudportal/HUD?src=/program_offices/housing/fhahistory)

<sup>2</sup> Public Law 101-625, 101<sup>st</sup> Congress, November 28, 1990, Section 332.

## Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Forward Mortgage Insurance-In-Force

November 10, 2017

Page 11

### Section 2: Summary of Findings

---

This section presents Pinnacle's estimates of the Cash Flow NPV of the MMIF Forward Mortgage portfolio as of September 30, 2017.

#### Fiscal Year 2017 Cash Flow NPV Estimate

This analysis estimates the Cash Flow NPV of the MMIF as of the end of fiscal year 2017 using data through September 30, 2017. We developed this estimate by analyzing historical mortgage performance using data provided by FHA, developing predictive models for mortgage transition and losses, and using these model results along with economic projections from the OMB and Moody's to project future cash flows of the MMIF. The Cash Flow NPV along with the MMIF's capital resources represent the economic value of the MMIF.

The predictive models used in this report are similar conceptually to the econometric models developed in the 2016 Actuarial Review; however, there is one difference in the modeling approach. We have developed multinomial logistic models which predict the likelihood of all possible transitions simultaneously. In the 2016 Actuarial Review, multiple binomial models were developed for each individual transition, and the multinomial likelihood was then estimated from the individual binomial models.

Section 4 summarizes the mortgage-level models, the assumptions used and the detailed projection model results.

The Cash Flow NPV is computed from the projected cash flows occurring during fiscal year 2018 and subsequent years. It is computed based on economic projections associated with the OMB Economic Assumptions. **As of the end of Fiscal Year 2017, Pinnacle estimates that the MMIF Cash Flow NPV is \$1.893 billion.** The Cash Flow NPV estimate provided by FHA to be used in FHA's Annual Report to Congress is \$1.4 billion.

In addition to the overall estimate of the Cash Flow NPV, we have estimated the Cash Flow NPV by cohort. The Pinnacle estimate compared to the FHA estimate by cohort is shown below.

## Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Forward Mortgage Insurance-In-Force

November 10, 2017

Page 12

Table 4: Cash Flow NPV by Cohort

Cohort	Cash Flow NPV (\$ in billions)		Dollar Difference
	Pinnacle	FHA	
1992	0.0	0.0	0
1993	0.0	0.0	0
1994	0.0	0.0	0
1995	0.0	0.0	0
1996	0.0	0.0	0
1997	0.0	0.0	0
1998	0.0	-0.1	0
1999	0.0	-0.1	0
2000	-0.1	-0.1	0
2001	-0.1	-0.2	0
2002	-0.2	-0.3	0
2003	-0.3	-0.4	0
2004	-0.5	-0.7	0
2005	-0.4	-0.8	0
2006	-0.5	-0.8	0
2007	-0.6	-1.0	0
2008	-1.7	-2.4	1
2009	-2.3	-3.4	1
2010	-1.9	-2.8	1
2011	-0.9	-1.2	0
2012	-0.1	-0.4	0
2013	0.7	1.1	0
2014	1.3	2.2	-1
2015	2.9	3.8	-1
2016	3.2	4.3	-1
2017	3.5	4.7	-1
Total	1.9	1.4	0.5

The Pinnacle estimates by cohort are higher (less negative) through 2012, and then conversely are lower (less positive) for cohorts 2013 and later. The total Pinnacle Cash Flow NPV estimate is \$0.5 billion higher than the FHA estimate, which as a percentage of IIF is 0.04%. The current IIF is \$1,265 billion.

The housing and economic crisis that occurred in 2008 has resulted in higher claim rates for mortgages originated during fiscal years 2005 - 2010. Given that their upfront mortgage insurance premium (MIP) has already been collected and is included as part of the current capital resources, and due to their large origination volume, the fiscal year 2008 - 2010 cohorts are estimated to experience larger negative Cash Flow NPVs than any other cohorts. However, at the end of the housing recession, house prices bottomed out and then turned positive, and as a result mortgages originated in fiscal years 2013 - 2017 have positive Cash Flow NPVs. The NPV is also being positively impacted for these more recent cohorts due to MIP now being collected over the life of the mortgage.

## Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Forward Mortgage Insurance-In-Force

November 10, 2017

Page 13

The table below shows Pinnacle's Cash Flow NPV estimates by cohort and product.

Table 5: Cash Flow NPV by Cohort and Product

Cohort	Fixed Rate 30 - Streamlined Refinance	Fixed Rate 15 - Streamlined Refinance	Adjustable Rate Mortgage - Streamlined Refinance	Total
1992	-1,564,549	-55,055	0	-1,909,421
1993	-1,995,836	-501,792	0	-2,739,891
1994	-2,889,882	-1,953,034	0	-5,491,182
1995	-4,489,312	-194,733	0	-5,824,664
1996	-7,835,515	-599,954	0	-9,775,912
1997	-14,435,660	-325,844	0	-17,901,828
1998	-21,852,966	-2,267,404	0	-27,082,830
1999	-38,382,860	-6,156,413	0	-45,833,203
2000	-45,690,875	-583,222	0	-51,074,500
2001	-88,710,692	-10,030,521	0	-100,982,699
2002	-157,407,408	-25,105,347	0	-193,415,912
2003	-238,974,383	-95,699,688	-41,667	-346,256,753
2004	-347,308,558	-82,455,649	-171,235	-458,386,429
2005	-345,355,030	-59,235,881	-301,583	-438,741,118
2006	-440,580,559	-30,164,849	-760,921	-484,933,531
2007	-593,106,589	-25,933,646	-1,603,683	-628,461,485
2008	-1,552,891,936	-94,088,585	-6,724,643	-1,672,216,832
2009	-1,769,741,843	-471,328,586	-11,260,891	-2,277,550,884
2010	-1,602,139,494	-227,394,837	-17,993,261	-1,911,996,837
2011	-699,767,865	-134,190,348	-19,698,403	-904,394,273
2012	-29,918,110	-52,852,842	-28,156,613	-126,950,483
2013	789,700,135	-100,589,385	-17,602,748	674,180,337
2014	1,273,799,719	-5,494,166	10,612,291	1,320,408,633
2015	2,370,351,127	498,165,330	28,951,021	2,941,476,574
2016	2,632,213,636	485,804,735	28,860,872	3,167,486,685
2017	3,035,450,464	412,248,912	28,750,096	3,501,277,456
Total	2,096,475,161	-30,982,802	-7,141,368	1,892,909,014

The value of the overall Cash Flow NPV is influenced primarily by the fixed rate 30-year mortgage product, which has the largest volume of mortgages historically. The total Cash Flow NPV is positive for the Fixed Rate 30 and Fixed Rate 15 Streamlined Refinance products, and is negative for the remaining products.

## Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Forward Mortgage Insurance-In-Force

November 10, 2017

Page 14

### Section 3: Cash Flow NPV Based on Alternative Scenarios

---

The Cash Flow NPV of the MMIF will vary from our estimates if the actual drivers of mortgage performance deviate from the baseline projections associated with the OMB Economic Assumptions. In this section, we develop additional estimates of the Cash Flow NPV based on the following approaches:

1. Moody's economic scenarios
2. Stochastic simulation of key economic variables
3. Sensitivity testing of key economic variables

We use these additional estimates of the Cash Flow NPV to develop a range of estimates and associated percentiles. These alternative estimates were then compared to the Cash Flow NPV resulting from the OMB Economic Assumptions to determine the sensitivity of the Cash Flow NPV estimate to alternative assumptions.

Each Moody's scenario produces an estimate of the Cash Flow NPV using future interest, unemployment and HPI rates as a deterministic path.

The Moody's scenarios are:

- Moody's Baseline
- Stronger Near-Term Growth
- Slower Near-Term Growth
- Moderate Recession
- Protracted Slump
- Below-Trend Long-Term Growth
- Stagflation
- Next-Cycle Recession
- Low Oil Price

The resulting Cash Flow NPV associated with each alternative scenario is summarized in Table 6. Below, we discuss the characteristics of each Moody's scenario.

#### Moody's Baseline Assumptions

In this scenario, the HPI increases over the entire projection period, and the rate of change is consistently between 2.0% and 3.5%. This is different from the OMB Economic Assumptions in that Moody's baseline grows more slowly for the first four years, and then increases at a faster rate through 2027. The mortgage interest rate increases more slowly than the OMB Economic Assumptions scenario, and settles at a longer term average of about 5.5%, which is lower than the OMB Economic Assumptions long term estimate of just over 6.0%. The unemployment rate decreases slightly to 3.7% over the next year, and then increases to a long-term average of around 5.0%. The OMB estimate decreases to about 4.4% over the next year, and then increases to a long-term average of 4.8%.

## **Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Forward Mortgage Insurance-In-Force**

November 10, 2017

Page 15

### Stronger Near-Term Growth Scenario

In Moody's Stronger Near-Term Growth scenario, the HPI is projected to increase more quickly than under the OMB scenario. In addition, mortgage interest rates are projected to be lower than the OMB estimates through 2018, then projected to be higher than OMB through 2020, then decrease to a long-term average of just under 5.5%. The unemployment rate also is lower than projected in the OMB scenario and remains lower throughout the entire projection period.

### Slower Near-Term Growth Scenario

In Moody's Slower Near-Term Growth scenario, the HPI increases more slowly than in the OMB scenario, and near the end of the projection period recovers to the level of the OMB assumptions. Mortgage interest rates are projected to be lower than the OMB assumptions throughout the projection period, settling at a long-term average of just over 5.5%. The unemployment rate is projected to be almost 0.70 percentage points higher than the OMB assumptions scenario by 2021, and then recovers to just 0.25 percentage points higher than the OMB assumptions in the long-term.

### Moderate Recession Scenario

In the Moderate Recession scenario, the HPI decreases over the next 18 months, and then begins to increase. Despite the recovery, the projected HPI is lower than the OMB assumptions for the entire projection period. Mortgage interest rates spike sharply in the fourth quarter of 2017, and then drop significantly through the first quarter of 2019. Mortgage rates then begin to slowly increase until they reach the long-term average of just over 5.5%. The unemployment rate spikes to almost 8% by 2019, and then recovers to a long-term average of just over 5%. The projected unemployment rate is higher than the OMB assumptions for the entire projection period.

### Protracted Slump

In Moody's Protracted Slump scenario, the HPI decreases significantly over the next 18 months, and then begins to increase again. Despite the recovery, the projected HPI is lower than the OMB assumptions for the entire projection period. Mortgage interest rates spike sharply in the fourth quarter of 2017, and then drop until the fourth quarter of 2019. They begin to slowly increase until they reach the long-term average of just over 5.5%. The unemployment rate spikes to over 10% by 2020, and then recovers to a long-term average of approximately 5.4%. The projected unemployment rate is higher than the OMB assumptions scenario for the entire projection period.

### Below-Trend Long-Term Growth

In Moody's Below-Trend Long-Term Growth scenario, the HPI increases more slowly than in the OMB assumptions and remains lower for the entire projection period. Mortgage interest rates increase gradually and settle at a long-term average of about 5.7%. The projected mortgage interest rate is lower than the OMB projection over the entire period. The unemployment rate increases to 5.6% by 2020, and then decreases to a long-term average of approximately 5.0%.

## **Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Forward Mortgage Insurance-In-Force**

November 10, 2017

Page 16

### Stagflation

In Moody's Stagflation scenario, the HPI decreases through the third quarter of 2019, and then begins to increase. Despite the recovery, the projected HPI is lower than the OMB assumptions for the entire projection period. Mortgage interest rates increase sharply to 6.8% by the second quarter of 2018, and then drop through the second quarter of 2019. They then begin to slowly increase to the long-term average of just over 5.5%. Unemployment rates increase significantly to just over 8% by 2019, and then decrease to a long-term average of just over 5%.

### Next-Cycle Recession

In Moody's Next-Cycle Recession scenario, the HPI increases at the same rate as the OMB assumptions through the first quarter of 2020, and then decreases significantly through the second quarter of 2021. The HPI then increases again until it is equal to the OMB assumptions by 2027. The mortgage interest rates are approximately equal to the OMB assumptions through 2020, and then increase significantly to 7.7% by 2022. The rates then drop slightly and settle in at a long term average of 7.4%. The unemployment rate is lower than the OMB assumptions through the third quarter of 2019, and then increases sharply to over 8% by 2021. It then decreases to the level of the OMB assumptions by 2024.

### Low Oil Price

In Moody's Low Oil Price scenario, the HPI increases at a rate similar to the OMB assumptions throughout the entire projection period. Mortgage interest rates decrease slightly through the first quarter of 2018, and then increase significantly through 2020. The rate then levels off at a long-term average of about 5.8%. Unemployment rates decrease through 2019, and then increase for the remainder of the projection period, settling at a long-term average of just over 5%.

### Summary of Alternative Scenarios

Table 6 shows the projected Cash Flow NPV from the ten deterministic scenarios. The range of projected results is between negative \$36.31 billion and positive \$8.70 billion.

# Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Forward Mortgage Insurance-In-Force

November 10, 2017

Page 17

Table 6: Cash Flow NPV Summaries from Alternative Scenarios

Cohort	Pinnacle ACE	Moody's Baseline	Moody's Stronger Near-Term Growth	Moody's Slower Near-Term Growth	Moody's Moderate Recession	Moody's Protracted Slump	Moody's Below-Trend Long-Term Growth	Moody's Stagflation	Moody's Next Cycle Recession	Moody's Low Oil Price
1992	-1,909,421	-1,629,189	-1,412,913	-2,000,042	-2,204,692	-2,571,325	-1,912,976	-2,041,695	-1,558,058	-1,495,958
1993	-2,739,891	-2,687,384	-2,395,768	-2,510,494	-3,526,298	-5,051,868	-2,866,324	-2,724,010	-2,265,570	-2,411,136
1994	-5,491,182	-4,986,935	-3,823,972	-5,593,247	-8,851,174	-12,858,243	-5,777,251	-6,974,514	-5,011,214	-4,650,445
1995	-5,824,664	-4,642,111	-5,248,017	-6,041,639	-10,113,015	-12,777,703	-5,658,464	-9,006,915	-5,785,758	-4,821,992
1996	-9,775,912	-9,388,559	-8,307,782	-11,451,981	-18,678,384	-25,698,604	-10,859,286	-14,629,402	-11,372,364	-8,680,949
1997	-17,901,828	-13,843,115	-13,090,234	-17,792,370	-29,180,164	-41,983,205	-18,874,053	-25,761,067	-16,559,130	-15,405,585
1998	-27,082,830	-22,386,906	-22,031,428	-26,349,872	-46,052,645	-66,181,226	-27,645,116	-39,313,572	-27,637,701	-22,840,747
1999	-45,833,203	-41,384,404	-36,870,254	-47,516,408	-85,044,228	-124,860,878	-51,227,638	-73,655,607	-49,285,443	-40,295,432
2000	-51,074,500	-45,629,306	-42,155,701	-53,121,577	-84,440,089	-135,740,137	-57,004,603	-80,298,157	-57,447,771	-44,291,191
2001	-100,982,699	-89,481,211	-85,332,023	-102,679,374	-152,042,207	-223,820,021	-110,089,323	-143,582,533	-107,929,441	-89,289,815
2002	-193,415,912	-178,747,880	-167,066,567	-201,638,597	-295,202,104	-419,582,183	-206,460,681	-284,075,275	-218,457,781	-176,321,352
2003	-346,256,753	-313,111,244	-300,928,551	-366,921,431	-531,424,093	-750,675,747	-379,585,087	-520,629,809	-406,851,069	-311,020,093
2004	-458,386,429	-424,475,362	-402,799,173	-482,043,787	-693,606,549	-1,022,044,426	-506,472,822	-698,861,126	-519,107,416	-423,667,303
2005	-438,741,118	-394,490,835	-374,692,237	-459,634,301	-656,048,684	-967,024,693	-485,117,216	-673,784,985	-486,922,432	-391,951,205
2006	-484,933,531	-443,275,941	-415,757,742	-513,981,332	-736,214,158	-1,056,557,117	-530,332,608	-724,203,295	-552,453,114	-447,101,774
2007	-628,461,485	-578,849,291	-538,307,287	-650,801,815	-952,488,279	-1,362,754,439	-693,778,693	-932,900,252	-704,102,440	-577,376,093
2008	-1,672,216,832	-1,521,933,495	-1,400,206,474	-1,740,538,913	-2,548,126,972	-3,724,735,182	-1,810,922,936	-2,492,284,944	-1,889,270,549	-1,483,581,489
2009	-2,277,550,884	-2,022,507,659	-1,857,705,912	-2,406,200,217	-3,675,365,742	-5,661,175,793	-2,503,801,217	-3,595,376,279	-2,719,194,598	-1,992,562,971
2010	-1,911,996,837	-1,685,093,871	-1,484,372,506	-2,075,507,146	-3,451,922,262	-5,711,182,025	-2,211,532,348	-3,475,377,330	-2,267,079,145	-1,650,266,407
2011	-904,394,273	-699,020,581	-576,900,456	-996,927,820	-1,938,343,935	-3,461,453,640	-1,077,072,495	-1,808,729,264	-1,203,329,713	-710,273,466
2012	-126,950,483	58,837,286	233,427,134	-223,329,932	-1,317,790,209	-3,024,841,831	-367,355,262	-1,121,944,363	-426,128,773	8,862,911
2013	674,180,337	991,593,677	1,198,860,441	591,475,522	-876,122,970	-3,163,818,237	403,614,009	-349,722,689	313,563,023	876,983,401
2014	1,320,408,633	1,606,356,302	1,792,860,020	1,332,363,971	163,624,522	-1,369,728,676	1,139,097,591	1,012,660,702	1,264,990,975	1,549,002,834
2015	2,941,476,574	3,599,444,521	3,958,940,139	3,115,818,065	1,336,374,456	-1,378,570,189	2,781,758,351	2,260,348,720	2,677,780,336	3,594,463,051
2016	3,167,486,685	3,933,322,068	4,402,725,353	3,392,768,881	1,479,404,477	-1,663,488,963	3,050,217,714	2,466,355,639	2,707,598,179	3,848,779,705
2017	3,501,277,456	4,311,071,214	4,852,372,770	3,794,231,113	1,890,377,263	-920,229,512	3,484,943,729	3,121,986,398	2,911,830,693	4,185,791,319
Total	1,892,909,014	6,003,059,790	8,699,780,859	1,834,075,258	-13,243,008,137	-36,309,405,864	-204,715,004	-8,214,525,624	-1,801,986,274	5,665,577,819

## Stochastic Simulation

The stochastic simulation approach provides information about the probability distribution of the Cash Flow NPV of the MMIF with respect to different possible future economic conditions and the corresponding prepayments, claims and loss rates. The simulation provides the Cash Flow NPV associated with each one of the 100 simulated future economic paths. The distribution of Cash Flow NPV based on these scenarios allows us to gain insights into the sensitivity of the MMIF's Cash Flow NPV to different economic conditions.

Figure 1 below shows the range of Cash Flow NPV for the 100 scenarios.

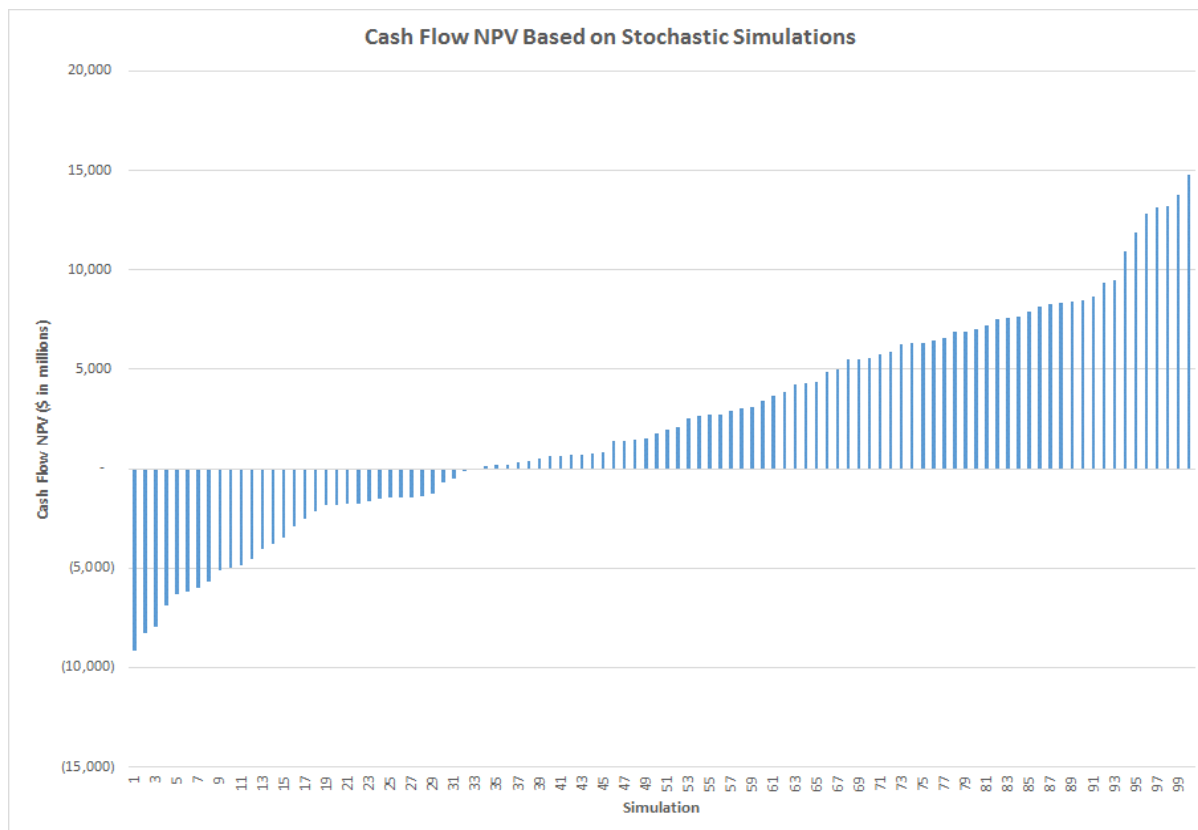


## Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Forward Mortgage Insurance-In-Force

November 10, 2017

Page 18

Figure 1: Stochastic Simulation Results



Based on the stochastic simulation results, we estimate that the range of reasonable Cash Flow NPV estimates is negative \$5.0 billion to positive \$8.5 billion. This range is based on an 80% likelihood that the ultimate Cash Flow NPV will fall within the lower and upper bound of the range. The 90<sup>th</sup>, 95<sup>th</sup> and 99<sup>th</sup> percentiles of the stochastic simulations are shown below:

- 90<sup>th</sup> percentile: \$8.5 billion
- 95<sup>th</sup> percentile: \$11.9 billion
- 99<sup>th</sup> percentile: \$13.7 billion

The range of reasonable Cash Flow NPV estimates may not include all conceivable outcomes. For example, it would not include conceivable extreme events where the contribution of such events to an expected value is not reliably estimable.

The Cash Flow NPV estimate provided by FHA to be used in the FHA Annual Report to Congress is \$1.368 billion. Based on Pinnacle's Actuarial Central Estimate and range of reasonable estimates, we conclude that the FHA estimate of Cash Flow NPV is reasonable.

## Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Forward Mortgage Insurance-In-Force

November 10, 2017

Page 19

### Sensitivity Tests of Economic Variables

The above scenario analyses were conducted to estimate the distribution of the Cash Flow NPV of the MMIF with different combinations of the interest rate and house price movements in the future. It is also useful to understand the marginal impact of each single economic factor on the Cash Flow NPV. Below, we show the sensitivity of the Cash Flow NPV with respect to the change of a single economic factor at a time. This sensitivity test is conducted for three sets of economic variables:

- House Price Appreciation (HPA)
- Interest rates, including:
  - 10-year CMT rate
  - 1-year CMT rate
  - Commitment rate on 30-year fixed-rate mortgages
- Unemployment Rate

The marginal impact is measured by the change in Cash Flow NPV from the OMB Economic Assumption scenario result. These simulations change each of these variables one at a time from the baseline scenario. The changes are parallel shifts in the path of each variable in the OMB Economic Assumption scenario, where all three interest rates are shifted together and at the same magnitudes, but are kept from going negative.

Figure 2 shows the sensitivity of the Cash Flow NPV with respect to changes in the HPA forecast. Specifically, we applied a parallel shift to the annualized HPA rates from the base scenario up and down by 20, 50, 100 and 200 basis points. The results show a small upward trend in the Change in Cash Flow NPV projections, with a more significant impact for the 200 basis point increase and decrease. This shows that there is a more moderate increasing trend for the -100 basis point to 100 basis point changes. The large negative HPA shift results in lower recoveries on homes sold by FHA, and thus a lower Cash Flow NPV is realized. Conversely, the large positive HPA shift causes HPA recovery rates to increase on FHA disposed properties, and thus results in a higher Cash Flow NPV for the MMIF. Figure 3 shows the range of the impact of the sensitivity tests as a percentage of the IIF. For the HPA sensitivity, the range of Cash Flow NPV impacts are -0.02% to +0.03% of IIF.

Figure 2 also shows the sensitivity of the Cash Flow NPV with respect to changes in future interest rates. Specifically, we applied parallel shift to the 1-year CMT rate, 10-year CMT rate and the mortgage rates up and down from the base scenario by 20, 50, 100 and 200 basis points. Interest rates are not allowed to be negative. The results show a positive slope, indicating that the Cash Flow NPV of the MMIF is positively related to future interest rates. Higher future interest rates benefit the MMIF in two ways. First, a higher future interest rate means lower refinance incentive for existing borrowers. Thus, there would be fewer prepayments, which lead to a longer stream of annual MIP revenue. Second, higher future interest rates imply that the mortgage payments of existing borrowers would be lower than that of a new mortgage with the market interest rate. The below-market mortgage payment serves as an incentive for borrowers to keep their mortgages longer and thus is a disincentive to default in order to continue to benefit from their below-market payments. A 100 basis point fall in interest rates will incur a decrease in Cash Flow NPV of \$7.0 billion, and a positive 100 basis point change in

## Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Forward Mortgage Insurance-In-Force

November 10, 2017

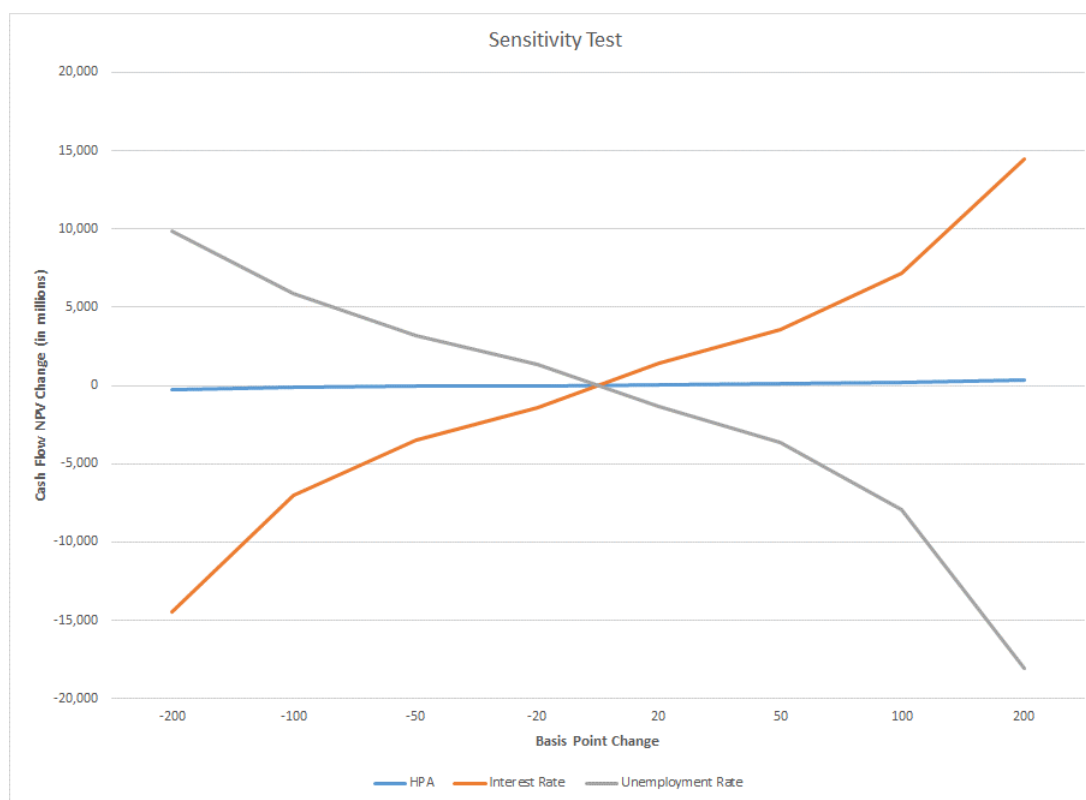
Page 20

interest rates will result in an increase in Cash Flow NPV of \$7.2 billion. For the interest rate sensitivity, the range of Cash Flow NPV impacts are -1.14% to +1.14% of IIF.

Finally, Figure 2 reports the sensitivity of the Cash Flow NPV with respect to the unemployment rate. A negative 100 basis point change in the unemployment rates will produce an increase in Cash Flow NPV of positive \$5.9 billion, and a positive 100 basis point change in the unemployment rate will result in a decrease in Cash Flow NPV of \$7.9 billion. This results from the fact that as unemployment increases, the likelihood of defaults and claims increase, and the average net loss increases as well. For the unemployment rate sensitivity, the range of Cash Flow NPV impacts are -1.43% to +0.78% of IIF.

These sensitivity analyses show that Cash Flow NPV of the MMIF portfolio would be significantly affected by changes in interest rates and unemployment, while a change in HPA has a smaller impact.

Figure 2: Sensitivity Test of Selected Economic Variables

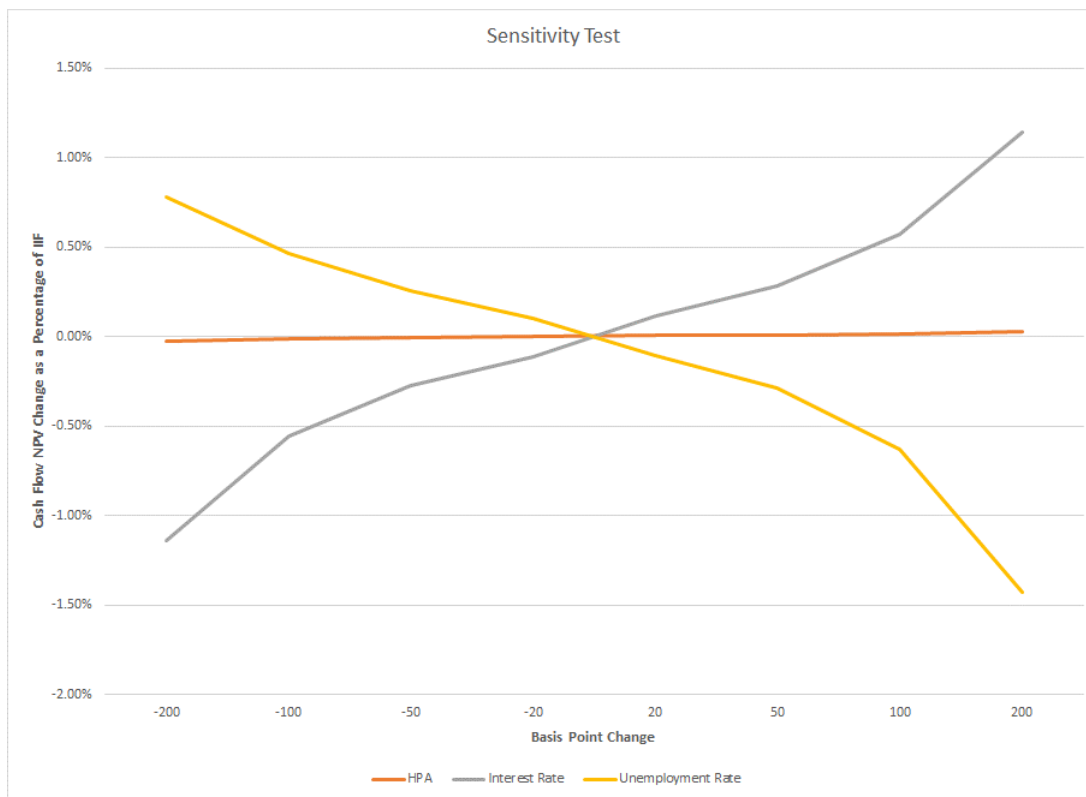


## Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Forward Mortgage Insurance-In-Force

November 10, 2017

Page 21

Figure 3: Sensitivity Test of Selected Economic Variables as a Percentage of IIF



## Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Forward Mortgage Insurance-In-Force

November 10, 2017

Page 22

### Section 4: Summary of Methodology

---

This section provides an overview of the analytical approach used in this analysis.

#### Data Sources

In our analysis, we have relied on data from FHA, Moody's and the OMB.

From FHA, we have received the following data:

1. Claims 601 Case Data: used for the cash entry from note sales
2. IDB: core case data, this table is derived based on fields from IDB\_1, IDB\_2, and the Decision\_FICO\_Score (one file each for 1975 – 2017)
3. Lossmit Costs: derived table based on the Loss Mitigation table and IDB\_1, used to obtain mitigation claim amounts
4. Sams case record: used to determine the status of the conveyances, the capital income/expense amounts, the sales and REO expenses and sales proceeds to FHA, where applicable
5. SFDW Default History: used to create period information related to default histories
6. Fannie FICO pre2004: used for supplemental credit data
7. SFDW Dictionary for Pinnacle: data dictionary for the data tables provided by FHA
8. LoanCounts\_by\_Year
9. 022317 fiscal year18 Budget Model Active Loan Panel Data Dictionary

From Moody's, we have received the following data elements:

1. Historical Economic Data
2. Baseline Economic Projections
3. Modified Economic Scenario Projections

From OMB, we have received the Economic Assumptions for the 2018 Budget Fall Baseline (updated as of March, 2017).

The economic data that is included in the analysis is shown below.

1. HPI
2. Mortgage rates
3. Treasury rates
4. Unemployment rates
5. GDP

#### Data Processing – Mortgage Level Modeling (Appendix A)

Starting with the raw data, Pinnacle processed the data to create datasets for developing the mortgage level transition and loss severity models. The steps below describe the data processing that occurred to prepare the data that was used for this analyses.

## **Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Forward Mortgage Insurance-In-Force**

November 10, 2017

Page 23

The first step in preparing the data for analysis was the processing of the economic data. Historical economic data was imported by quarter, additional data elements were derived, and data was joined to the FHA mortgage data.

Once the economic data was prepared, the core data processing occurred. We used mortgage-level data to reconstruct quarterly mortgage-event histories by relating mortgage origination information to other data reflecting events that occurred over the history of the mortgage. In the process of creating quarterly event histories, each mortgage contributed an observed transition for every quarter from origination up to and including the period of mortgage termination, or until the end of the end of fiscal year 2017 if the mortgage remained active.

### Data Reconciliation

To reconcile the data processed by Pinnacle with the data provided by FHA, Pinnacle compared summaries of key data elements with summaries provided by FHA. The summaries for the number of active mortgages, IIF, number of 90 day delinquencies, and the number of claims to date are shown in the following tables. The data processed by Pinnacle matches the FHA data totals within 1%.

The following tables are based on data as of June 30, 2017, as this was the data used to develop the transition and net loss models.

# **Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Forward Mortgage Insurance-In-Force**

November 10, 2017

Page 24

*Table 7: Data Validation – Number of Active Mortgages*

<b>Number of Active Mortgages</b>			
Credit Subsidy Cohort	Federal Housing Administration	Independent Actuary	Absolute Difference (Actuary - FHA)
1992	15,787	15,787	0
1993	25,388	25,388	0
1994	36,350	36,350	0
1995	17,268	17,268	0
1996	27,749	27,749	0
1997	29,767	29,767	0
1998	47,399	47,399	0
1999	59,857	59,857	0
2000	32,696	32,696	0
2001	57,229	57,229	0
2002	86,431	86,431	0
2003	135,145	135,145	0
2004	167,933	167,933	0
2005	120,326	120,326	0
2006	95,422	95,422	0
2007	91,885	91,885	0
2008	219,218	219,218	0
2009	505,018	505,018	0
2010	651,683	651,683	0
2011	522,944	522,944	0
2012	638,408	638,408	0
2013	880,300	880,300	0
2014	441,568	441,568	0
2015	831,831	831,831	0
2016	1,138,319	1,138,319	0
2017	909,036	909,036	0
Total	7,784,957	7,784,957	0

# **Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Forward Mortgage Insurance-In-Force**

November 10, 2017

Page 25

Table 8: Data Validation – Insurance in Force

<b>Insurance in Force (\$M)</b>				
= Original Loan Amount on Active Loans				
Credit Subsidy Cohort	Federal Housing Administration	Independent Actuary	Absolute Difference (Actuary - FHA)	Percent Difference (Actuary - FHA) / FHA
1992	965	965	0	0%
1993	1,660	1,660	0	0%
1994	2,430	2,430	0	0%
1995	1,097	1,097	0	0%
1996	1,829	1,829	0	0%
1997	2,017	2,017	0	0%
1998	3,474	3,474	0	0%
1999	4,621	4,621	0	0%
2000	2,503	2,503	0	0%
2001	4,945	4,945	0	0%
2002	8,065	8,065	0	0%
2003	14,068	14,068	0	0%
2004	17,507	17,507	0	0%
2005	12,989	12,989	0	0%
2006	10,871	10,871	0	0%
2007	11,283	11,283	0	0%
2008	30,776	30,776	0	0%
2009	77,525	77,525	0	0%
2010	98,904	98,904	0	0%
2011	81,884	81,884	0	0%
2012	102,200	102,200	0	0%
2013	145,068	145,068	0	0%
2014	63,979	63,979	0	0%
2015	148,133	148,133	0	0%
2016	217,030	217,030	0	0%
2017	182,327	182,327	0	0%
Total	1,248,150	1,248,150	0	0%



# **Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Forward Mortgage Insurance-In-Force**

November 10, 2017

Page 26

*Table 9: Data Validation – Number of 90 Day Delinquencies*

<b>Number of 90 Day Delinquencies</b>				
= Current Number of 90 Day Delinquencies				
Credit Subsidy Cohort	Federal Housing Administration	Independent Actuary	Absolute Difference (Actuary - FHA)	Percent Difference (Actuary - FHA) / FHA
1992	634	630	(4)	-1%
1993	951	947	(4)	0%
1994	1,439	1,436	(3)	0%
1995	1,114	1,110	(4)	0%
1996	1,848	1,841	(7)	0%
1997	2,267	2,252	(15)	-1%
1998	3,342	3,332	(10)	0%
1999	4,624	4,608	(16)	0%
2000	3,406	3,388	(18)	-1%
2001	4,974	4,953	(21)	0%
2002	6,919	6,881	(38)	-1%
2003	8,738	8,687	(51)	-1%
2004	12,044	11,969	(75)	-1%
2005	10,427	10,373	(54)	-1%
2006	10,504	10,442	(62)	-1%
2007	12,744	12,690	(54)	0%
2008	30,556	30,407	(149)	0%
2009	42,912	42,715	(197)	0%
2010	35,359	35,088	(271)	-1%
2011	22,149	21,992	(157)	-1%
2012	21,235	21,006	(229)	-1%
2013	23,843	23,580	(263)	-1%
2014	18,502	18,291	(211)	-1%
2015	23,176	22,868	(308)	-1%
2016	15,713	15,520	(193)	-1%
2017	1,641	1,631	(10)	-1%
Total	321,061	318,637	(2,424)	-1%

## Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Forward Mortgage Insurance-In-Force

November 10, 2017

Page 27

Table 10: Data Validation – Number of Claims to Date

Number of Claims To Date			
Federal Housing Administration	Independent Actuary	Absolute Difference (Actuary - FHA)	Percent Difference (Actuary - FHA) / FHA
36,631	36,634	3	0%
52,004	52,007	3	0%
65,539	65,543	4	0%
44,321	44,324	3	0%
62,868	62,869	1	0%
59,101	59,102	1	0%
66,319	66,319	0	0%
82,575	82,576	1	0%
70,014	70,014	0	0%
83,339	83,340	1	0%
87,529	87,529	0	0%
87,464	87,464	0	0%
110,234	110,234	0	0%
86,785	86,785	0	0%
88,259	88,259	0	0%
98,984	98,984	0	0%
206,201	206,201	0	0%
200,798	200,798	0	0%
95,656	95,656	0	0%
36,205	36,205	0	0%
19,137	19,137	0	0%
14,249	14,249	0	0%
5,767	5,767	0	0%
2,503	2,503	0	0%
347	347	0	0%
1	1	0	0%
1,762,830	1,762,847	17	0%

### Specification of Mortgage Transition Models (Appendix B)

The purpose of the transition predictive models is to estimate the future incidences of claim and prepayment terminations for FHA forward mortgages in the MMIF portfolio. The models are used to project future outstanding balances, cash flows, and ultimately the Cash Flow NPV.

The predictive models reflect the fact that mortgage borrowers possess two mutually exclusive options, one to prepay the mortgage and the other to default by permanently ceasing payment. From FHA's point of view, prepayment and claim events are the corresponding outcomes of "competing risks" in the sense that they are

## Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Forward Mortgage Insurance-In-Force

November 10, 2017

Page 28

mutually exclusive, and realization of one of these events precludes the other. Prepayment means cessation of cash inflows from MIP, but at the same time eliminates any chance of incurring claim losses. Conversely, termination through foreclosure means claim costs are incurred and MIP inflows cease, but uncertainty about the possibility and timing of prepayment is eliminated.

The models developed for this analysis also include additional transitions. These include the transition from current to 90 days or more delinquent (Default), cures from Default separated into cures by mortgage modification, and self-cures with no modification or with “light” modifications. We track the post-cure behavior of modified mortgages and self-cured mortgages separately with modification-related variables, namely a modification flag and the payment reduction ratio. We also track the status of mortgages post-default by including a prior default flag and the time since the most recent default.

We model five possible transitions from a mortgage in current status: remain current, default (enter 90+ days delinquent), prepay by streamline refinance (SR) or other prepayments, cure with a mortgage modification or self-cure. Given that these are mutually exclusive outcomes, the sum of the probabilities for all five transitions is unity. For a mortgage in default status at the beginning of a particular time period, the possible transitions are that it may be prepaid, transition into a claim, self-cure, cure with a mortgage modification, or remain in default.

We use multinomial logistic models to estimate the probability of transition for current and default mortgages. There are several benefits to using multinomial logistic models. First, they ensure that the event probabilities sum to unity. This means that at any point in time, a mortgage must experience only one of the possible transitions over the next period. Second, the possible values of each probability are constrained to be between zero and one. Third, as the probability of one transition type increases, the probabilities of the others are automatically reduced, reflecting the competing-risk nature among the transition events. Finally, they allow the conditional termination rates using mortgage-level data to be estimated. With mortgage-level observations, the possible outcomes at each point in time are either 0 (the event did not happen), or 1 (the event happened).

### Estimation Sample

The entire population of mortgage-level data from the FHA single-family data warehouse was provided to Pinnacle for this analysis. This data represents the history of almost 33 million single family mortgages originated between fiscal year 1975 through the end of fiscal year 2017.

We have applied random sampling to improve the efficiency of the model estimation. For the transition models with the initial condition of Current, we used the following sampling percentages:

*Table 11: Current Transition Model Sampling Percentages*

Ending Condition	Sampling Percentage
Current	2.5%
Current with Self-Cure	50%
Current with Mortgage Modification	100%

## Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Forward Mortgage Insurance-In-Force

November 10, 2017

Page 29

Claim	50%
Pre-payment	50%
Streamline Refinance	50%

For transition models with the initial condition of Default, we sampled 25% of the records with ending condition of Default. For all other ending conditions, we used 100% of the data.

The sampling percentages were selected as a balance between having a credible amount of data to estimate the probability of the transition and efficiently running the models.

### Loss Severity Model (Appendix C)

FHA incurs a loss from a mortgage claim event. This loss amount depends on many factors, including the disposition channel. In practice, foreclosed properties generally have higher severity compared to pre-foreclosure-sales (PFS). Foreclosure mortgages can be further separated into real-estate-owned (REO) and Claims Without Conveyance of Title (CWCOT). We have developed multiple models to predict loss severity: a model to predict whether the property is disposed by PFS, REO or CWCOT, and separate loss severity models for REO, PFS and CWCOT cases. The loss severity models capture characteristics of the mortgage, the collateral, the borrower, and the housing market environment when a claim occurs. The claim disposition selection model was estimated using multinomial logistic regression, while Generalized Linear Models (GLM) were developed for loss severity models.

In addition to the loss severity models, we have also developed a model to project the severity associated with loss mitigation claims.

### Cash Flow Projections (Appendix E)

After projecting the future transitions and severities using the predictive models, we use this information to project the corresponding cash flows. The cash flow model includes the calculation of five types of cash flows:

1. Upfront MIP
2. Annual MIP
3. Claim payments
4. Loss mitigation related expenses
5. Premium refunds

The federal credit subsidy present value conversion factors provided by OMB are used to discount future cash flows to determine their present value as of the end of fiscal year 2017.

FHA executed a note sale in November 2015 and launched another one in September 2016. There are no current planned or pending note sales. Therefore, we have not projected any future note sales in our analysis.

## **Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Forward Mortgage Insurance-In-Force**

November 10, 2017

Page 30

We have calculated the Cash Flow NPV based on multiple deterministic economic scenario paths. The ACE projection is based on the OMB Economic Assumptions, and the variation in the estimate is calculated by using nine alternative economic projection scenarios from Moody's. These scenarios includes both more favorable than expected and less favorable than expected economic assumptions. The resulting Cash Flow NPV is then calculated based on these varying assumptions. The following are the economic variables that drive the variation in the MMIF Cash Flow NPV:

- 1-year CMT rates
- 10-year CMT rates
- 30-year Fixed Rate Mortgage (FRM) rates
- FHFA national purchase-only HPI
- Unemployment rates

Appendix F:  
Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage  
Insurance Fund: Cash Flow Net Present Value from Home Equity  
Conversion Mortgage Insurance-in-Force

November 10, 2017

Dana Wade  
General Deputy Assistant Secretary  
Office of Housing  
U.S. Department of Housing and Urban Development  
451 Seventh Street, S.W., Room 9100  
Washington, D.C. 20410

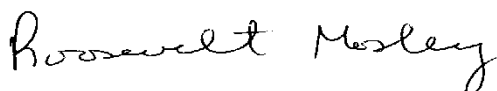
Dear Ms. Wade:

Pinnacle Actuarial Resources, Inc. (Pinnacle) has completed Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund. The attached report details our estimate of the Cash Flow Net Present Value for Fiscal Year 2017.

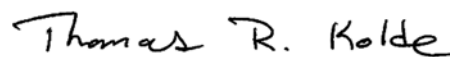
Roosevelt C. Mosley, Jr., FCAS, MAAA and Thomas R. Kolde, FCAS, MAAA are responsible for the content and conclusions set forth in the report. We are Fellows of the Casualty Actuarial Society and Members of the American Academy of Actuaries, and are qualified to render the actuarial opinion contained herein.

It has been a pleasure working with you and your team to complete this study. We are available for any questions or comments you have regarding the report and its conclusions.

Respectfully Submitted,



Roosevelt C. Mosley, Jr. FCAS, MAAA  
Principal and Consulting Actuary



Thomas R. Kolde, FCAS, MAAA  
Consulting Actuary

# Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Home Equity Conversion Mortgage Insurance-In-Force

---

November 10, 2017



3109 Cornelius Drive  
Bloomington, IL 61704  
309.807.2300  
pinnacleactuaries.com



# Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Home Equity Conversion Mortgage Insurance-In-Force

## Table of Contents

Summary of Findings .....	1
Executive Summary .....	4
Impact of Economic and Mortgage Factors .....	4
Distribution and Use .....	6
Reliances and Limitations .....	6
Section I. Introduction .....	8
Scope .....	8
HECM Background .....	9
Maximum Claim Amount .....	9
Principal Limits and Principal Limit Factors .....	10
Payment Plans .....	10
Unpaid Principal Balance and Mortgage Costs .....	10
Mortgage Terminations .....	10
Assignments and Recoveries .....	11
Report Structure .....	11
Section 2. Summary of Findings .....	12
Fiscal Year 2017 Net Present Value Estimate .....	12
Section 3. HECM Cash Flow NPV Based on Alternative Scenarios .....	14
Moody's Baseline Assumptions .....	14
Stronger Near-Term Growth Scenario .....	14
Slower Near-Term Growth Scenario .....	15
Moderate Recession Scenario .....	15
Protracted Slump Scenario .....	15
Below-Trend Long-Term Growth Scenario .....	15
Stagflation Scenario .....	15
Next-Cycle Recession Scenario .....	16

# **Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Home Equity Conversion Mortgage Insurance-In-Force**

November 10, 2017

Page ii

Low Oil Price Scenario .....	16
Summary of Alternative Scenarios .....	16
Stochastic Simulation .....	16
Sensitivity Tests of Economic Variables.....	17
Section 4. Summary of Methodology .....	22
Data Sources (Appendix A) .....	22
Data Processing – Mortgage-Level Modeling.....	23
Data Reconciliation.....	24
HECM Base Termination Model (Appendix B).....	25
HECM Cash Flow Draw Projection Models (Appendix C) .....	26
HECM Cash Flow Analysis (Appendix E) .....	26
Cash Flow Components .....	26
Net Future Cash Flows.....	27
Discount Factors .....	27
Appendices .....	28
Appendix A: Data Sources, Processing and Reconciliation .....	29
Data Processing – Mortgage Level Modeling .....	30
Data Reconciliation.....	30
Appendix B: HECM Base Termination Model .....	33
Model Specification .....	33
Multinomial Logistic Regression Theory .....	34
Explanatory Variables .....	35
Model Validation .....	36
Appendix C: HECM Cash Draw Projection Models .....	43
Likelihood of a Cash Draw .....	43
Estimated Cash Draw Amount.....	43
Appendix D: Economic Scenarios .....	44
Alternative Scenarios.....	44
Graphical Depiction of the Scenarios .....	45

**Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow  
Net Present Value from Home Equity Conversion Mortgage Insurance-In-Force**

November 10, 2017

Page iii

Stochastic Simulations .....	47
Historical Data .....	48
Modeling Techniques .....	51
1-Year CMT Rate .....	51
Additional Interest Rate Models .....	53
HPA .....	54
Unemployment Rate .....	56
Gross Domestic Product .....	57
Final Simulation Selection .....	57
Appendix E: HECM Cash Flow Analysis .....	58
General Approach to Mortgage Termination Projections .....	58
Cash Flow Components .....	58
Mortgage Balance .....	59
Tax & Insurance Defaults .....	59
MIP .....	60
Claims .....	60
Note Holding Expenses After Assignment .....	62
Recoveries from Assigned Mortgages .....	62
Net Future Cash Flows .....	63
Discount Factors .....	63

## Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Home Equity Conversion Mortgage Insurance-In-Force

### Summary of Findings

This report presents the results of Pinnacle Actuarial Resources, Inc.'s (Pinnacle) independent actuarial review of the Cash Flow Net Present Value (NPV) associated with Home Equity Conversion Mortgages (HECM) insured by the Mutual Mortgage Insurance Fund (MMIF) for fiscal year 2017. The Cash Flow NPV associated with forward mortgages are analyzed separately and are excluded from this report. In the remainder of this report, the term MMIF refers to HECMs and excludes forward mortgages.

Below, we summarize the findings associated with each of the required deliverables.

**Deliverable 1: The Actuary's conclusion regarding the reasonableness of Federal Housing Administration's (FHA) estimate of Cash Flow Net Present Value from Home Equity Conversion Mortgage Insurance-In-Force as presented in FHA's Annual Report to Congress and the Actuary's best estimate of the range of reasonable estimates, including the 90th, 95th and 99th percentiles.**

As of the end of Fiscal Year 2017, Pinnacle's Actuarial Central Estimate (ACE) of the MMIF HECM Cash Flow NPV is negative \$14.2 billion. Pinnacle's ACE is based on the Economic Assumptions for the 2018 Budget Fall Baseline from the Office of Management and Budget (OMB Economic Assumptions).

Pinnacle also estimated additional Cash Flow NPV outcomes based on economic scenarios from Moody's Analytics (Moody's). The Cash Flow NPV results based on these scenarios are shown in Table 1.

*Table 1: Cash Flow NPV Outcomes Based on OMB Economic Assumptions and Moody's Scenarios*

<b>Economic Scenario</b>	<b>Fiscal Year 2017 Cash Flow NPV</b>
Pinnacle ACE	-14,223,318,904
Moody's Baseline	-10,249,845,836
Moody's Stronger Near Term Growth	-11,193,943,212
Moody's Slower Near Term Growth	-10,961,549,259
Moody's Moderate Recession	-16,776,531,667
Moody's Protracted Slump	-23,523,321,544
Moody's Below-Trend Long-Term Growth	-11,935,231,153
Moody's Stagflation	-10,048,838,891
Moody's Next Cycle Recession	-14,253,562,204
Moody's Low Oil Price	-10,072,530,203
Moody's Aggregate	-14,776,981,894

The range of results based on Moody's economic scenarios is negative \$23.5 billion to negative \$10.0 billion.

In addition, Pinnacle has estimated a range of outcomes based on 100 randomly generated stochastic simulations of key economic variables. Based on these simulations, we estimate that the range of reasonable

## Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Home Equity Conversion Mortgage Insurance-In-Force

November 10, 2017

Page 2

Cash Flow NPV estimates is negative \$20.4 billion to negative \$7.6 billion. This range is based on an 80% likelihood that the ultimate Cash Flow NPV will fall within the lower and upper bound of the range. The 90<sup>th</sup>, 95<sup>th</sup> and 99<sup>th</sup> percentiles of the stochastic simulations are shown below:

- 90<sup>th</sup> percentile: - \$7.6 billion
- 95<sup>th</sup> percentile: - \$5.7 billion
- 99<sup>th</sup> percentile: - \$3.2 billion

The Cash Flow NPV estimate provided by FHA to be used in the FHA's Annual Report to Congress is negative \$15.5 billion. Based on Pinnacle's ACE and range of reasonable estimates, we conclude that the FHA estimate of Cash Flow NPV is reasonable.

**Deliverable 2: The Actuary's best estimate and range of reasonable estimates of Cash Flow Net Present Value by cohort from Home Equity Conversion Mortgage Insurance-In-Force as presented in FHA's Annual Report to Congress.**

Pinnacle's ACE and range of reasonable estimates of the Cash Flow NPV by cohort are shown below. The range of estimates are based on the stochastic simulation results.

Table 2: Range of Reasonable Estimates - HECM Cash Flow NPV

Credit Subsidy Cohort	Cash Flow NPV Range		
	10th Percentile	90th Percentile	Pinnacle ACE
2009	-3,904	-1,580	-2,493
2010	-2,914	-1,659	-2,275
2011	-2,434	-1,072	-1,896
2012	-2,225	-1,005	-1,637
2013	-2,822	-1,257	-2,051
2014	-1,266	-208	-794
2015	-1,479	-242	-886
2016	-1,608	-204	-1,048
2017	-1,704	-337	-1,144
Total	-20,356	-7,565	-14,223

**Deliverable 3: Reconciliation of the data used to prepare Pinnacle's estimates with data used by FHA to prepare its estimated Cash Flow NPV.**

Section 4 shows the reconciliation of the data used by Pinnacle with the data used by FHA. Please see the section titled [Data Reconciliation](#).

**Deliverable 4: Assumptions and judgments on which estimates are based, support for the assumptions and sensitivity of the estimates to alternative assumptions and judgments.**

## **Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Home Equity Conversion Mortgage Insurance-In-Force**

November 10, 2017

Page 3

The assumptions and judgments on which the estimates are based are summarized in Section 4. The section titled HECM Base Termination Model summarizes the specifications and assumptions related to the base termination models. The HECM Cash Flow Draw Projection Models section summarizes the cash draw models for HECM mortgages with lines of credit. Section 3 discusses the economic assumptions incorporated into the estimates. Lastly, the HECM Cash Flow Analysis section of Section 4 details the assumptions associated with the cash flow projections. Section 3 also shows the sensitivity of the estimates to alternative economic scenarios.

**Deliverable 5: Narrative component that provides detail to explain to FHA and the Department of Housing and Urban Development (HUD) management and auditors, OMB and Congressional offices the findings and their significance, and technical component that traces the analysis from the data to the conclusions.**

Sections 1 and 2 provide an explanation of the findings and the significance of the findings. Also, Section 4 traces the analysis from data to conclusions.

**Deliverable 6: Commentary on the likelihood of risks and uncertainties that could result in material adverse changes in the condition of the MMIF HECM portfolio as measured by the Cash Flow NPV.**

Section 3 provides a discussion of the economic conditions that could result in material adverse condition of the Cash Flow NPV.

## Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Home Equity Conversion Mortgage Insurance-In-Force

November 10, 2017

Page 4

### Executive Summary

---

FHA provides reverse mortgage insurance through the HECM program. HECMs enable senior homeowners to access the value of their homes. The program began as a pilot program in 1989 and became permanent in 1998. Between 2003 and 2008, the number of HECM endorsements grew because of increasingly widespread product awareness, lower interest rates, higher home values and higher FHA mortgage limits. Prior to fiscal year 2009, the HECM program was part of the General Insurance (GI) Fund. The FHA Modernization Act within the Housing and Economic Recovery Act of 2008 (HERA) moved all new HECM program endorsements into the MMIF effective October 1, 2008.

The Cranston-Gonzalez National Affordable Housing Act (NAHA), enacted in 1990, introduced a minimum capital requirement for MMIF<sup>1</sup>. By 1992, the capital ratio was to be at least 1.25%, and by 2000 the capital ratio was to be no less than 2.0%. The capital ratio is defined by NAHA as the ratio of capital plus Cash Flow NPV to unamortized insurance-in-force (IIF). NAHA also implemented the requirement that an independent actuarial study of the MMIF be completed annually. HERA also amended 12 USC 1708(a)-(4) to include the requirement for the annual actuarial study. Accordingly, an actuarial review must be conducted on HECM mortgages within the MMIF. In this report, we analyze the HECM portion of the MMIF, which is mortgages endorsed in fiscal year 2009 and later.

**Pinnacle projects that, as of the end of fiscal year 2017, the HECM Cash Flow NPV is negative \$14.2 billion.**

To project the Cash Flow NPV, Pinnacle analyzed all HECM historical terminations and associated recoveries using mortgage-level HECM performance data provided by FHA through September 30, 2017. We developed mortgage-level models using various economic and mortgage-specific factors. We then estimated the future mortgage performance of all active mortgages as of the end of fiscal year 2017 using various assumptions, including macroeconomic forecasts from OMB, Moody's, and HECM portfolio characteristics.

#### Impact of Economic and Mortgage Factors

The projected Cash Flow NPV depends on various economic and mortgage-specific factors. These include the following:

- House Price Index (HPI): HPI reflects the relative change in housing prices from period to period. HPI rates impact the recovery FHA receives upon mortgage terminations and the rate at which borrowers will refinance or move out of their property. HPI projections are obtained from OMB and Moody's Scenario projections.
- 1-year and 10-year Constant Maturity Treasury (CMT) rates and 1-year London Interbank Offered Rate (LIBOR) rate: Interest rates impact the growth rate of mortgage balances and the amount of equity available to borrowers at origination. Interest rate projections used in the cash flow projections are from the OMB projections and Moody's Scenario projections.

---

<sup>1</sup> Public Law 101-625, 101<sup>st</sup> Congress, November 28, 1990, Section 332.

## Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Home Equity Conversion Mortgage Insurance-In-Force

November 10, 2017

Page 5

- **Mortality Rates:** Information on the date of death of borrowers and co-borrowers have either been directly obtained or derived from the U.S. Decennial Life Table for the 1990-1991, 1999-2001, and 2001-2012 populations, published by the Center for Disease Control and Prevention (CDC) or from the Social Security Administration.
- **Cash Drawdown Rates:** These rates represent the speed at which borrowers access the equity in their homes over time, which impacts the growth of the mortgage balance. Predictive models have been developed to estimate borrower cash draw rates based on past HECM program experience, borrower characteristics and the economic environment.

The realized Cash Flow NPV will vary from the estimates in this analysis if the actual drivers of mortgage performance deviate from the projections based on the OMB Economic Assumptions. Table 3 presents the Cash Flow NPV from the projections based on the OMB Economic Assumptions and nine scenarios from Moody's. Each scenario estimates the Cash Flow NPV under a specific future path of interest, unemployment and HPI. The range of Cash Flow NPV estimates based on the alternative economic scenarios is negative \$23.5 billion to negative \$10.0 billion.

Table 3: HECM Cash Flow NPV Based on Alternative Economic Scenarios

Economic Scenario	Fiscal Year 2017 Cash Flow NPV
Pinnacle ACE	-14,223,318,904
Moody's Baseline	-10,249,845,836
Moody's Stronger Near Term Growth	-11,193,943,212
Moody's Slower Near Term Growth	-10,961,549,259
Moody's Moderate Recession	-16,776,531,667
Moody's Protracted Slump	-23,523,321,544
Moody's Below-Trend Long-Term Growth	-11,935,231,153
Moody's Stagflation	-10,048,838,891
Moody's Next Cycle Recession	-14,253,562,204
Moody's Low Oil Price	-10,072,530,203
Moody's Aggregate	-14,776,981,894

The scenario that produces the highest (least negative) HECM Cash Flow NPV is the Stagflation scenario. The Protracted Slump scenario produces the worst (most negative) Cash Flow NPV.

We also randomly generated 100 stochastic simulations of key economic variables. Based on these simulations, we estimate that the range of reasonable Cash Flow NPV estimates is negative \$20.4 billion to negative \$7.6 billion. This range is based on an 80% likelihood that the ultimate Cash Flow NPV will fall within the lower and upper bound of the range.



## **Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Home Equity Conversion Mortgage Insurance-In-Force**

November 10, 2017

Page 6

### **Distribution and Use**

---

This report is being provided to FHA for their use and the use of makers of public policy in evaluating the Cash Flow NPV of the MMIF. Permission is hereby granted for its distribution on the condition that the entire report, including the exhibits and appendices, is distributed rather than any excerpt. Pinnacle also acknowledges that excerpts of this report will be used in preparing summary comparisons for FHA's Annual Report to Congress, and permission is granted for this purpose as well. We are available to answer any questions that may arise regarding this report.

Any third parties receiving the report should recognize that the furnishing of this report is not a substitute for their own due diligence and should place no reliance on this report or the data contained herein that would result in the creation of any duty or liability by Pinnacle to the third party.

Our conclusions are predicated on a number of assumptions as to future conditions and events. These assumptions, which are documented in subsequent sections of the report, must be understood in order to place our conclusions in their appropriate context. In addition, our work is subject to inherent limitations, which are also discussed in this report.

### **Reliances and Limitations**

---

Listed in Section 4 are the data sources Pinnacle has relied on in our analysis. We have relied on the accuracy of these data sources in our calculations. If it is subsequently discovered that the underlying data or information is erroneous, then our calculations would need to be revised accordingly.

We have relied on a significant amount of data and information without auditing or verifying the accuracy of the data. This includes economic data projected over the next 30 years from Moody's and the OMB. However, we did review as many elements of the data and information as practical for reasonableness and consistency with our knowledge of the mortgage insurance industry. It is possible that the historical data used to develop our estimates may not be predictive of future default and loss experience. We have not anticipated any extraordinary changes to the legal, social or economic environment which might affect the number or cost of mortgage defaults beyond those contemplated in the economic scenarios described in this report. To the extent that realized experience deviates significantly from these assumptions, the actual results may differ, perhaps significantly, from estimated results.

The predictive models used in this analysis are based on a theoretical framework and certain assumptions. These models predict the termination rates, cash flow draws and net loss based on a number of individual mortgage characteristics and economic variables. The parameters of the predictive models are estimated over a wide variety of mortgages that originated since 1989 and their performance under the range of economic conditions and mortgage market environments experienced. The models are combined with assumptions about future mortgage endorsements and certain key economic assumptions to produce future projections of the Cash Flow NPV. Although the models are based on mortgages from as far back as 1989, the results presented in the report are only related to mortgages endorsed in fiscal year 2009 and later, as this is when the HECM mortgages

**Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow  
Net Present Value from Home Equity Conversion Mortgage Insurance-In-Force**

November 10, 2017

Page 7

were added to the MMIF.

Pinnacle is not qualified to provide formal legal interpretation of federal legislation or FHA policies and procedures. The elements of this report that require legal interpretation should be recognized as reasonable interpretations of the available statutes, regulations and administrative rules.

# **Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Home Equity Conversion Mortgage Insurance-In-Force**

November 10, 2017

Page 8

## **Section I. Introduction**

---

### Scope

FHA has engaged Pinnacle to perform an annual independent actuarial study of the MMIF. This study is required by 12 USC 1708(a)-(4) and must be completed in compliance with the Federal Credit Reform Act as implemented and all applicable Actuarial Standards of Practice (ASOPs).

The FHA Modernization Act within the HERA moved all new endorsements for FHA's HECM program from the GI Fund to the MMIF starting in fiscal year 2009. Therefore, an actuarial review must also be conducted on the HECM portfolio within the MMIF. This report provides the estimated HECM Cash Flow NPV as of September 30, 2017.

The MMIF is a group of accounts of the federal government which records transactions associated with the FHA's guaranty programs for single family mortgages. Currently, the FHA insures approximately 7.82 million forward mortgages under the MMIF and 440,000 reverse mortgages under the HECM program.

Per 12 USC 1711-(f), the FHA must ensure that the MMIF maintains a capital ratio of not less than 2.0%. The capital ratio is defined as the ratio of capital to MMIF obligations on outstanding mortgages (IIF). Capital is defined as cash available to the Fund plus the Cash Flow NPV that is expected to result from the outstanding HECMs insured by the MMIF.

The deliverables included in this study are:

1. The Actuary's conclusion regarding the reasonableness of FHA's estimate of Cash Flow NPV from Home Equity Conversion Mortgage Insurance-In-Force as presented in FHA's Annual Report to Congress and the Actuary's best estimate of the range of reasonable estimates, including the 90th, 95th and 99th percentiles.
2. The Actuary's best estimate and range of reasonable estimates of Cash Flow NPV by cohort from Home Equity Conversion Mortgage Insurance-In-Force as presented in FHA's Annual Report to Congress.
3. Reconciliation of the data used to prepare Pinnacle's estimates with data used by FHA to prepare its estimated Cash Flow NPV.
4. Assumptions and judgments on which estimates are based, support for the assumptions and sensitivity of the estimates to alternative assumptions and judgments.
5. Narrative component that provides detail to explain to FHA and HUD management and auditors, OMB and Congressional offices the findings and their significance, and a technical component that traces the analysis from the data to the conclusions.

## **Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Home Equity Conversion Mortgage Insurance-In-Force**

November 10, 2017

Page 9

6. Commentary on the likelihood of risks and uncertainties that could result in material adverse changes in the condition of the MMIF as measured by the Cash Flow NPV.

### HECM Background

FHA insures reverse mortgages through the HECM program, which enables senior homeowners to borrow against the value of their homes. Since the inception of the HECM program in 1989, FHA has insured just over one million reverse mortgages. The following conditions must be met to be eligible for a HECM:

1. at least one of the homeowners must be 62 years of age or older,
2. if there is an existing mortgage, the outstanding balance must be paid off with the HECM proceeds and
3. the borrower(s) must have received FHA-approved reverse mortgage counseling to learn about the program.

HECM's are available from FHA-approved lending institutions. These approved institutions provide homeowners with cash payments or lines of credit secured by the collateral property. There is no required repayment as long as the borrowers continue to live in the home and meet FHA guidelines on requirements for paying property taxes and homeowner's insurance premiums and for maintaining the property in a reasonable condition. A HECM terminates for reasons including death, moving out of the home and refinance. The existence of negative equity does not require borrowers to pay off the mortgage and it does not prevent the borrowers from receiving additional cash draws if available based on their HECM contract.

The reverse mortgage insurance provided by FHA through the HECM program protects lenders from losses due to insufficient recovery on terminated mortgages. When a mortgage terminates and the mortgage balance is greater than the net sale price of the home, the lender can file a claim for loss up to the maximum claim amount (MCA). A lender can assign the mortgage note to FHA if the mortgage meets the eligibility requirements when the mortgage balance reaches 98% of the MCA. On assignment, the lender is reimbursed for the balance of the mortgage (up to the MCA). When note assignment occurs, FHA switches from being the insurer to the holder of the note and controls the servicing of the mortgage until termination. At mortgage termination (post-assignment), FHA attempts to recover the mortgage balance including any expenses, accrued interest, property taxes and insurance premiums.

The following are definitions of common HECM terms.

### Maximum Claim Amount

The MCA is the minimum of the appraised value or purchase price of the home and the FHA mortgage limit at the time of origination. It is the maximum HECM insurance claim a lender can receive. The MCA is also used together with the Principal Limit Factor (PLF) to calculate the maximum amount of initial credit available to the borrower. The MCA is determined at origination and does not change over the life of the mortgage. However, if the home value appreciates over time, borrowers may access additional credit by refinancing. In the event of termination, the entire net sales proceeds can be used to pay off the outstanding mortgage balance, regardless of whether the size of the MCA was capped by the FHA mortgage limit at origination.

## Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Home Equity Conversion Mortgage Insurance-In-Force

November 10, 2017

Page 10

### Principal Limits and Principal Limit Factors

FHA manages its insurance risk by limiting the percentage of the initial available equity that a HECM borrower can draw by use of a PLF. The PLF is similar conceptually to the loan-to-value (LTV) ratio applied to a traditional mortgage. For a HECM, the MCA is multiplied by the PLF, which is determined according to the HECM program features and the borrower's age and gender. The result is the maximum HECM Principal Limit (PL) available to be drawn by the applicant. The PLF increases with the borrower's age at HECM origination and decreases as the expected mortgage interest rate increases. Over the course of the mortgage, the PL grows at a rate equal to the sum of the mortgage interest, the Mortgage Insurance Premium (MIP) and the servicing fees. Borrowers can continue to draw cash as long as the mortgage balance is below the current PL (except for the tenure plan, which acts as an annuity)<sup>2</sup>.

### Payment Plans

HECM borrowers access the equity available to them according to the payment plan they select. Borrowers can change their payment plan at any time during the course of the mortgage as long as they have not exhausted their PL. The payment plans are:

- Tenure plan: a fixed monthly cash payment as long as the borrowers stay in their home;
- Term plan: a fixed monthly cash payment over a specified number of years;
- Line of credit: the ability to draw on allowable funds at any time; and
- Any combination of the above.

Under the current program, the initial disbursement period limitation is applicable to all payment plans and subsequent payment plan changes that occur during the initial disbursement period.

### Unpaid Principal Balance and Mortgage Costs

The Unpaid Principal Balance (UPB) is the mortgage balance and represents the amount drawn from the HECM. In general, after the initial cash draw, the mortgage balance continues to grow with additional borrower cash draws and accruals of interest, premiums and servicing fees until the mortgage terminates.

### Mortgage Terminations

When a HECM terminates, the current mortgage balance becomes due. If the net sales proceeds from the home sale exceed the mortgage balance, the borrower or the estate is entitled to the difference. If the net proceeds from the home sale are insufficient to pay off the full outstanding mortgage balance and the lender has not assigned the note, the lender can file a claim for the shortfall, up to the amount of the MCA. HECMs are non-recourse, so the property is the only collateral for the mortgage; no other assets or the income of the borrowers can be accessed to cover any shortfall.

---

<sup>2</sup> Mortgagee Letter 97-15, April 24, 1997: Home Equity Conversion Mortgage (HECM) Insurance Program – Implementation of Final Rule and Other Information.

## Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Home Equity Conversion Mortgage Insurance-In-Force

November 10, 2017

Page 11

### Assignments and Recoveries

The assignment option is a unique feature of the HECM program. When the balance of a HECM reaches 98% of the MCA and meets other assignment requirements, the lender can choose to terminate the FHA insurance by redeeming the mortgage note with FHA at face value, a transaction referred to as mortgage assignment. FHA will pay an assignment claim in the full amount of the mortgage balance (up to the MCA) and will continue to hold the note until termination. During the note holding period, the mortgage balance will continue to grow by additional draws and unpaid taxes and insurance. Borrowers can continue to draw cash as long as the mortgage balance is below the current PL. The only exception is that borrowers on the tenure plan are not constrained by the PL. At mortgage termination, the borrowers or their estates are required to repay FHA the minimum of the mortgage balance and the net sales proceeds of the home. These repayments are referred to as post-assignment recoveries.

### Report Structure

The remainder of this report consists of the following sections:

- **Section 2. Summary of Findings** – presents the estimated Cash Flow NPV for the HECM portfolio as of the end of fiscal year 2017.
- **Section 3. HECM NPV Based on Alternative Scenarios** – presents the HECM portfolio Cash Flow NPV using alternative economic scenarios.
- **Section 4. Summary of Methodology** – presents an overview of the data processing and reconciliation, base termination models, cash draw models for mortgages with a line of credit and cash flow models used to estimate the Cash Flow NPV.

## Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Home Equity Conversion Mortgage Insurance-In-Force

November 10, 2017

Page 12

### Section 2. Summary of Findings

This section presents the projected HECM Cash Flow NPV for fiscal year 2017. This review covers mortgages that were endorsed in fiscal year 2009 and subsequent and are still in force as of the end of fiscal year 2017. Data through September 30, 2017 was used to estimate the Cash Flow NPV.

#### Fiscal Year 2017 Net Present Value Estimate

The Cash Flow NPV of in-force HECM's consists of discounted cash inflows and outflows. HECM cash inflows consist of MIP and recoveries. Cash outflows consist of claims and note-holding expenses. The cash flow model projects cash inflows and outflows using economic forecasts and mortgage performance projections. The Cash Flow NPV is estimated to be negative \$14.2 billion as of the end of fiscal year 2017. This estimate is the result of the cash flow projections resulting from the OMB President's Economic Assumptions for Fiscal Year 2017.

According to NAHA, IIF is defined as the "obligation on outstanding mortgages." We calculate the IIF as the total UPB of all HECM's remaining in the insurance portfolio as of the end of fiscal year 2017. Table 4 shows the Cash Flow NPV and IIF for active HECM's by cohort.

Table 4: Cash Flow NPV and IIF by Cohort

Cohort	Cash Flow NPV (\$ Millions)	Insurance-In-Force (\$ Millions)
2009	-2,493	12,826
2010	-2,275	7,651
2011	-1,896	8,200
2012	-1,637	6,889
2013	-2,051	8,257
2014	-794	5,710
2015	-886	6,920
2016	-1,048	6,476
2017	-1,144	7,362
Total	-14,223	70,291

The Pinnacle Cash Flow NPV estimate compared to the FHA estimate by cohort is shown below.

# **Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Home Equity Conversion Mortgage Insurance-In-Force**

November 10, 2017

Page 13

*Table 5: Comparison of Cash Flow NPV by Cohort*

	<b>Cash Flow NPV</b>		
<b>Credit Subsidy Cohort</b>	<b>Pinnacle</b>	<b>FHA</b>	<b>Difference</b>
2009	-2,493	-3,248	756
2010	-2,275	-2,183	-92
2011	-1,896	-1,883	-13
2012	-1,637	-1,477	-161
2013	-2,051	-1,653	-397
2014	-794	-723	-71
2015	-886	-1,050	163
2016	-1,048	-1,293	245
2017	-1,144	-1,961	817
<b>Total</b>	<b>-14,223</b>	<b>-15,469</b>	<b>1,246</b>

The difference between the Pinnacle and FHA estimate is \$1.246 billion, which is 1.8% of the HECM IIF. The Pinnacle estimates of Cash Flow NPV by cohort are lower (more negative) than the FHA estimates for cohorts 2010 – 2014, and higher (less negative) for cohorts 2009 and 2015 – 2017.



## Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Home Equity Conversion Mortgage Insurance-In-Force

November 10, 2017

Page 14

### Section 3. HECM Cash Flow NPV Based on Alternative Scenarios

---

The Cash Flow NPV will vary from our estimates if the actual drivers of mortgage performance deviate from the projections based on the OMB Economic Assumptions. In this section, we develop additional estimates of the Cash Flow NPV based on the following:

1. Moody's Economic Scenarios
2. Stochastic simulation of key economic variables
3. Sensitivity testing of key economic variables

Each Moody's scenario produces an estimate of the Cash Flow NPV using the future interest, unemployment and HPI rates as a deterministic path.

The Moody's scenarios are:

- Moody's Baseline
- Stronger Near-Term Growth
- Slower Near-Term Growth
- Moderate Recession
- Protracted Slump
- Below-Trend Long-Term Growth
- Stagflation
- Next-Cycle Recession
- Low Oil Price

The resulting Cash Flow NPV associated with each alternative scenario is summarized in Table 6.

#### Moody's Baseline Assumptions

In this scenario, the HPI increases over the entire projection period, and the rate of change is consistently between 2.0% and 3.5%. This is different from the OMB Economic Assumptions in that the Moody's baseline grows more slowly for the first four years, and then increases at a faster rate through 2027. The mortgage interest rate increases more slowly than the OMB Economic Assumptions scenario, and settles at a longer term average of about 5.5%, which is lower than the OMB Economic Assumptions long term estimate of just over 6.0%. The unemployment rate decreases slightly to 3.7% over the next year, and then increases to a long-term average of around 5.0%. The OMB estimate decreases to about 4.4% over the next year, and then increases to a long-term average of 4.8%.

#### Stronger Near-Term Growth Scenario

In the Moody's Stronger Near-Term Growth scenario, the HPI is projected to increase more quickly than under the OMB scenario. In addition, mortgage interest rates are projected to be lower than the OMB estimates through 2018, then projected to be higher than OMB through 2020, then decrease to a long-term average of

## **Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Home Equity Conversion Mortgage Insurance-In-Force**

November 10, 2017

Page 15

just under 5.5%. The unemployment rate also is lower than projected in the OMB scenario and remains lower throughout the entire projection period.

### Slower Near-Term Growth Scenario

In the Moody's Slower Near-Term Growth scenario, the HPI increases more slowly than in the OMB scenario, and near the end of the projection period recovers to the level of the OMB assumptions. Mortgage interest rates are projected to be lower than the OMB assumptions throughout the projection period, settling at a long-term average of just over 5.5%. The unemployment rate is projected to be almost 0.70 points higher than the OMB assumptions scenario by 2021, and then recovers to just 0.25 points higher than the OMB assumptions in the long-term.

### Moderate Recession Scenario

In the Moderate Recession scenario, the HPI decreases over the next 18 months, and then begins to increase. Despite the recovery, the projected HPI is lower than the OMB assumptions for the entire projection period. Mortgage interest rates spike sharply in the fourth quarter of 2017, and then drop significantly through the first quarter of 2019. Mortgage rates then begin to slowly increase until they reach the long-term average of just over 5.5%. The unemployment rate spikes to almost 8% by 2019, and then recovers to a long-term average of just over 5%. The projected unemployment rate is higher than the OMB assumptions for the entire projection period.

### Protracted Slump Scenario

In the Moody's Protracted Slump scenario, the HPI decreases significantly over the next 18 months, and then begins to increase again. Despite the recovery, the projected HPI is lower than the OMB assumptions for the entire projection period. Mortgage interest rates spike sharply in the fourth quarter of 2017, and then drop until the fourth quarter of 2019. They begin to slowly increase until they reach the long term average of just over 5.5%. The unemployment rate spikes to over 10% by 2020, and then recovers to a long-term average of approximately 5.4%. The projected unemployment rate is higher than the OMB scenario for the entire projection period.

### Below-Trend Long-Term Growth Scenario

In the Moody's Below-Trend Long-Term Growth scenario, the HPI increases more slowly than in the OMB assumptions and remains lower for the entire projection period. Mortgage interest rates increase gradually and settle at a long-term average of about 5.7%. The projected mortgage interest rate is lower than the OMB projection over the entire period. The unemployment rate increases to 5.6% by 2020, and then decreases to a long-term average of approximately 5.0%.

### Stagflation Scenario

In the Moody's Stagflation scenario, the HPI decreases through the third quarter of 2019, and then begins to increase. Despite the recovery, the projected HPI is lower than the OMB assumptions for the entire projection period. Mortgage interest rates increase sharply to 6.8% by the second quarter of 2018, and then drop through

## Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Home Equity Conversion Mortgage Insurance-In-Force

November 10, 2017

Page 16

the second quarter of 2019. They then begin to slowly increase to the long-term average of just over 5.5%. Unemployment rates increase significantly to just over 8% by 2019, and then decrease to a long-term average of just over 5%.

### Next-Cycle Recession Scenario

In the Moody's Next-Cycle Recession scenario, the HPI increases at the same rate as the OMB assumptions through the first quarter of 2020, and then decreases significantly through the second quarter of 2021. The HPI then increases again until it is equal to the OMB assumptions by 2027. The mortgage interest rates are approximately equal to the OMB assumptions through 2020, and then increase significantly to 7.7% by 2022. The rates then drop slightly and settle in at a long-term average of 7.4%. The unemployment rate is lower than the OMB assumptions through the third quarter of 2019, and then increases sharply to over 8% by 2021. It then decreases to the level of the OMB assumptions by 2024.

### Low Oil Price Scenario

In the Moody's Low Oil Price scenario, the HPI increases at a rate similar to the OMB assumptions throughout the entire projection period. Mortgage interest rates decrease slightly through the first quarter of 2018, and then increase significantly through 2020. The rate then levels off at a long-term average of about 5.8%. Unemployment rates decrease through 2019, and then increase for the remainder of the projection period, settling at a long-term average of just over 5%.

### Summary of Alternative Scenarios

Table 6 shows the projected Cash Flow NPV from the ten deterministic scenarios. The range of projected results is between negative \$23.5 billion and negative \$10.0 billion.

*Table 6: Cash Flow NPV Summaries from Alternative Scenarios*

Cohort	Pinnacle ACE	Moody's Baseline	Moody's Stronger Near Term Growth	Moody's Slower Near Term Growth	Moody's Moderate Recession	Moody's Protracted Slump	Moody's Below-Trend Long-Term Growth	Moody's Stagflation	Moody's Next Cycle Recession	Moody's Low Oil Price
2009	-2,492,632,633	-1,983,905,835	-2,350,129,027	-2,021,498,418	-3,472,328,698	-4,816,792,920	-2,236,437,141	-1,949,247,920	-3,089,554,313	-2,017,232,947
2010	-2,274,965,367	-1,926,771,873	-2,080,003,134	-1,931,284,885	-2,538,639,463	-3,122,370,814	-1,946,847,325	-1,575,932,471	-2,198,234,164	-1,918,775,133
2011	-1,896,261,134	-1,581,395,040	-1,758,753,393	-1,534,968,868	-2,236,229,391	-2,733,142,840	-1,515,916,209	-1,010,883,451	-1,824,463,995	-1,628,230,765
2012	-1,637,057,570	-1,220,982,918	-1,331,046,006	-1,343,729,485	-2,150,992,638	-2,590,001,750	-1,319,695,735	-1,019,129,615	-1,536,442,143	-1,290,124,145
2013	-2,050,630,500	-1,497,661,266	-1,644,957,453	-1,681,406,842	-2,705,998,891	-3,499,439,374	-1,748,993,662	-1,599,164,107	-2,140,453,207	-1,440,631,316
2014	-793,705,080	-478,860,205	-488,722,137	-525,492,327	-964,934,541	-1,656,310,997	-660,831,151	-601,851,159	-886,820,900	-421,388,721
2015	-886,171,583	-521,061,634	-522,730,593	-601,421,077	-969,533,024	-1,728,401,730	-750,934,844	-696,632,797	-909,798,443	-461,827,506
2016	-1,048,285,152	-481,207,884	-489,966,466	-628,123,007	-847,482,914	-1,676,654,147	-845,014,523	-738,523,981	-842,348,683	-394,825,878
2017	-1,143,609,885	-557,999,181	-527,635,003	-693,624,350	-890,392,107	-1,700,206,972	-910,560,563	-857,473,390	-825,446,356	-499,493,792
Total	-14,223,318,904	-10,249,845,836	-11,193,943,212	-10,961,549,259	-16,776,531,667	-23,523,321,544	-11,935,231,153	-10,048,838,891	-14,253,562,204	-10,072,530,203

### Stochastic Simulation

The stochastic simulation approach provides information about the probability distribution of the HECM Cash Flow NPV with respect to different possible future economic conditions and the corresponding terminations, cash flow draws and loss rates. The simulation provides the Cash Flow NPV associated with each one of the 100 possible future economic paths. The distribution of Cash Flow NPV based on these scenarios allows us to gain insights into the sensitivity of the Cash Flow NPV to different economic conditions.

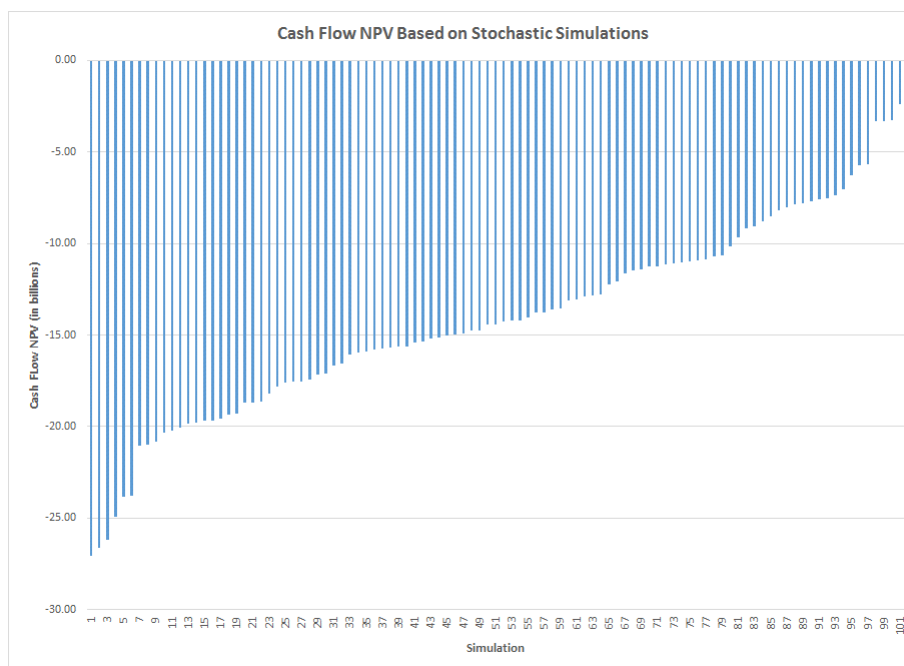
## Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Home Equity Conversion Mortgage Insurance-In-Force

November 10, 2017

Page 17

The figure below shows the range of Cash Flow NPV resulting from the 100 simulated scenarios.

Figure 1: Stochastic Simulation Results



Based on these simulations, we estimate that the range of reasonable Cash Flow NPV estimates is negative \$20.4 billion to negative \$7.6 billion. This range is based on an 80% likelihood that the ultimate Cash Flow NPV will fall within the lower and upper bound of the range. The 90<sup>th</sup>, 95<sup>th</sup> and 99<sup>th</sup> percentiles of the stochastic simulation results are shown below:

- 90<sup>th</sup> percentile: - \$7.6 billion
- 95<sup>th</sup> percentile: - \$5.7 billion
- 99<sup>th</sup> percentile: - \$3.2 billion

The Cash Flow NPV estimate provided by FHA to be used in the FHA's Annual Report to Congress is negative \$15.5 billion. Based on Pinnacle's ACEstimate and range of reasonable estimates, we conclude that the FHA estimate of Cash Flow NPV is reasonable.

### Sensitivity Tests of Economic Variables

The above scenario analyses were conducted to estimate the distribution of the Cash Flow NPV of the MMIF with different possible combinations of economic variable movements in the future. It is also useful to understand the marginal impact of a change in each single economic factor on the Cash Flow NPV. Below, we show the sensitivity of the Cash Flow NPV with respect to the change of a single economic factor at a time. This

## **Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Home Equity Conversion Mortgage Insurance-In-Force**

November 10, 2017

Page 18

sensitivity test is conducted for the House Price Appreciation (HPA) and interest rates.

The marginal impact is measured by the change of the Cash Flow NPV based on the OMB scenario. These simulations change each of these variables one at a time from the OMB scenario. The changes are parallel shifts in the path of each variable in the OMB scenario, where all three interest rates are shifted together and at the same magnitudes, but are kept from going negative.

*Figure 2 reports the sensitivity of the Cash Flow NPV with respect to changes in the HPA forecast. Specifically, we applied a parallel shift to the annualized HPA rates from the base scenario up and down by 20, 50, 100 and 200 basis points. The sensitivity to shifts in the annualized HPA from the base scenario has a positive slope, and a more significant effect from increases in HPAs than decreases. The results show that adverse house price shifts reduce the Cash Flow NPV by a lower level of magnitude than favorable house price shifts increase the Cash Flow NPV. A negative 100 basis points parallel shift in HPA will decrease Cash Flow NPV by \$1.3 billion, and a positive 100 basis points parallel shift in HPA will increase Cash Flow NPV by \$980 million.*

Figure 3 shows the change in Cash Flow NPV as a percentage of the IIF. The change as a percentage of IIF ranges from -4.5% to +1.4%.

*Figure 2 also reports the sensitivity of the Cash Flow NPV with respect to changes in interest rates. Specifically, we applied a parallel shift to the annualized CMT and mortgage rates from the base scenario up and down by 20, 50, 100 and 200 basis points. The sensitivity to shifts in the interest rates from the base scenario has a positive slope. A negative 100 basis points parallel shift in interest rates will*

**Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow  
Net Present Value from Home Equity Conversion Mortgage Insurance-In-Force**

November 10, 2017

Page 19

*decrease Cash Flow NPV by \$6.6 billion, and a positive 100 basis points parallel shift in HPA will increase Cash Flow NPV by \$4.9 billion.*

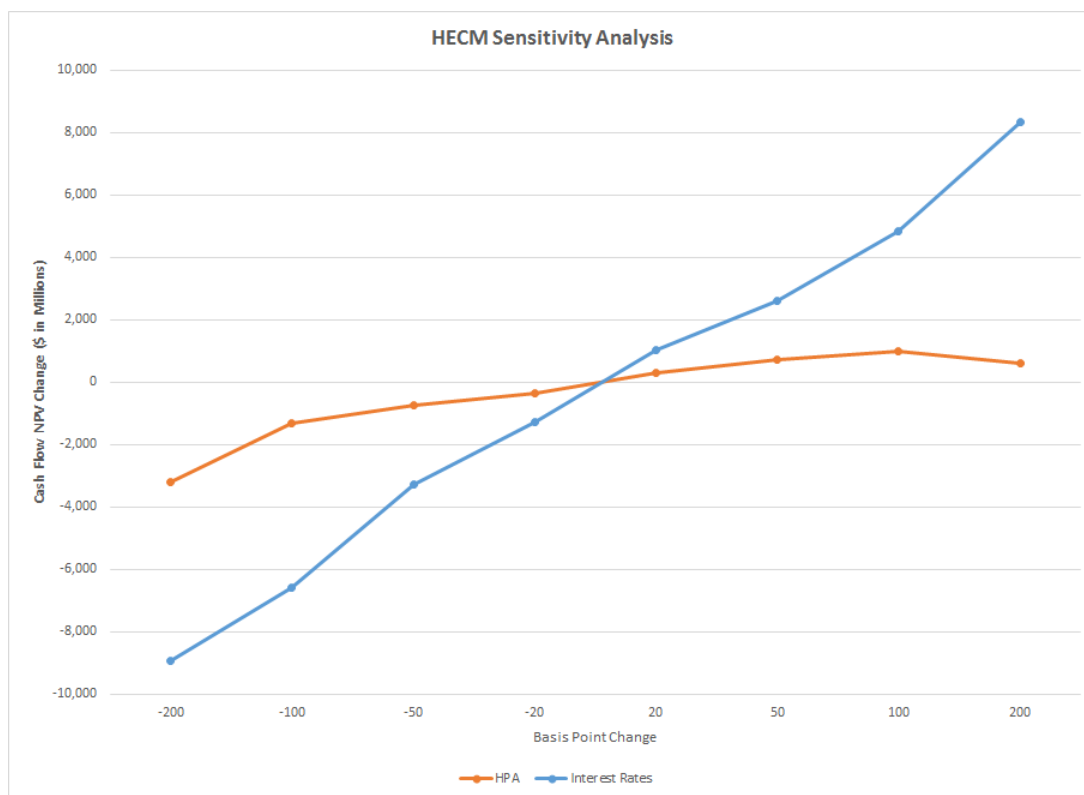
Figure 3 shows the change in Cash Flow NPV as a percentage of the IIF. The change as a percentage of IIF ranges from -12.7% to +11.9%.

# Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Home Equity Conversion Mortgage Insurance-In-Force

November 10, 2017

Page 20

Figure 2: HECM Sensitivity Analysis – Change in Cash Flow NPV

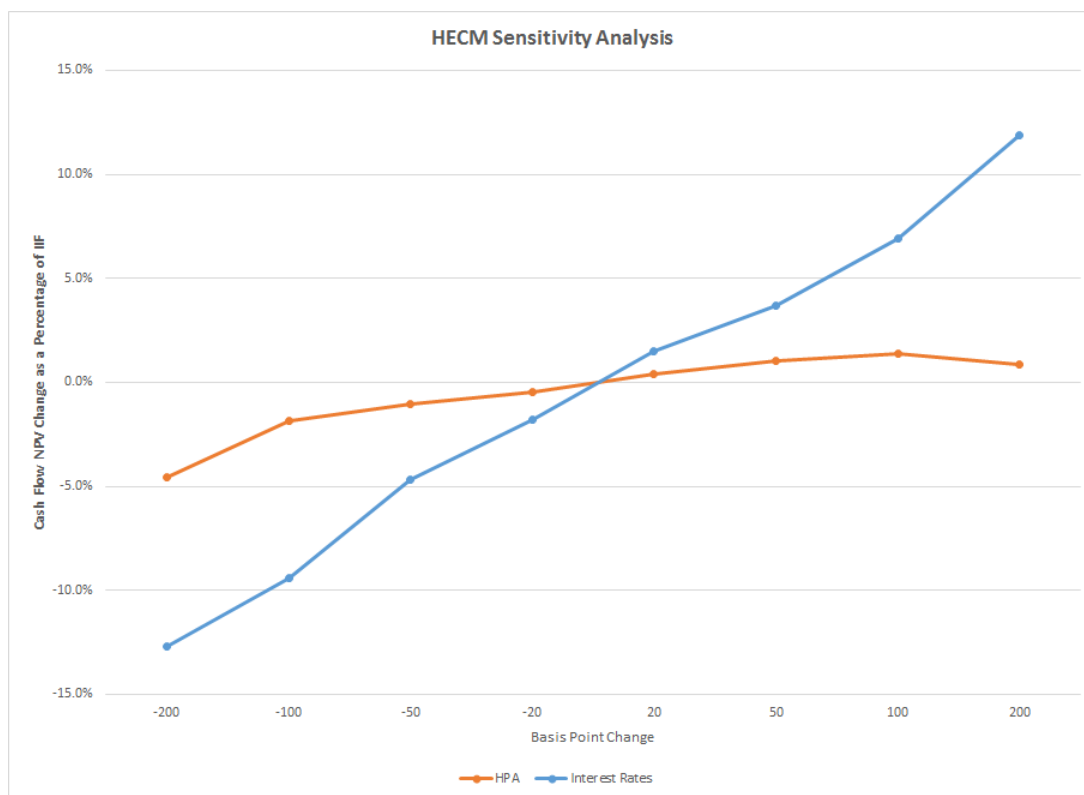


# Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Home Equity Conversion Mortgage Insurance-In-Force

November 10, 2017

Page 21

Figure 3: HECM Sensitivity Analysis – Change in Cash Flow NPV as a Percentage of IIF





## Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Home Equity Conversion Mortgage Insurance-In-Force

November 10, 2017

Page 22

### Section 4. Summary of Methodology

---

This section describes the analytical approach implemented in this analysis.

#### Data Sources (Appendix A)

In our analysis, we have relied on data from FHA, Summit-Milliman, Moody's and OMB.

From FHA, we have received the following data tables.

1. hermit\_case\_detail: case level data for HECM's.
2. hermit\_claim\_detail: data for electronically processed HECM claims.
3. hermit\_transactions\_balance: HECM balance transactions data.
4. hermit\_transactions\_setaside: HECM setaside transactions data.
5. hermit\_transactions\_growth: HECM growth transactions data.
6. hermit\_payment\_plan: payment plan information on HECM's.
7. hermit\_lender\_detail: supporting lender information for HECM's.
8. sams\_case\_record: Union of sams\_monthly\_record and sams\_archive\_record.
9. hecm\_claim\_detail: data for paper claims for HECM's.
10. assigned\_f12\_transactions: historical F12 transaction records for HECM cases that were assigned prior to October 3, 2012.
11. idb\_1\_and\_coborr: Integrated Database (IDB) idb\_1\_and\_coborr is a composite of five Single Family legacy systems
12. Consolidated Balance Transfer Files

From Summit-Milliman, we have received the following data tables.

1. Tmod\_cd\_full: consolidated mortgage-level dataset with information on all HECM cases endorsed to-date. The dataset contains variables on mortgage characteristics, borrower characteristics, current mortgage status, and current unpaid principal balance.

## **Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Home Equity Conversion Mortgage Insurance-In-Force**

November 10, 2017

Page 23

2. Tmod\_ti\_trans: transaction-level dataset with tax and insurance delinquency related cash flows over time for HECM cases.
3. Tmod\_upb\_fyr\_fqtr: dataset with one observation per mortgage-fiscal quarter with UPB information over time for each HECM case.

From Moody's, we have received the following data elements.

1. Historical Economic Data
2. Baseline Economic Scenario Projections
3. Alternative Economic Scenario Projections

From OMB, we received the Economic Assumptions for the 2018 Budget Fall Baseline as of March, 2017

The economic data that is included in the analysis is shown below.

1. HPI
2. Mortgage rates
3. CMT rates
4. LIBOR

### Data Processing – Mortgage-Level Modeling

Starting with the raw data, Pinnacle processed the data to create datasets for developing the mortgage-level transition and loss severity models. The steps below describe the data processing that occurred to prepare the data that was used for this analyses.

1. Pre-Processing: fields from supplemental tables were added to main HECM Case file
2. HECM Quarterly: a number of calculated fields and flags are added to the dataset
3. Transaction Processing: quarterly historical transactions are then processed
4. Claim Processing: historical claim amounts are calculated based on claims transactions
5. Historical quarterly UPB is calculated for each mortgage
6. MIP Processing: Initial and subsequent MIP inflows are summarized by case number and period from the Consolidated Balance Transfer File
7. Cash Draw Processing: Incremental and cumulative cash draws are calculated by case number and period
8. Taxes and Insurance Processing: Incremental and cumulative taxes and insurance are calculated by case number and period
9. Line of Credit Processing: Incremental and cumulative line of credit draws are calculated by case number and period
10. Table Joins: tables generated in steps 3 – 9 were joined to the main table created in step 2

## Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Home Equity Conversion Mortgage Insurance-In-Force

November 10, 2017

Page 24

### Data Reconciliation

To reconcile the data processed by Pinnacle with the data provided by FHA, Pinnacle compared summaries of key data elements with the summaries provided by FHA. The summaries for the IIF, number of active assignments and the number of claims to date are shown in the following tables. The data processed by Pinnacle matches the FHA data totals within 2%.

The reconciliation tables were based on data as of June 30, 2017, which was the data file used to develop the predictive models.

Table 7: Data Validation – Insurance in Force

Insurance in Force (\$M)				
= Total Loan Amount on Active Loans				
Credit Subsidy Cohort	Federal Housing Administration	Independent Actuary	Absolute Difference (Actuary - FHA)	Percent Difference (Actuary - FHA) / FHA
2009	13,120	13,122	2	0%
2010	8,059	8,060	1	0%
2011	8,600	8,602	3	0%
2012	7,120	7,120	1	0%
2013	8,351	8,346	(5)	0%
2014	5,762	5,754	(8)	0%
2015	7,070	7,005	(65)	-1%
2016	6,413	6,437	24	0%
2017	5,398	5,406	7	0%
Total	69,892	69,852	(40)	0%

Table 8: Data Reconciliation - Number of Active Assignments

Number of Active Assignments				
Credit Subsidy Cohort	Federal Housing Administration	Independent Actuary	Absolute Difference (Actuary - FHA)	Percent Difference (Actuary - FHA) / FHA
2009	9,086	9,086	0	0%
2010	14,203	14,203	0	0%
2011	7,645	7,645	0	0%
2012	2,134	2,134	0	0%
2013	304	304	0	0%
2014	6	6	0	0%
2015	1	1	0	0%
2016	0	0	0	NA
2017	0	0	0	NA
Total	33,379	33,379	0	0%

## Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Home Equity Conversion Mortgage Insurance-In-Force

November 10, 2017

Page 25

Table 9: Data Reconciliation – Number of Claims to Date

Number of Claims to Date				
Credit Subsidy Cohort	Federal Housing Administration	Independent Actuary	Absolute Difference (Actuary - FHA)	Percent Difference (Actuary - FHA) / FHA
2009	27,426	26,853	(573)	-2%
2010	24,332	23,660	(672)	-3%
2011	13,273	13,104	(169)	-1%
2012	4,752	4,714	(38)	-1%
2013	1,805	1,803	(2)	0%
2014	331	331	0	0%
2015	78	78	0	0%
2016	5	5	0	0%
2017	0	0	0	NA
Total	72,002	70,548	(1,454)	-2%

### HECM Base Termination Model (Appendix B)

Pinnacle developed predictive models to estimate future HECM terminations. No repayment of principal is required on a HECM while the mortgage is active. Termination of a HECM typically occurs due to death of the borrower, the borrower moving out, or voluntary termination via refinance or payoff. The termination model estimates the probabilities of the three mutually exclusive HECM termination events denoted as mortality, mobility and refinance. A multinomial logistic regression modeling approach was used to analyze the different termination events.

The termination model incorporates four main categories of explanatory variables:

- Fixed initial borrower characteristics, such as borrower age at origination and gender.
- Fixed initial mortgage characteristics, such as mortgage interest rate, origination year and quarter, the first month cash draw percentage, the estimated ratio of the property value to the local area's median home values at time of origination, and the estimated ratio of the local area's median home value to the HECM national mortgage limit at the time of origination.
- Dynamic variables based on mortgage/borrower characteristics, such as mortgage age and borrower and co-borrower ages.
- Dynamic variables derived by combining mortgage characteristics with external macroeconomic data, such as interest rates, HPI, the amount of additional equity available to the borrower through refinancing and the updated ratio of UPB to home value.

For each possible termination event type, a multinomial logistic model is developed based on mortgage-level historical HECM performance data and economic factors to determine the overall termination probabilities for the HECM's.

## **Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Home Equity Conversion Mortgage Insurance-In-Force**

November 10, 2017

Page 26

### HECM Cash Flow Draw Projection Models (Appendix C)

Over 90% of HECM's have a line of credit associated with them. To estimate the present value of future cash flows on the existing portfolio of HECM's, we need to estimate the future cash draws associated with the line of credit. As these cash draws are not certain as they would be for a term product, we have developed predictive models to forecast cash draws. We have incorporated a two-stage model:

1. A binomial model is developed to estimate the likelihood of a cash draw occurring in a period
2. A Generalized Linear Model (GLM) is then developed to estimate the amount of the cash draw for the period

Using the historical HECM data, for each quarter we develop an indicator of whether or not a net positive unscheduled cash draw was taken from the line of credit during that quarter, and also the amount of the cash draw. We then develop models to predict the amount of future cash draws based on a series of explanatory variables. The explanatory variables used in the model are the same as those used for the Base Termination Models.

### HECM Cash Flow Analysis (Appendix E)

HECM termination rates are projected for all future policy years for each active mortgage. The variables used in the projection are derived from mortgage characteristics and economic forecasts. Moody's September 2017 forecasts of interest, unemployment rates and HPI are combined with the mortgage-level data to simulate the projected economic paths and create the necessary forecasted variables. MSA-level forecasts of HPI apply to mortgages in metropolitan areas; otherwise mortgages use the state-level HPI forecasts. Moody's house price forecasts are generated simultaneously with various macroeconomic variables including the local unemployment rates.

For each mortgage during future policy years, the derived mortgage variables serve as independent variables to the multinomial logistic termination models described in the Base Termination Model section. The termination projections by claim type are then calculated to generate the probability of mortgage termination in a policy year by different modes of termination given that it survives to the end of the prior policy year. The HECM cash flow model uses these forecasted termination rates to project the cash flows associated with different termination events. Based on the specific characteristics of the mortgage, the probability of each termination is calculated. Then, a random number between 0 and 1 is generated, and based on this random draw a mortgage transition is determined. The projection process continues for each mortgage until the mortgage ends by termination or claim.

### Cash Flow Components

There are four major components of HECM cash flows:

1. MIP,
2. claims,

## Fiscal Year 2017 Independent Actuarial Review of the Mutual Mortgage Insurance Fund: Cash Flow Net Present Value from Home Equity Conversion Mortgage Insurance-In-Force

November 10, 2017

Page 27

3. note holding expenses, and
4. recoveries on notes in inventory (after assignment).

Premiums consist of upfront and annual MIPs, which are inflows to the HECM program. Recoveries are the property recovery amount received by FHA at the time of note termination after assignment, which is the minimum of the mortgage balance and the predicted net sales proceeds at termination. The recovery amount for refinance termination is always the mortgage balance. Claim Type 1 payments are cash outflows paid to the lender when the net proceeds of a property sale are insufficient to cover the balance of the mortgage. Claim Type 2 payments result from assignment of mortgages to HUD and note holding payments are additional outflows.

### Net Future Cash Flows

The Cash Flow NPV for the HECM book of business is computed by summing the individual components as they occur over time:

$$Net\ Cash\ Flow_t = Annual\ Premiums_t + Recoveries_t - Claim\ Type\ 1_t - Claim\ Type\ 2_t - Note\ Holding\ Expenses_t$$

### Discount Factors

The discount factors applied were provided by FHA and reflect the most recent Treasury yield curve, which captures the Federal government's cost of capital in raising funds. These factors reflect the capital market's expectation of the consolidated interest risk of U.S. Treasury securities. Our simulations aggregated each future quarter's cash flows, which are treated as being received at the end of the quarter.