



November 2017

FEDERAL HOUSING ADMINISTRATION

Capital Requirements and Stress Testing Practices Need Strengthening

Accessible Version

GAO Highlights

Highlights of [GAO-18-92](#), a report to congressional requesters

Why GAO Did This Study

FHA insures private lenders against losses from defaults on single-family mortgages. According to independent actuarial reviews, in fiscal years 2009–2014, FHA’s MMI Fund (which insures \$1.2 trillion in single-family traditional and reverse mortgages) did not meet its statutory 2 percent capital requirement. Also, a budgetary review determined that the fund required \$1.69 billion in supplemental funds in fiscal year 2013.

GAO was asked to examine issues concerning the MMI Fund’s capital requirement and actuarial reviews. This report examines the types of information provided by assessments of the fund’s financial condition, FHA’s capital requirement and stress testing practices, and trade-offs associated with including reverse mortgages in the fund’s capital assessment.

GAO analyzed actuarial and budgetary assessments of the MMI Fund. GAO reviewed financial institution and regulatory capital and stress testing principles to develop an evaluative framework and applied it to FHA. GAO also interviewed federal and mortgage industry officials.

What GAO Recommends

Congress should consider specifying the economic conditions the MMI Fund would be expected to withstand without supplemental funds, and FHA should conduct stress tests on a fund-wide basis and specify the objectives of its stress tests. GAO also continues to maintain that Congress should incorporate accountability mechanisms into FHA’s capital requirement (as stated in [GAO-13-722](#)). FHA agreed with GAO’s recommendations.

View [GAO-18-92](#). For more information, contact Daniel Garcia-Diaz at (202) 512-8678 or garciadiazd@gao.gov.

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What GAO Found

The Federal Housing Administration’s (FHA) budgetary reviews of the Mutual Mortgage Insurance Fund (MMI Fund) assess whether it needs more budget authority to cover expected future costs, and independent actuarial reviews provide complementary information on the fund’s finances. FHA uses the actuarial reviews to assess whether the MMI Fund’s capital ratio (economic value divided by insurance obligations) meets the 2 percent requirement and how fund components would perform under alternative economic scenarios. While the actuarial assessment does not directly determine the need for additional budget authority, it evaluates the fund’s ability to absorb unexpected losses and may prompt changes in FHA policies and insurance premiums.

Capital requirements and stress testing practices—tools for managing financial risks—for the MMI Fund are not consistent with all elements of a framework GAO developed to help assess these tools in the context of FHA’s single-family mortgage insurance programs. In accordance with the framework, FHA’s capital assessments and stress tests are transparent and incorporate a number of relevant risk factors. However, areas of inconsistency include the following:

- **Scenario-based requirement.** The statutory capital requirement is intended to help ensure the fund can absorb unexpected losses but is not based on a specified risk threshold, such as an adverse economic scenario the fund would be expected to withstand without requiring supplemental funds.
- **Accountability mechanisms.** The capital requirement also does not include accountability mechanisms, such as a set of steps FHA would have to take if the capital ratio again fell below the 2 percent minimum.
- **Fund-wide stress tests.** FHA has conducted separate stress tests—projections of financial condition under adverse scenarios—of its forward (traditional) and reverse mortgage (loans against home equity available to seniors) portfolios, but has not performed tests on a fund-wide basis.
- **Stress test objectives.** FHA has not defined specific objectives for its stress tests such as determining the amount of additional capital, if any, that would be needed to withstand conditions similar to the last housing crisis.

Strengthening FHA’s capital requirement and stress testing practices could help ensure that the MMI Fund is able to withstand economic downturns and that stress test results are as relevant and useful as possible for risk management.

Including reverse mortgages in the fund’s capital assessment has advantages and disadvantages. Unlike for stress tests, FHA jointly assesses forward and reverse mortgages to calculate a combined capital ratio. Subjecting the reverse mortgage portfolio to capital assessment has made its financial condition more transparent. But, the portfolio’s sensitivity to changes in economic assumptions makes the combined ratio more unpredictable. Alternative approaches also pose trade-offs. For example, a separate reverse mortgage capital requirement may help ensure the financial transparency of both portfolios, but requiring FHA to hold more capital to account for the volatility of the reverse mortgage portfolio could compel FHA to raise insurance premiums or lower borrowing limits.

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Abbreviations

CCAR	Comprehensive Capital Analysis and Review
DFAST	Dodd-Frank Act Stress Tests
FCRA	Federal Credit Reform Act of 1990

Federal Reserve	Board of Governors of the Federal Reserve System
FHA	Federal Housing Administration
FHFA	Federal Housing Finance Agency
GAAP	generally accepted accounting principles
HECM	Home Equity Conversion Mortgage
HERA	Housing and Economic Recovery Act of 2008
HUD	Department of Housing and Urban Development
MMI Fund	Mutual Mortgage Insurance Fund
PMIER	<i>Private Mortgage Insurer Eligibility Requirements</i>

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November 9, 2017

The Honorable Sean P. Duffy
Chairman
Subcommittee on Housing and Insurance
Committee on Financial Services
House of Representatives

The Honorable Blaine Luetkemeyer
Chairman
Subcommittee on Financial Institutions and Consumer Credit
Committee on Financial Services
House of Representatives

The Department of Housing and Urban Development's (HUD) Federal Housing Administration (FHA) administers single-family forward and reverse mortgage programs that insure private lenders against losses on mortgages that finance home purchases, refinance existing mortgages, and convert home equity into cash advances.¹ These programs have helped millions of households achieve homeownership or benefit from home equity while living in their homes. FHA insures almost all of its single-family mortgages under its Mutual Mortgage Insurance Fund (MMI Fund). As of the end of fiscal year 2016, the fund's insurance-in-force (total insured mortgage balances outstanding) was about \$1.2 trillion.

The MMI Fund is statutorily required to maintain at least a 2 percent capital ratio, defined as the economic net worth (economic value) of the fund divided by the amortized insurance-in-force.² The fund's economic value depends on actual and estimated cash inflows (for example insurance premiums collected from borrowers) and outflows (for example, claim payments to lenders on defaulted loans). Therefore, FHA must manage the fund such that, on average, the inflows exceed the outflows by enough to maintain the required capital reserve. However, in fiscal

¹Traditional mortgages, also known as forward mortgages, require borrowers to make monthly payments to the lender, increasing home equity and decreasing the loan balance over time. Reverse mortgages are a type of loan against home equity available to seniors. Reverse mortgage borrowers receive payments from the lender, decreasing home equity and increasing the loan balance over time.

²12 U.S.C. § 1711(f)(4). The economic value of the MMI Fund is the sum of existing capital resources plus the net present value of projected future cash flows. The amortized insurance-in-force is the remaining principal balance on all insured loans in the MMI Fund.

year 2009, in the midst of the 2007–2011 housing crisis, the MMI Fund’s capital ratio fell below 2 percent and did not meet the statutory requirement again until fiscal year 2015, according to independent actuarial reviews.³ Additionally, at the end of fiscal year 2013, the MMI Fund required supplemental funds—about \$1.7 billion—for the first time in its history to help ensure that it had sufficient resources to cover expected net future costs on outstanding insurance. These developments highlight a key challenge FHA and Congress face in balancing the fund’s financial self-sufficiency with FHA’s role in facilitating mortgage credit to underserved borrowers and stabilizing the housing market during economic downturns.

In light of the MMI Fund’s recent fiscal challenges, you asked us to examine issues pertaining to the MMI Fund’s actuarial reviews, capital requirement, and stress tests.⁴ This report examines (1) the types of information actuarial reviews and other assessments provide about the MMI Fund’s financial condition, including its ability to remain self-sufficient; (2) the extent to which the capital requirement and stress testing practices for the MMI Fund are consistent with principles and practices underlying those of other financial institutions; and (3) key advantages and disadvantages of including both forward and reverse mortgages in the MMI Fund’s capital assessment.

To examine the types of information actuarial reviews and other assessments provide about the MMI Fund’s financial condition, including its ability to remain self-sufficient, we reviewed actuarial reports of the fund prepared by an FHA contractor and related FHA reports to Congress. Additionally, we reviewed FHA budget documents and audited financial statements containing assessments of the fund, as well as FHA documents and our prior reports describing the mechanisms used to provide supplemental resources to the fund, if necessary.

To assess the extent to which capital requirements and stress testing practices for the MMI Fund are consistent with principles underlying requirements for other institutions, we developed and applied two

³We use the 2007–2011 date range to identify the housing crisis based on trends in average home prices. According to the S&P/Case Shiller National Home Price Index, average home prices fell each calendar year from 2007 through 2011, for a total decline of almost 27 percent. This index is a composite of single-family home price indexes for the nine U.S. Census divisions and is calculated monthly.

⁴Stress tests are projections of financial condition under adverse scenarios.

evaluative frameworks. We developed draft frameworks by reviewing documents on the requirements and practices of financial regulators and institutions, and by identifying key common elements that could apply to the MMI Fund, assuming the fund would continue to operate under federal accounting standards and budgeting requirements.⁵ In addition to FHA, we shared the draft frameworks with the Federal Housing Finance Agency (FHFA), the National Association of Insurance Commissioners, and the American Academy of Actuaries and interviewed officials from these organizations to obtain their input on the frameworks. We chose these organizations based on their expertise in financial assessments of housing finance and mortgage insurance institutions. To provide additional perspective on stress tests of the MMI Fund, we compared the two most stressful economic scenarios from the fiscal year 2016 actuarial review of FHA's forward mortgage portfolio with the severely adverse scenario used by the Board of Governors of the Federal Reserve System (Federal Reserve) in its 2016 supervisory stress tests of large banking organizations.

To identify key advantages and disadvantages of jointly considering forward and reverse mortgages in the MMI Fund's capital assessment, we reviewed actuarial results for both mortgage portfolios for fiscal years 2009–2016 and recent FHA reports to Congress discussing this issue. Using information from the actuarial reviews, we analyzed the implications of including the reverse mortgage portfolio in the joint capital assessment and of holding the reverse mortgage portfolio to a separate capital requirement. We also interviewed FHA officials and five mortgage industry associations and stakeholders (selected based on their knowledge of FHA and reverse mortgages) to obtain their views on the joint capital assessment and possible alternative approaches. Appendix I describes our objectives, scope, and methodology in greater detail.

We conducted this performance audit from August 2016 to November 2017 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for

⁵In a September 2013 report, we identified key differences between the capital requirements and reserving practices of FHA and private mortgage insurers, including differences stemming from the federal accounting standards and budgeting requirements FHA must follow. See GAO, *FHA Mortgage Insurance: Applicability of Industry Requirements Is Limited, but Certain Features Could Enhance Oversight*, [GAO-13-722](#) (Washington, D.C.: Sept. 9, 2013).

our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Background

FHA's Role and Insured Portfolio

FHA's single-family mortgage insurance programs insure private lenders against losses from borrower defaults on mortgages that meet FHA criteria for properties with one to four housing units.⁶ FHA insures a variety of mortgage types, including loans for initial home purchases, construction and rehabilitation, and refinancing. In fiscal year 2016, FHA insured roughly 1.3 million single-family mortgages with total initial balances of approximately \$260 billion. Partly because of its low 3.5 percent minimum down-payment requirement, FHA has played a particularly large role among groups with lower average levels of accumulated wealth, including minority, lower-income, and first-time home buyers. For example, in fiscal year 2016, roughly 82 percent of FHA-insured home purchase loans went to first-time home buyers and more than 33 percent went to minority home buyers.

FHA also generally is thought to promote stability in the housing market by helping to ensure the availability of mortgage credit in areas that may be underserved by the private sector or that are experiencing economic downturns. Consistent with this view, the volume of FHA-insured forward mortgages peaked in fiscal year 2009, toward the end of the 2007–2009 recession and in the midst of the 2007–2011 housing crisis.⁷ In terms of loan originations, the share of the single-family home purchase mortgage market insured by FHA reached nearly 30 percent in fiscal year 2009, while in more recent years it has been about 20 percent.

⁶Among other things, FHA has criteria for loan size, down payment, borrower credit score, and borrower debt burden. For more information, see GAO, *Home Mortgage Guarantees: Issues to Consider in Evaluating Opportunities to Consolidate Two Overlapping Single-Family Programs*, [GAO-16-801](#) (Washington, D.C.: Sept. 29, 2016).

⁷The recession of 2007–2009 started in December 2007 and ended in June 2009, according to the Business Cycle Dating Committee of the National Bureau of Economic Research.

FHA's Mutual Mortgage Insurance Fund

The MMI Fund includes almost all of FHA's single-family mortgage insurance programs, the largest of which is the 203(b) program.⁸ The Housing and Economic Recovery Act of 2008 (HERA) moved a number of other programs that were previously under the General and Special Risk Insurance Fund to the MMI Fund.⁹ These included programs for insuring mortgages on condominium units, mortgages that simultaneously finance home purchase and rehabilitation costs, and reverse mortgages.¹⁰

A reverse mortgage is a type of loan against the borrower's home equity. With a reverse mortgage, borrowers do not need to repay the loan as long as they meet certain conditions. These conditions, among others, require the borrower to live in the home, pay property taxes and homeowners' insurance, maintain the property, and retain the title in his or her name. Unlike forward mortgages, where the borrower makes monthly payments to the lender, increasing equity and decreasing the loan balance over time, reverse mortgages typically are "rising debt, falling equity" loans. For reverse mortgages, the loan balance increases and the home equity decreases over time. As the borrower receives payments from the lender, the lender adds the principal and interest to the loan balance, reducing the homeowner's equity. FHA insures reverse mortgages under its Home Equity Conversion Mortgage (HECM) program, which serves eligible borrowers aged 62 or older.¹¹ Congress established the HECM program in 1988 as a way to alleviate economic hardship caused by the increasing costs of health care, housing, and subsistence needs at a time in life when income is reduced, while

⁸The 203(b) program is FHA's basic program for home purchases and refinancings. This program was authorized by Section 203 of the National Housing Act, Pub. L. No. 73-479, 48 Stat. 1246 (1934) (codified, as amended, at 12 USC 1709).

⁹When HERA moved the programs from the General and Special Risk Insurance Fund into the MMI Fund, only new loans became part of the MMI Fund. Loans originated prior to fiscal year 2009 were kept in the General and Special Risk Insurance Fund.

¹⁰Pub. L. No. 110-289, §§ 2115, 2117, 2118, 122 Stat. 2654, 2832–2835 (2008).

¹¹For more information on HECMs, see GAO, *Reverse Mortgages: Policy Changes Have Had Mostly Positive Effects on Lenders and Borrowers, but These Changes and Market Developments Have Increased HUD's Risk*, [GAO-09-836](#) (Washington, D.C.: July 30, 2009) and *Product Complexity and Consumer Protection Issues Underscore Need for Improved Controls over Counseling for Borrowers*, [GAO-09-606](#) (Washington, D.C.: June 29, 2009).

protecting reverse mortgage lenders and borrowers from financial losses.¹²

The MMI Fund is supported by insurance premiums paid by borrowers. For forward mortgages, FHA has the authority to establish and collect a single up-front premium (in an amount not to exceed 3.0 percent of the amount of the original insured principal of the mortgage) and annual premiums of up to 1.5 percent of the remaining insured principal balance, or 1.55 percent for borrowers with down payments of less than 5.0 percent. As of September 2017, FHA charged a 1.75 percent up-front premium and either a 0.80 percent or 0.85 percent annual premium, depending on the size of the down payment.¹³ As of the same date, FHA charged HECM borrowers an initial premium of either 0.50 percent or 2.5 percent, depending on how they draw down available funds, and an annual premium equal to 1.25 percent of the outstanding HECM balance.¹⁴

Reviews of the MMI Fund

Each year, the MMI Fund is subject to three different financial assessments:

Independent actuarial review. The National Housing Act requires an annual independent actuarial review of the MMI Fund's financial position.¹⁵ FHA uses the results of the actuarial review to determine whether the MMI Fund is meeting the act's requirement that it maintain a capital ratio of at least 2 percent. Each year, an independent actuarial contractor conducts two separate actuarial reviews—one for forward mortgages and one for HECMs—to estimate the economic value of the

¹²12 U.S.C. § 1715z-20 (a).

¹³These percentages apply to home purchase mortgages less than or equal to \$625,000 and with durations greater than 15 years. FHA charges different premiums for larger mortgages, mortgages with durations of 15 years or less, and certain refinance mortgages.

¹⁴On August 29, 2017, HUD announced that, effective October 2, 2017, new HECM borrowers will be required to pay an initial premium of 2.0 percent and an annual premium of 0.5 percent. HUD also announced new, lower limits on the amount of home equity new HECM borrowers can borrow, effective as of the same date.

¹⁵12 U.S.C. § 1708(a)(4). The requirement for an annual independent actuarial review originated in the Omnibus Budget Reconciliation Act of 1990. Pub. L. No. 101-508 § 2105, 104 Stat. 1388, 1388-19 (1990).

two portfolios. In a separate annual report to Congress, FHA combines the findings of the forward mortgage and HECM actuarial reviews to determine the capital ratio for the MMI Fund as a whole.¹⁶ As previously noted, the capital ratio is the fund's economic value divided by the insurance-in-force.

Budgetary review. FHA estimates and reestimates the net lifetime costs—known as credit subsidy costs—of the mortgages it insures as part of the MMI Fund's annual budgetary review. Under the Federal Credit Reform Act of 1990 (FCRA), FHA and other federal agencies must estimate the credit subsidy costs of their direct loan or loan guarantee programs in their annual budgets.¹⁷ Credit subsidy costs represent the present value of estimated cash flows to the government minus the present value of estimated cash flows from the government over the life of the loan, excluding administrative costs. For a mortgage insurance program, cash inflows consist primarily of insurance premiums charged to borrowers and proceeds from sales of foreclosed properties, and cash outflows consist mostly of insurance claim payments to lenders. Annually, agencies estimate credit subsidy costs for new loan cohorts—the loans agencies commit to guarantee in a given fiscal year. When estimated cash inflows exceed expected cash outflows, a cohort is said to have a negative credit subsidy cost, meaning that the cohort is estimated to generate income. When the opposite is true, the cohort is said to have a positive credit subsidy cost.

Generally, agencies also are required to produce annual updates of their subsidy estimates—known as reestimates—for each loan cohort on the basis of information on actual performance and estimated changes in future loan performance. Each additional year provides more historical data on loan performance that may influence estimates of the amount and timing of future claims. Additionally, economic assumptions (such as house prices and interest rates) also can change from year to year, which would affect estimates of future loan performance. In recognition of the difficulty in making credit subsidy estimates that mirror actual loan performance, FCRA provides permanent and indefinite budget authority for reestimates that reflect increased credit subsidy costs (upward

¹⁶The annual report to Congress is required by 12 U.S.C. § 1708(a)(4).

¹⁷Pub. L. No. 101-508, § 13201(a), 104 Stat. 1388, 1388-609 (1990), *codified, as amended*, at 2 U.S.C. §§ 661-661f.

reestimates).¹⁸ While FHA has had a number of upward reestimates, the only year in which the MMI Fund has needed to draw on permanent and indefinite budget authority was fiscal year 2013, when it received \$1.69 billion. All other upward reestimates were covered by funds held in the MMI Fund's capital reserve account.

Financial accounting review. The preparation of FHA's financial statements also provides a review of the MMI Fund. FHA is required to prepare financial statements in accordance with generally accepted accounting principles for the federal government (federal GAAP). The financial statements provide information on the overall financial position of the MMI Fund, including its assets, liabilities, and actual cash flows during the year. In addition, federal GAAP requires FHA to calculate a liability for loan guarantees, which represents the estimated net present value of expected future cash flows for outstanding insurance.¹⁹

Capital Requirements and Stress Testing

In general, capital exists to absorb unexpected losses and allow a financial institution to continue operations during economic downturns. The MMI Fund plays a key role during such periods by helping to maintain the flow of mortgage credit to areas that may be underserved by the private sector. As previously noted, the MMI Fund is statutorily required to maintain at least a 2 percent capital ratio. It also is the only federal credit program with a capital requirement.²⁰ Because the MMI Fund can draw on permanent and indefinite budget authority, if necessary, it has greater ability to weather adverse economic conditions than a private entity. However, the capital requirement is intended to help ensure that the fund remains self-sufficient by creating a reserve for unexpected losses. The size of the MMI Fund's capital reserve can be expected to fluctuate depending on economic conditions and other factors. For example, the reserve may tend to grow when the economy is strong (limiting borrower defaults and FHA insurance losses), and may

¹⁸Permanent and indefinite budget authority is available for obligation and expenditure without fiscal year limitation and is not limited to a specified amount or ceiling.

¹⁹The liability for loan guarantees applies to insurance commitments made on or after October 1, 1991.

²⁰Congress has imposed reserve requirements on other federal funds such as the Federal Deposit Insurance Corporation's Deposit Insurance Fund.

tend to shrink when the economy is weak (increasing borrower defaults and FHA insurance losses).

Stress tests are a risk management tool used by banks and other financial institutions. The International Actuarial Association defines stress testing as a projection of the financial condition of an institution under a specific set of adverse conditions. While there is no requirement that FHA stress test the MMI Fund, actuarial reviews of the MMI Fund have included analyses of the MMI Fund's economic value and insurance-in-force under alternative scenarios, including adverse scenarios. As discussed later in this report, the alternative scenarios include selected economic paths used in estimating the economic value of the MMI Fund's forward mortgage and HECM portfolios, as well as baseline and economic slump paths produced by Moody's Analytics.²¹ FHA considers these analyses to be a form of stress testing.

Budgetary and Actuarial Assessments of the Fund Serve Different but Complementary Functions

Supplemental Funding Is Determined by Budgetary Assessments, and Actuarial Reviews Provide Complementary Information

FHA assessments performed as part of the MMI Fund's annual budgetary review—specifically, the credit subsidy estimates and reestimates discussed previously—determine the fund's financing account and capital reserve account balances. The financing account is designed to hold sufficient funds to cover anticipated net future costs on outstanding insurance.²² The capital reserve account holds additional funds that could

²¹Moody's Analytics provides economic data, research, analysis, and forecasting.

²²The financing account appears in the President's budget for informational and analytical purposes, but is not included in the budget totals for budget authority or outlays. It is required to record lifetime cash flows for loans insured in 1992 and thereafter. All federal credit programs have financing accounts.

be used to cover unexpected losses (for example, due to higher-than-anticipated mortgage defaults).²³ If the capital reserve account had insufficient funds to cover an upward credit subsidy reestimate (that is, an increase in expected lifetime costs), FHA would draw on permanent and indefinite budget authority. As previously noted, this has occurred one time (fiscal year 2013) since the implementation of FCRA. Drawing on permanent and indefinite budget authority means that the MMI Fund is not self-sufficient under FCRA requirements. However, it does not indicate that the fund is unable to pay insurance claims in the near-term without supplemental funding, because the fund's financing account holds balances to cover the anticipated net future costs on claims expected in the near-term and over the long-term for the existing insurance portfolio.²⁴

In contrast, the actuarial reviews do not directly determine the need for additional budget authority; rather, they are used to assess whether the MMI Fund is in compliance with the requirement to maintain at least a 2 percent capital ratio. Additionally, the reviews are statutorily required to be conducted by an independent actuary rather than by FHA. As previously noted, the actuarial reviews estimate the economic value of the forward mortgage and HECM portfolios separately, and FHA combines these estimates to calculate the capital ratio (that is, the economic value divided by the insurance-in-force) for the MMI Fund as a whole. The economic value of each portfolio consists of existing net capital resources (assets less liabilities) plus the net present value of anticipated future cash inflows and outflows on outstanding insurance.²⁵

To determine existing net capital resources, FHA's actuarial contractor uses information on the assets and liabilities of the financing and capital reserve accounts previously discussed. Beginning with the fiscal year 2012 actuarial review and continuing through the fiscal year 2016 review (the most recently completed one), FHA's actuarial contractor has estimated the net present value of cash flows using Monte Carlo

²³FHA created the capital reserve account to retain the MMI Fund's negative credit subsidy and any subsequent downward credit subsidy reestimates.

²⁴In the event of an increase in expected credit subsidy costs, the financing account would receive funds from the capital reserve account or, if the capital reserve account were depleted, through the provision of permanent and indefinite budget authority.

²⁵The present value of a stream of future cash inflows or outflows is its worth in terms of money paid immediately. In calculating present value under FCRA, interest rates on Treasury securities when the underlying loans were disbursed provide the basis for converting future amounts into their "money now" equivalents.

simulation—a methodology that involves running simulations of multiple economic paths.²⁶ Specifically, for the forward mortgage and HECM portfolios separately, the contractor generated 100 economic paths, centered around Moody’s Analytics’ baseline economic scenario, and computed a net present value of future cash flows for each of these paths.²⁷ The contractor added the average of these 100 numbers to the existing net capital resources to produce the economic value used to assess compliance with the MMI Fund’s 2 percent capital requirement. Table 1 shows the fiscal year 2016 economic value, insurance-in-force, and capital ratio for the forward mortgage and HECM portfolios, as well as for the MMI Fund as a whole.

Table 1: Mutual Mortgage Insurance Fund (MMI Fund) Capital Ratio Calculation for Fiscal Year 2016

Portfolio component	Economic value (dollars in billions)	Insurance-in-force (dollars in billions)	Capital ratio (percent)
Forward mortgages	35.27	1,076.65	3.28
Home Equity Conversion Mortgages	-7.72	111.92	-6.90
Overall MMI Fund	27.55	1,188.57	2.32

Source: Federal Housing Administration. | GAO-18-92

Under the independent actuarial reviews, an economic value of zero—and therefore a capital ratio of zero—for the MMI Fund as a whole indicates that estimated resources are enough to cover anticipated net future costs and no more. Specifically, if the capital ratio is zero, the MMI Fund’s existing net capital resources (for example, cash and Treasury investments) and the net present value of future cash inflows (for example, premium revenue and proceeds from sales of foreclosed homes) are estimated to be equal to the net present value of future cash outflows (for example, insurance claim payments and costs to maintain foreclosed properties). Therefore, in concept, a positive economic value is similar to a positive balance in the capital reserve account under the budget process—that is, it projects the availability of funds above what is needed to cover expected net future costs on outstanding insurance.

However, the independent actuarial reviews have used different estimation models and economic assumptions from those used in FHA’s

²⁶Monte Carlo methods use random sampling to “draw” values for variables from prespecified distributions.

²⁷According to Moody’s Analytics, the baseline economic scenario represents the most likely outcome based on current conditions.

budgetary assessment to estimate the present value of future cash flows; therefore, the actuarial and budgetary reviews have not produced identical capital estimates. (See app. II for more information on the related components of the budgetary and actuarial reviews.) A capital ratio below 2 percent, or even below zero, does not directly determine the need for permanent and indefinite budget authority. However, it indicates that according to the models and assumptions of the actuarial reviews, the MMI Fund's ability to absorb unexpected losses may be limited and that premium and policy changes designed to bolster the fund's capital position may be needed.

Actuarial Reviews Also Include Stress Tests of the MMI Fund and Other Insights

In addition to the capital assessment, the actuarial reviews also have projected the MMI Fund's performance under alternative economic scenarios, including stress scenarios. For example, the fiscal year 2016 actuarial reviews estimated the economic value and insurance-in-force of the MMI Fund under eight alternative scenarios, including both strong economic conditions and economic downturns. Specifically, the fiscal year 2016 reviews estimated the 10th best and worst, 25th best and worst, and worst economic values produced by the Monte Carlo simulation, along with the economic values resulting from Moody's Analytics' baseline and protracted slump scenarios.²⁸ In addition, the fiscal year 2016 reviews included a low-interest-rate scenario, which assumes that low interest rates persist for 2 years, before resuming on the path of the Moody's Analytics' baseline scenario.²⁹ The reviews also include information on the house price index values, interest rates, and unemployment rates from the economic paths that produced these alternative economic values.

²⁸Under Moody's Analytics' protracted slump scenario, the level of the house price index falls significantly for 2 years and then converges to the long-term index level of its baseline forecast. As a result, this scenario shows low house-price growth rates in the short term, followed by higher growth rates. FHA's actuarial contractor modified this scenario to show less optimistic house-price growth rates after the initial stress period.

²⁹Lower interest rates reduce the MMI Fund's economic value because they provide incentives for borrowers to refinance their loans (including refinancings into non-FHA loans), resulting in higher prepayments and reduced premium income for FHA from existing loans.

The actuarial reviews have analyzed the economic value under alternative scenarios separately for the forward mortgage and HECM portfolios. The estimated economic values for the forward mortgage and HECM portfolios can be combined to arrive at fund-wide capital ratios for the average of the 100 economic values produced by the simulation— Monte Carlo average—and all of the Moody’s Analytics’ scenarios (see table 2). However, the 10th best and worst, 25th best and worst, and worst economic values produced by the Monte Carlo simulations cannot be combined. This limitation is due to the fact that the economic scenario that led to the 10th best forward mortgage economic value, for example, may be different from the scenario that led to the 10th best HECM economic value.³⁰

Table 2: Mutual Mortgage Insurance Fund (MMI Fund) Capital Ratio for Fiscal Year 2016 under Different Economic Scenarios

	Monte Carlo simulation scenarios	Moody’s Analytics scenarios		
	Average (percent)	Baseline (percent)	Baseline with low interest rate ^a (percent)	Protracted slump ^b (percent)
Combined capital ratio	2.32	2.74	2.13	-4.66

Source: GAO analysis of Federal Housing Administration data. | GAO-18-92

^aThis scenario holds interest rates low for the first 2 years of the projection, then follows the Moody’s Analytics baseline scenario beginning in year 3.

^bThis scenario modified the Moody’s Analytics protracted slump scenario by assuming less optimistic house-price growth rates after the initial stress period.

In contrast, the budgetary reviews do not include analysis of future loan performance under alternative economic scenarios. The budgetary reviews are required to use the President’s economic assumptions, which the Office of Management and Budget provides to agencies for budget formulation.

In addition to the actuarial reviews prepared by FHA’s contractor, FHA compiles statutorily required annual reports for Congress based on the results of the actuarial analysis. These reports include the calculation of the MMI Fund’s overall capital ratio and some additional analyses of the MMI Fund’s financial condition. Statutory requirements for the content of the reports to Congress are broad, and each year, FHA determines the

³⁰The combination of house price, interest rate, and unemployment assumptions that comprise an economic scenario may not affect forward mortgages and HECMs similarly because of differences between the two portfolios in their sensitivity to economic conditions and the timing of their cash flows.

types of information it believes will be most useful to Congress.³¹ FHA officials said they consider what they reported in the previous year, events from the past year, and feedback from readers to determine what would be most useful to include. For example, in its fiscal year 2015 report to Congress, FHA discussed the amount of additional capital that would have been needed for the forward mortgage portfolio to achieve a 2 percent capital ratio and withstand losses in the event of an economic downturn similar to the last economic crisis.

Financial Statements and Quarterly Reports Provide Additional Perspectives on the MMI Fund's Financial Condition

FHA's financial statements present the MMI Fund from a financial accounting perspective and are prepared according to federal GAAP. The financial statements are composed of year-end balance sheets, the related statements of net cost and changes in net position, and the combined statements of budgetary resources. As with the budgetary and actuarial reviews, FHA's annual management reports, which include the financial statements, also include information on the MMI Fund's capital resources and a net present value calculation of cash flows from outstanding insurance. Information used in preparing the financial statements—specifically, the MMI Fund's assets and liabilities (excluding the liability for loan guarantees)—is used in the budgetary review to inform the amount needed in the financing account and is used by the actuarial review to determine the existing capital resources component of the economic value calculation. Like the budgetary reviews, the financial statement reviews do not include analysis of future loan performance under alternative economic scenarios.

Another source of information on the MMI Fund's financial status is quarterly reports FHA issues to Congress, as required by HERA.³² The quarterly reports can help provide early insight into whether there are potential deviations from the prior year's projections before the next annual budgetary and actuarial reviews are completed. Among other topics, the reports must include information on any significant changes

³¹12 U.S.C. § 1708(a)(4). The statute states that the Secretary of HUD shall submit a report annually to the Congress describing the results of the actuarial reviews and assessing the financial status of the MMI Fund.

³²Pub. L. No. 110-289, 122 Stat. 2654, 2834 (2008) (codified at 12 U.S.C. § 1708(a)(5)).

between actual and projected claim and prepayment activity, and projected versus actual loss rates. However, while the quarterly reports update certain measures of the MMI Fund's performance and financial condition, they are not intended to provide a full actuarial or budgetary analysis.

The MMI Fund's Capital Requirement Lacks Accountability Mechanisms, and Stress Tests Are Not Fund-Wide

The MMI Fund's capital requirement and stress tests are consistent with some principles and practices promulgated or used by financial institutions and regulators, but are not consistent with others. To assess the MMI Fund's consistency with these principles and practices, we developed a framework of important considerations in designing capital requirements and another for designing stress tests. Our frameworks include underlying principles or key features of the requirements and practices of institutions we reviewed—such as transparency and accountability—that could also be applied to the MMI Fund. See appendix I for further details on our methodology.

The Capital Requirement Is Not Based on a Specified Risk Threshold and Lacks Accountability Mechanisms

The MMI Fund's capital requirement is consistent with our framework element on transparency and partially consistent with two other elements—that the requirement include both risk-based and fixed components and that the requirement be designed to cover unexpected losses and be based on specified risk thresholds. However, the MMI Fund's capital requirement is not consistent with the element on including accountability mechanisms. We were unable to determine whether the requirement is consistent with the element on balancing financial soundness with the entity's role and mission because such an assessment would require more information about the severity of the economic conditions the capital requirement was designed to withstand without supplemental funding. Table 3 summarizes our assessments.

Table 3: Assessment of the Federal Housing Administration’s Capital Requirement Using GAO’s Framework

Framework element	Assessment
1. Capital requirement and results of capital assessments are transparent	Consistent
2. Includes risk-based and fixed components	Partially consistent
3. Is designed to cover unexpected losses and is based on specified risk thresholds	Partially consistent
4. Includes accountability mechanisms	Not consistent
5. Balances financial soundness with the entity’s role and mission ^a	Unable to determine

○ Not consistent ● Partially consistent ● Consistent — Unable to determine

Source: GAO. | GAO-18-92

^aWe were unable to determine whether the requirement is consistent with the element on balancing financial soundness with the entity’s role and mission because such an assessment would require more information about the severity of the economic conditions the capital requirement was designed to withstand without supplemental funding.

Transparency

The MMI Fund’s capital requirement is consistent with the framework element of being transparent so that external parties can understand the financial risks facing the entity.³³ FHA’s actuarial reports and accompanying report to Congress provide specific information about the MMI Fund’s capital requirement and capital assessment results. For example, the actuarial reports describe how the capital ratio is calculated, the models and data sources used to calculate the net present value of future cash flows, key economic assumptions used in calculating the MMI Fund’s economic value, and estimated economic values of the forward mortgage and HECM portfolios. Additionally, FHA’s reports to Congress include calculations of the Fund-wide capital ratio based on these values, as well as analyses of factors affecting the past performance of the forward mortgage and HECM portfolios and factors that could affect their future performance. The actuarial reviews and reports to Congress are publicly available on HUD’s website.³⁴

³³Private sector entities may be more limited in what they can disclose compared with FHA because of their need to protect proprietary business information.

³⁴The actuarial reports, accessed on August 15, 2017, can be found at https://portal.hud.gov/hudportal/HUD?src=/program_offices/housing/rmra/oe/rpts/actr/actrmenu and the annual reports to Congress, accessed on August 22, 2017, can be found at <https://portal.hud.gov/hudportal/HUD?src=/fhammifrpt>.

Risk-Based and Fixed Components

The MMI Fund's capital requirement is partially consistent with the framework element of having both a risk-based and a fixed component. For capital requirements with this feature, whichever component requires the greater level of capital is the binding minimum requirement. Among other things, a risk-based component helps to ensure that the entity holds more capital as the asset quality of its portfolio (credit quality, specifically, in the case of a mortgage portfolio) decreases.³⁵ A fixed component is insensitive to asset quality; it therefore is not subject to the potential for estimation errors of risk-based assessments and serves as a backstop to the risk-based component.

While the MMI Fund's capital requirement is statutorily set at 2 percent, it is risk-based because the calculation of the capital ratio's numerator (economic value) accounts for loan and borrower quality. As loan and borrower characteristics, such as loan-to-value ratios and borrower credit scores, get riskier, the models used to estimate the MMI Fund's economic value predict higher insurance claims and higher net losses on claims (due to increased foreclosures and decreased returns on sales of foreclosed properties).³⁶ This, in turn, reduces the MMI Fund's estimated economic value and makes it more difficult for the fund to meet the 2 percent capital requirement. The MMI Fund's capital requirement also has attributes similar to a fixed component in that the fund's economic value must be at least 2 percent of the insurance-in-force, regardless of the credit quality of the insurance portfolio. However, the requirement does not have a separate fixed component that backstops the risk-based component (that is, becomes binding when it is the more stringent of the two).

Developing and implementing a separate fixed component to the MMI Fund's capital requirement would pose challenges. For example, a requirement that was insensitive to portfolio credit quality would not align with the FCRA requirements and accounting principles that FHA must

³⁵In this framework element, we focus on risks related to the characteristics of loans and borrowers that may affect the likelihood of repayment. We discuss risks related to changes in economic conditions in the next framework element.

³⁶The loan-to-value ratio is the amount of the loan divided by the value of the home at origination. Borrower credit scores are numeric values generally ranging from 300 to 850 calculated based on credit reports from the national credit bureaus. Credit scores are an indicator of a borrower's ability to repay future obligations.

follow. These requirements and principles emphasize the consideration of risk factors in estimating potential financial losses. Additionally, substantial additional analysis would be required to determine the structure of a separate fixed component, the level at which it should be set, under what conditions it might become binding, and how it might affect FHA's ability to fulfill its mission. As a result, it is unclear whether developing a separate fixed component to the MMI Fund's capital requirement would be beneficial.

Unexpected Losses and Specified Risk Thresholds

The MMI Fund's capital requirement is partially consistent with the framework element of being able to cover unexpected losses and being based on a specified risk threshold, such as an adverse economic scenario that the entity would be expected to withstand. The MMI Fund's capital requirement is designed to cover some unexpected losses. As previously noted, the MMI Fund's capital ratio is calculated by dividing the economic value of the fund by the amortized insurance-in-force. The economic value is determined by adding existing capital resources to the net present value of future cash flows on outstanding insurance. An economic value of zero (and therefore a capital ratio of zero) indicates that based on the actuarial calculations, the sum of the MMI Fund's existing capital resources and the present value of expected cash inflows (for example, premium income) is exactly the amount needed to cover the present value of expected cash outflows (for example, claim payments). Therefore, a 2 percent capital requirement serves the purpose of covering some losses above expected amounts. However, the requirement was not designed to absorb losses associated with a specified economic scenario, so the extent of loss protection it provides is unclear.³⁷

In a February 2001 report, we concluded that neither the statute that created the 2 percent capital requirement nor FHA had established criteria to determine how severe of a stress the MMI Fund should be able

³⁷Research done at the time the requirement was enacted suggested that a 1.25 percent capital ratio could allow the MMI Fund to weather a mild recession. See Price Waterhouse, Office of Government Services, (Washington, D.C.: 1990). In a February 2001 report, we concluded that a 2 percent capital buffer appeared sufficient to withstand moderately severe economic scenarios but cautioned that our results were valid only for the MMI Fund at that time. See GAO, *Mortgage Financing: FHA's Fund Has Grown, but Options for Drawing on the Fund Have Uncertain Outcomes*, [GAO-01-460](#) (Washington, D.C.: Feb. 28, 2001).

to withstand.³⁸ Accordingly, we recommended that Congress or FHA specify the economic conditions that the MMI Fund would be expected to withstand.³⁹ In March 2002, a legislative proposal was introduced in the House of Representatives that would have required a capital ratio sufficient to withstand a broad range of adverse economic circumstances, but it was not enacted.⁴⁰ Neither Congress nor FHA has subsequently specified the economic conditions the MMI Fund should be able to withstand or corresponding minimum capital ratios. FHA officials said they did not consider it their role to define those economic conditions and would comply with any requirement Congress established. Because the MMI Fund's capital requirement is not based on a specified risk threshold, it may not provide an adequate financial cushion under economic scenarios in which Congress may anticipate that the fund would be self-sufficient.

Accountability Mechanisms

The MMI Fund's capital requirement is not consistent with the framework element of having accountability mechanisms such as additional reporting requirements, remediation plans, and operational restrictions that are triggered if capital requirements are not met. Failure to comply with the MMI Fund's capital requirement does not trigger a defined process or set of steps to be taken by FHA. In a September 2010 report, we stated that Congress should consider establishing a minimum time frame for restoring the capital ratio to 2 percent should the ratio fall below that level.⁴¹ A legislative proposal was introduced in Congress in December 2011 that, among other things, would have required FHA to return the MMI Fund's capital ratio to the statutorily required level within 2 years, but it was not enacted.⁴² In addition, in a September 2013 report, we stated that Congress should consider requiring FHA to submit a capital restoration plan and regular updates on plan implementation whenever

³⁸[GAO-01-460](#).

³⁹In comments on the report, FHA neither agreed nor disagreed with our recommendation.

⁴⁰H.R. 3995, 107th Cong. (2002).

⁴¹GAO, *Mortgage Financing: Opportunities to Enhance Management and Oversight of FHA's Financial Condition*, [GAO-10-827R](#) (Washington, D.C.: Sept. 14, 2010).

⁴²S. 1997, the FHA Bailout Protection Act of 2011, was introduced in the Senate on December 15, 2011. It was referred to the Senate Committee on Banking, Housing, and Urban Affairs but was not reported out of committee.

the capital ratio falls below 2 percent.⁴³ Congress has not yet acted on this suggestion, but doing so could help ensure prompt action by FHA and focus Congress's monitoring efforts should this situation arise in the future.

Balancing Financial Soundness and Mission

We could not assess the consistency of the MMI Fund's capital requirement with the framework element of balancing financial soundness with the entity's role and mission. Such an assessment would require more information about the severity of the economic conditions the capital requirement was designed to withstand without supplemental funding. As previously discussed, the statute that created the requirement did not specify those conditions. As a result, it is unclear whether FHA's difficulties in maintaining the financial soundness of the MMI Fund while carrying out its public mission during and after the 2007–2011 housing crisis indicate that the 2 percent capital requirement is insufficient.

Any reconsideration of the capital requirement would involve policy decisions that would need to be made through congressional deliberations. These decisions center on the relative weight FHA should place on its financial and mission goals and requirements. On the one hand, FHA has a statutory operational goal to minimize mortgage default risk to the MMI Fund and a statutory requirement to maintain a capital ratio of at least 2 percent. A minimum capital requirement that is too low may result in FHA taking on too much risk and having an insufficient capital buffer to withstand an economic downturn without requiring supplemental funding. On the other hand, FHA also has a statutory operational goal to provide mortgage insurance to traditionally underserved borrowers—such as low-income, minority, and first-time home buyers—and historically has played a role in stabilizing housing markets during economic downturns. Setting a minimum capital requirement that is too high may limit FHA's ability to serve the borrowers for which it was intended or play its market-stabilizing role, because it might require FHA to charge insurance premiums that many borrowers cannot afford or impose underwriting standards they cannot meet. The tension between the financial and mission aspects of FHA's goals and requirements poses trade-offs that must be weighed by policymakers in setting the MMI Fund's capital requirement.

⁴³[GAO-13-722](#).

FHA Has Not Conducted Fund-Wide Stress Tests or Specified the Objectives of Its Tests

Stress testing practices for the MMI Fund are consistent with two of the five elements in our stress testing framework—that stress testing methods and results be transparent and stress testing scenarios capture relevant risks. The stress testing practices are inconsistent with two other elements—that the scope of testing includes entity-wide assessments and that the specific objectives of the tests be defined. We were unable to determine the consistency of MMI Fund stress testing practices with the framework element that methods and scenarios be consistent with the objectives of the tests because FHA has not defined specific objectives. Table 4 summarizes our assessments.

Table 4: Assessment of the Federal Housing Administration’s Stress Testing Practices Using GAO’s Framework

Framework element	Assessment
1. The stress testing methods and results are transparent	Consistent
2. The stress scenarios capture risks relevant to the entity	Consistent
3. The scope of the stress testing includes entity-wide assessments	Not consistent
4. The specific objectives of the stress testing are defined	Not consistent
5. The stress testing methods and scenarios are consistent with the objectives of the tests	Unable to determine

○ Not consistent ● Consistent — Unable to determine

Source: GAO. | GAO-18-92

Transparency

Stress tests of the MMI Fund are consistent with the framework element of transparency. Specifically, stress testing methods, scenarios, and results should be specific and available for review.⁴⁴ Actuarial reports on the MMI Fund provide detailed information on the methodology and results of fund stress tests. For example, the actuarial reports describe the stress testing method of estimating economic values for the forward mortgage and HECM portfolios using hypothetical scenarios based on projected unemployment, house price appreciation, and interest rates. The reports also describe sources for these projections, including scenarios developed by Moody’s Analytics and generated by the actuarial contractor through Monte Carlo simulation. In addition, for each variable,

⁴⁴Private sector entities may be more limited in what they can disclose compared with FHA because of their need to protect proprietary business information.

the reports present graphics showing their projected paths under each scenario over the stress period. Furthermore, for each scenario, the reports provide quantitative results and an accompanying narrative discussion highlighting key drivers of the results. The reports are publicly available on HUD's website.⁴⁵

Risks Relevant to Entity

Stress tests of the MMI Fund are consistent with the framework element of capturing risks that are relevant to the entity. The stress scenarios used in the actuarial reviews have incorporated risks the MMI Fund faces by considering changes in economic conditions that would negatively affect the fund's cash flows and, by extension, the fund's economic value. More specifically, they include declines in house prices and rises in unemployment, which can be expected to increase borrower defaults on FHA-insured mortgages and increase the number and severity of insurance claims FHA pays to lenders.⁴⁶ In addition, the scenarios include declines in interest rates, which can be expected to increase the number of FHA-insured mortgages that are paid off before maturity—for example, as borrowers refinance out of their FHA-insured mortgages into conventional mortgages (those without government insurance or guarantees)—thus reducing the amount of insurance premiums FHA collects. To examine these risks, the stress scenarios in recent FHA actuarial reviews have included substantial declines in a Federal Housing Finance Agency national house price index, increases in unemployment rates, and decreases in interest rates for 30-year home mortgages.

To provide additional perspective on the severity, duration, and timing of scenarios used to stress test the MMI Fund, appendix III compares selected MMI Fund stress scenarios to the severely adverse scenario

⁴⁵The actuarial reports, accessed on August 15, 2017, can be found at https://portal.hud.gov/hudportal/HUD?src=/program_offices/housing/rmra/oe/rpts/actr/actrmenu.

⁴⁶Severity refers to the size of the loss relative to the insurance claim. In an environment where house prices are declining, claim severity can be expected to increase because lower housing values reduce FHA's ability to offset claim payments with proceeds from the sale of foreclosed properties.

used by the Federal Reserve in conducting annual supervisory stress tests of large banking organizations.⁴⁷

Entity-Wide Scope

Stress tests of the MMI Fund are not consistent with the framework element of including entity-wide assessments to provide a complete picture of risk.⁴⁸ Since fiscal year 2009, when the HECM portfolio was first included in the MMI Fund, stress tests of the MMI Fund have analyzed the forward mortgage and HECM portfolios separately, but not on a fund-wide basis. This practice partly reflects the way in which capital assessments of the MMI Fund are performed—through separate assessments of the forward mortgage and HECM portfolios. Additionally, an FHA official said the agency has been reluctant to report combined ratios for stress scenarios because the results could be misinterpreted (for example, result in too much or too little confidence in the fund’s ability to withstand stress) if the scenarios are not viewed in the proper historical context.⁴⁹ However, without the combined analysis, it is unclear what the capital position of the MMI Fund as a whole would be under stressful conditions. As a result, FHA and Congress may lack information that could be useful in assessing risks to the MMI Fund, including circumstances that could cause the fund’s capital ratio to fall below the statutory minimum.

Defined Objectives

Stress testing of the MMI Fund is not consistent with the framework element of defining the specific objectives of the tests. According to

⁴⁷The Dodd-Frank Wall Street Reform and Consumer Protection Act requires that all financial companies with more than \$10 billion in total consolidated assets that are supervised by a primary federal financial regulatory agency are required to conduct an annual company-run stress test. Only bank holding companies with total consolidated assets of \$50 billion or more and each nonbank financial company that the Financial Stability Oversight Council has designated for supervision by the Federal Reserve are subject to the annual supervisory stress test conducted by the Federal Reserve. The supervisory stress tests must provide for at least three different sets of conditions—baseline, adverse, and severely adverse—under which the Federal Reserve would conduct its evaluation. 12 U.S.C. § 5365(i)(2); 12 C.F.R. § 252.52(g).

⁴⁸For purposes of this framework element, we considered the MMI Fund to be the entity because the capital requirement applies to the fund as a whole.

⁴⁹As previously noted in this report, combined capital ratios can be calculated for the stress scenarios not generated from Monte Carlo simulations.

guidance from federal banking regulators, large banking organizations should indicate the specific purpose and focus of stress tests within a framework that allows for consistent, repeatable exercises.⁵⁰ Additionally, this guidance and stress testing principles and practices from two international financial organizations provide examples of stress testing objectives such as informing assessment of vulnerabilities, contingency planning, identifying and monitoring risk concentrations, and determining the level of risk the entity is willing to accept (risk appetite).⁵¹

The MMI Fund actuarial reviews have included the broad statement that the stress tests performed as part of the reviews provide insights into the sensitivity of the MMI Fund's economic value under different economic conditions. In addition, FHA has included some information from the stress tests in recent annual reports to Congress to highlight different points. However, FHA has not articulated specific objectives for the stress tests, in part because a key use of the actuarial reviews is to help determine the MMI Fund's compliance with the capital requirement under a baseline economic scenario (which, in recent actuarial reviews, has been the Monte Carlo average). Accordingly, the types of information FHA has reported to Congress have varied from year to year. For example, in recent years, FHA's reporting on stress test results has ranged from no information (fiscal year 2016), to how much additional capital the forward mortgage portfolio would need to withstand losses comparable to the last economic crisis (fiscal year 2015), to the probability that the economic value of the HECM portfolio would fall below zero under deteriorating economic conditions (fiscal year 2013). Without specific objectives for its stress testing, FHA has limited assurance that its stress tests are targeted to risk-management needs and that its reporting to Congress provides consistent information on the MMI Fund's ability to withstand adverse conditions.

⁵⁰Board of Governors of the Federal Reserve System, Federal Deposit Insurance Corporation, Office of the Comptroller of the Currency, *Guidance on Stress Testing for Banking Organizations with Total Consolidated Assets of More Than \$10 Billion*, SR Letter 12-7 (May 14, 2012). While FHA is not bound by this guidance, it faces challenges similar to those faced by large banking organizations in understanding potential risk exposures and preparing for stressful economic events.

⁵¹Basel Committee on Banking Supervision, Bank for International Settlements, *Principles for Sound Stress Testing Practices and Supervision* (Basel, Switzerland: May 2009); and International Actuarial Association, *Stress Testing and Scenario Analysis* (Ottawa, Canada: July 2013).

Methods and Scenarios Consistent with Objectives

Because FHA has not defined specific objectives for MMI Fund stress tests, we could not assess whether existing tests were consistent with the framework element of using stress testing methods and scenarios that are consistent with stated objectives. Entities should use stress testing methods—such as conventional stress testing (which looks at the effect of specified hypothetical or historical stress scenarios) or reverse stress testing (which assumes a negative outcome and identifies scenarios that would lead to that outcome)—that yield information responsive to the objectives of the stress tests.

Actuarial reviews of the MMI Fund have used conventional stress testing and a range of stress scenarios developed by Moody's Analytics and generated by Monte Carlo simulation. But, depending on how FHA defines the specific objectives of the MMI Fund's stress tests, other stress testing methods or scenarios might provide useful information for risk management. For example, if the objective of the stress testing was to identify the conditions that might cause the MMI Fund's capital ratio to fall below 2 percent or require supplemental funding, reverse stress testing would be an appropriate method. If the objective was to assess the MMI Fund's ability to withstand conditions similar to those of the Great Depression or the 2007–2011 housing crisis, developing historical stress scenarios would be appropriate. Additionally, if the objective was to assess the effect of changes to a particular variable or input (as opposed to a broader economic scenario), sensitivity stress tests would be appropriate.⁵²

⁵²In contrast to scenario stress tests, sensitivity stress tests may explore the impact of changes—including extreme values or shocks—to particular variables or inputs without defining the events or underlying reasons for those changes. Instead, the changes may be computed using statistical measures or be based on judgment.

Joint Capital Assessment Has Advantages and Disadvantages

Advantages of Including Reverse Mortgages in the Fund's Capital Requirement Include Greater Transparency

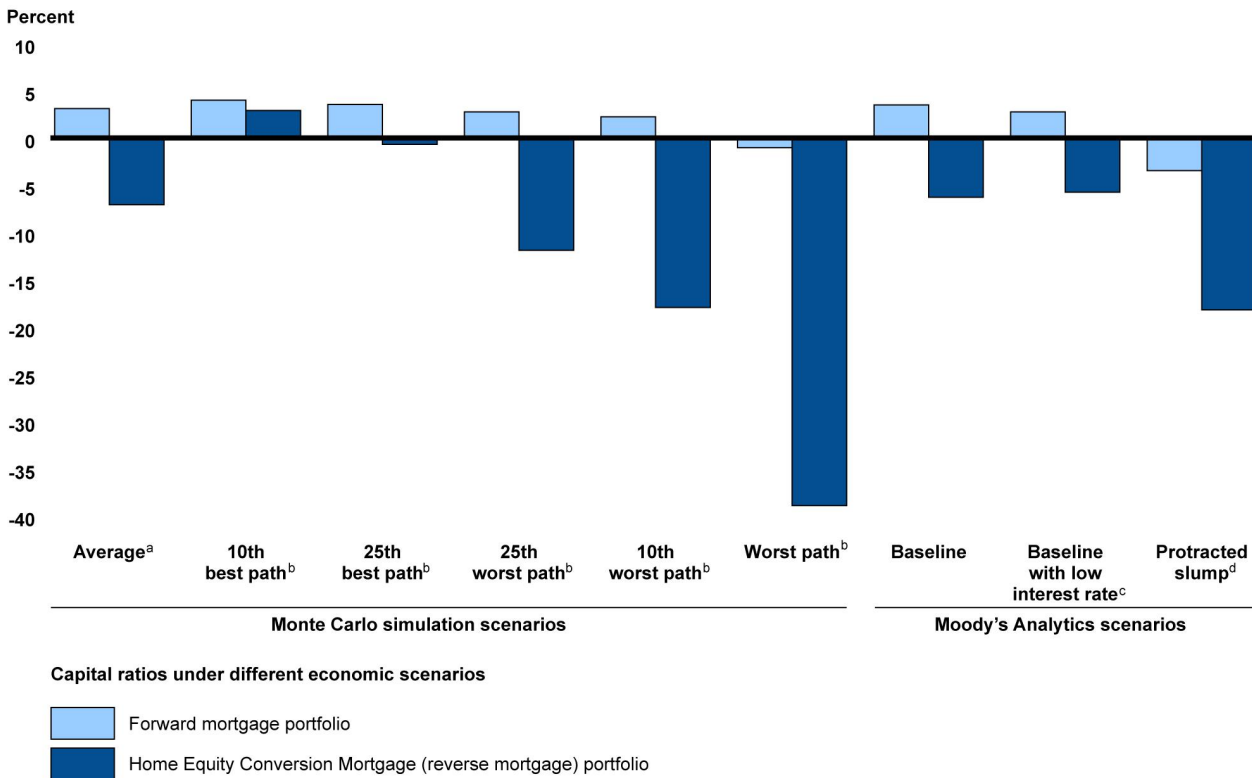
Beginning with the 2009 loan cohort, HERA placed new HECMs (FHA-insured reverse mortgages) in the MMI Fund, while previous HECMs remained in the General and Special Risk Insurance Fund. When the post-2008 HECM portfolio became part of the MMI Fund, it also was included in the MMI Fund's capital ratio assessment and became subject to annual actuarial review requirements. These changes have had some advantages. First, subjecting HECMs to the annual actuarial review requirements has improved the transparency of the program's financial condition. For example, the actuarial reviews have included estimates of the HECM portfolio's economic value and performance under alternative economic conditions, which were not available prior to 2009.

Second, jointly considering the forward mortgage and HECM portfolios in the MMI Fund's capital assessment mitigates the potential difficulty of independently holding the HECM portfolio to a specified capital ratio. The economic value of the HECM portfolio is more sensitive to changes in economic conditions and inputs to the models than the forward mortgage portfolio.⁵³ As a result, the capital ratio for the HECM portfolio is more volatile, and requiring HECMs to independently meet a capital ratio would be difficult. Specifically, it could be difficult to manage HECM insurance premiums, loan limits, and other program requirements to ensure that a capital requirement is consistently met. Estimates of HECM capital ratios under alternative economic scenarios from the fiscal year 2016 actuarial

⁵³One reason the HECM portfolio is more sensitive to economic assumptions is that HECMs are, on average, longer in duration than forward mortgages. Because their cash flows extend over a lengthier time frame, the economic value of HECMs is more sensitive to assumptions, such as interest rates, that have greater effects the longer they are applied. In addition, HECMs are negative amortization loans, meaning the loan balances grow over time. Therefore, an increase in interest rates would have a larger effect on the growing balances of HECMs than it would on the decreasing balances of forward mortgages, and the present value of cash flows from HECMs will be more affected by even a small change in interest rates. Similarly, because a HECM loan balance grows over time and proceeds from the sale of the house are typically used to pay off the balance when it becomes due, a decline in house values increases the likelihood that the proceeds will not cover the loan balance, resulting in an insurance claim and loss to FHA.

review illustrate the sensitivity of this portfolio’s economic value—and therefore its capital ratio—to changes in economic conditions (see fig.1). While the capital ratio for forward mortgages ranged from negative 3.3 percent to positive 4.17 percent under all of the economic scenarios, the corresponding range for HECMs was negative 38.74 percent to positive 3.07 percent.

Figure 1: Fiscal Year 2016 Forward Mortgage and HECM Portfolio Capital Ratios under Different Economic Scenarios



Source: GAO analysis of Federal Housing Administration data. | GAO-18-92

^aThe Monte Carlo average capital ratios are calculated using the average of the Monte Carlo simulation’s 100 economic values.

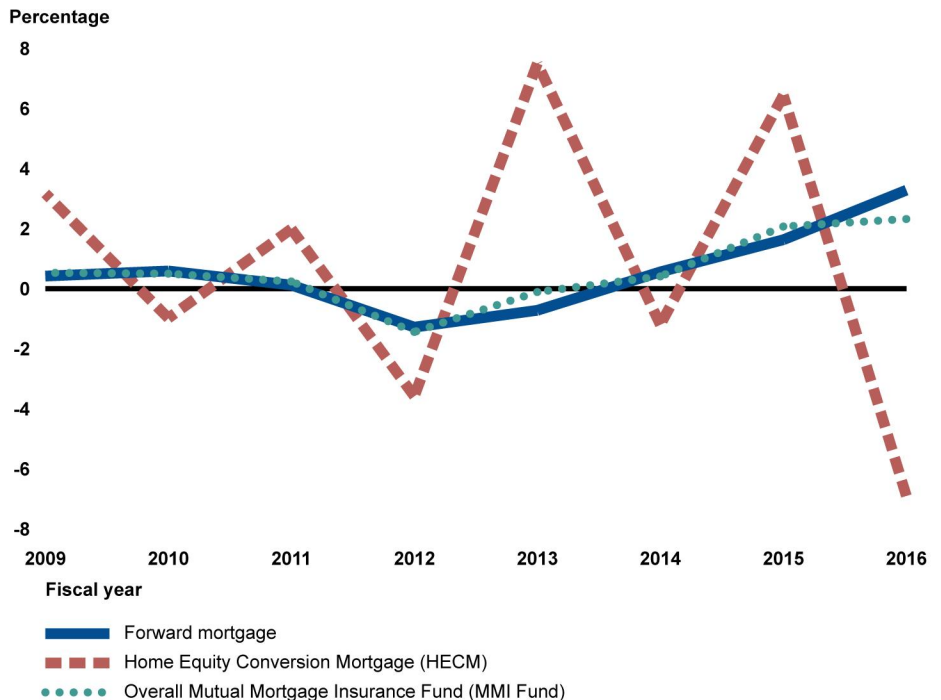
^bThe 10th best, 25th best, 25th worst, 10th worst, and worst Monte Carlo simulation paths are the economic scenarios that produced the corresponding economic value for each portfolio. Because the combination of house price, interest rate, and unemployment assumptions that comprise an economic scenario may not affect forward mortgages and HECMs similarly, the economic scenarios represented by each of these paths may be different for forward mortgages and HECMs.

^cThis scenario holds interest rates low for the first 2 years of the projection, then follows the Moody’s Analytics baseline scenario beginning in year 3.

^dThis scenario modified the Moody’s Analytics protracted slump scenario by assuming less optimistic house-price growth rates after the initial stress period.

Under the current approach of jointly considering the HECM and forward mortgage portfolios in the capital assessment, both portfolios in combination are subject to the capital requirement, but the volatility of the HECM portfolio's economic value is mitigated by the relative stability of the forward mortgage portfolio. More specifically, because the forward mortgage portfolio is substantially larger than the HECM portfolio (with the HECM portfolio accounting for roughly 10 percent of the MMI Fund's insurance-in-force in fiscal year 2016), the combined capital ratio more closely follows the generally less volatile capital ratio for forward mortgages (see fig. 2). As a result, the combined capital ratio is less uncertain than the HECM capital ratio, and managing the HECM portfolio within that combined framework is more feasible than managing it to a separate capital requirement.

Figure 2: Forward Mortgage, HECM, and Combined Capital Ratios, Fiscal Years 2009–2016



Source: GAO analysis of Federal Housing Administration actuarial reviews of forward mortgages and HECMs (reverse mortgages). | GAO-18-92

Finally, another possible advantage of the joint assessment is some degree of risk diversification. The cash inflows and outflows of the forward mortgage and HECM portfolios do not necessarily rise and fall in tandem in response to changes in macroeconomic conditions. For example, all

other things being equal, rising mortgage interest rates tend to increase the economic value of the forward mortgage portfolio but tend to decrease the economic value of the HECM portfolio.⁵⁴ Because the cash flows of the two portfolios are not fully correlated, the amount of capital needed for the two portfolios in combination may be less than the sum of the amount of capital needed for each portfolio separately.

Disadvantages of Including HECMs in the MMI Fund Include More Uncertainty about the MMI Fund's Financial Condition

Joint assessment of the forward mortgage and HECM portfolios in determining compliance with the capital requirement also has some disadvantages. First, including HECMs in the MMI Fund can result in more uncertainty about the Fund's expected performance. As previously discussed, the economic value of HECMs is more volatile and sensitive to economic conditions than the economic value of forward mortgages. As a result, estimates of the MMI Fund's economic value and capital ratio and its potential performance under alternative economic scenarios are less predictable and more difficult to interpret with the inclusion of HECMs.

Although the combined capital ratio generally tracks with the forward mortgage capital ratio, the inclusion of HECMs in the assessment can affect the combined capital ratio. For example, in fiscal year 2015, a high HECM capital ratio (6.44 percent) pulled the combined capital ratio above 2 percent (2.07 percent), even though the forward mortgage capital ratio was below 2 percent (1.63 percent). In this case, the inclusion of the HECM portfolio in the capital ratio resulted in the MMI Fund meeting the 2 percent capital requirement for the first time in 6 years. In its fiscal year 2014 report to Congress, FHA concluded that the HECM portfolio was over 10 times more volatile than the forward mortgage portfolio, noting that small changes to the HECM program can affect the overall value of the MMI Fund. Further, in its fiscal year 2015 report to Congress, FHA noted that because the HECM portfolio is projected to continue growing at

⁵⁴When interest rates rise, borrowers with forward mortgages are less likely to prepay their mortgages (for example, through refinancing). As a result, FHA benefits from the insurance premiums it continues to collect from those borrowers. In contrast, for HECM borrowers (many of whom have adjustable-rate loans) rising interest rates tend to make their loan balances grow more quickly. This increases the likelihood and size of insurance claims because the amount borrowed is more likely to exceed the net proceeds from the sale of the home when the loan terminates.

a faster rate than the forward portfolio, year-to-year HECM volatility is likely to contribute more uncertainty to future actuarial valuations of the MMI Fund. In recent years, HECMs have accounted for an increasing percentage of the MMI Fund's insurance-in-force, rising from 4.01 percent in fiscal year 2009 to 9.42 percent in fiscal year 2016.

Second, relying on a combined capital ratio to assess the MMI Fund's compliance with the capital requirement could mask the financial condition of the individual portfolios. Information on the performance of each portfolio is available in separate actuarial reports, but differences between the financial health of the two portfolios may be overlooked because compliance with the 2 percent capital requirement is determined by the combined capital ratio. For example, in fiscal year 2013, the combined capital ratio was below 2 percent (negative 0.11 percent), while the HECM capital ratio was 7.50 percent. In contrast, in fiscal year 2016, the combined ratio was above 2 percent (2.32 percent), while the HECM capital ratio was below 2 percent (negative 6.90 percent). In those years, the substantial difference between the financial condition of the HECM portfolio and the overall MMI Fund would not have been evident from the combined capital ratio.

Even in years when the capital ratios of both the forward mortgage and HECM portfolios are above or below the 2 percent level, the combined capital ratio may still hide important differences between the two. For example, in fiscal year 2014, the capital ratios for both the forward mortgage and HECM portfolios were below 2 percent. However, the forward mortgage capital ratio was positive (0.56 percent), while the HECM capital ratio was negative (-1.20 percent). This difference may be important to policymakers because a positive capital ratio indicates that the portfolio has some capital cushion to absorb unexpected losses, even if it is small. In contrast, a negative ratio suggests the portfolio may not have sufficient capital to independently cover all expected net losses on outstanding insurance, and may essentially be financially supported by the other portfolio in the MMI Fund.

Finally, in certain circumstances, the joint capital assessment could create pressure to raise insurance premiums or tighten underwriting standards in one program to compensate for the weaker financial performance of another program. For example, if the forward mortgage capital ratio were above 2 percent, but the HECM capital ratio pulled the combined ratio below 2 percent, raising insurance premium rates for

forward mortgages could be the quickest way to regain a 2 percent capital ratio.⁵⁵ In this example, a portion of the premiums paid by the forward mortgage borrower would essentially support the HECM program. While this situation would benefit HECM borrowers (because their insurance premiums would not increase), it would potentially create a burden for forward mortgage borrowers and could reduce the number of prospective borrowers who are able to afford FHA mortgage insurance. However, as of September 2017, FHA officials said that the agency had not increased forward mortgage premiums to support the HECM program or vice versa.

Alternative Approaches to Managing the HECM Program and Assessing the Capital Requirement Pose Trade-offs

Alternatives to the MMI Fund's joint capital assessment could address some of the disadvantages of this approach but would also involve potential trade-offs between mission, financial soundness, and transparency goals. Policy decisions about these trade-offs could have significant implications for the management of FHA's programs and for potential FHA borrowers.

If Congress wishes to place additional emphasis on the financial self-sufficiency of the HECM program, it may be appropriate to hold the HECM portfolio to a capital requirement separate from that of forward mortgages. Under this option, future HECMs could either remain in the MMI Fund or be placed under a different insurance fund.⁵⁶ The capital requirement could be set at the same congressionally defined level as the one for forward mortgages, or it could be tailored to the risks and volatility of the HECM portfolio. A separate HECM capital requirement would help ensure that the forward mortgage portfolio is not supporting the HECM portfolio, or vice versa. Decisions about premiums and other program requirements could be based solely on each portfolio's financial condition and would not be influenced by a need to keep a combined capital ratio sufficiently high.

⁵⁵Raising HECM insurance premium rates by an equal amount would have a smaller effect because the program insures far fewer loans.

⁵⁶When HERA moved HECMs from the General and Special Risk Insurance Fund into the MMI Fund, only new HECM cohorts became part of the MMI Fund. HECMs originated prior to fiscal year 2009 were kept in the General and Special Risk Insurance Fund. If Congress were to move the HECM portfolio again, and take the same approach of moving only new cohorts, the HECM portfolio could potentially be split among three different subportfolios.

In addition, a separate HECM capital requirement would help ensure that for future loan cohorts, the financial conditions of the individual portfolios are not masked by a combined capital ratio. However, if the HECM portfolio was required to independently meet a minimum capital ratio, the volatility of the portfolio's economic value could make it difficult for FHA to consistently meet the requirement without targeting a capital level substantially above the minimum requirement. Doing so may require FHA to raise insurance premiums or place greater restrictions on the amount seniors can borrow, which would limit the program's ability to serve its goal of alleviating economic hardship.

In comparison, if Congress wishes to place greater emphasis on maximizing the benefits of the HECM program for seniors, another option may be to exempt the HECM portfolio from a capital requirement. Under this option, future HECMs would not be part of the MMI Fund and would not be subject to the MMI Fund's capital requirement. As with a separate HECM capital requirement, this option would help ensure that the financial condition of future loan cohorts in the forward mortgage portfolio is not masked by a combined capital ratio. But, the financial condition of the HECM portfolio would not be as transparent, unless FHA continued to conduct HECM actuarial assessments. In addition, FHA could set premiums and program limits without consideration for building a capital buffer, which might decrease the likelihood that the HECM program would operate on at least a break-even basis over the long run. Some industry participants we spoke with did not think that HECMs should be exempted from a capital requirement, noting that the increased transparency and accountability of HECMs were important. However, even without a capital requirement, FHA could choose to continue conducting actuarial assessments of the HECM program for continued transparency.

Conclusions

The programs FHA administers under its MMI Fund play an important role in the mortgage market by expanding homeownership opportunities and helping stabilize housing markets during economic downturns. However, the MMI Fund's financial challenges in the wake of the 2007–2011 housing crisis illustrate the fund's vulnerability to severely adverse economic conditions and underscore the importance of capital requirements and stress testing practices for this \$1.2 trillion mortgage insurance portfolio. Opportunities exist to strengthen these requirements and practices by making them more consistent with those used by

financial institutions and regulators, as reflected in our two evaluative frameworks.

As we concluded in our September 2013 report, and consistent with the capital requirements framework in this report, including accountability mechanisms in FHA's capital requirement could enhance management and oversight of the MMI Fund. Therefore, as we suggested in our 2013 report, we maintain that Congress should consider requiring FHA to submit a capital restoration plan and regular updates on plan implementation whenever the fund's capital ratio falls below the required level.⁵⁷ In our current review, we identified three additional areas where the capital requirement and stress testing practices for the MMI Fund could be strengthened in accordance with our frameworks. Specifically, the statutory 2 percent capital requirement does not specify the economic conditions the fund would be expected to withstand. As a result, it may not provide an adequate financial cushion under scenarios in which Congress may anticipate that the fund would be self-sufficient. In addition, FHA has not analyzed or reported stress test results on a fund-wide basis, making it unclear what the capital position of the fund as a whole would be under stressful conditions. Finally, FHA has not defined the specific objectives of the fund's stress tests and therefore has limited assurance that its stress testing methods and scenarios are targeted to risk-management needs.

Matter for Congressional Consideration

Congress should consider amending the National Housing Act to specify the economic conditions the MMI Fund would be expected to withstand without substantial risk of drawing on permanent and indefinite budget authority, and require FHA to specify and comply with a capital ratio consistent with these conditions. In specifying the economic conditions, Congress should take into account FHA's statutory operational goals and role in supporting the mortgage market during periods of economic stress. (Matter for Consideration 1)

Recommendations for Executive Action

We are making the following two recommendations to FHA:

⁵⁷[GAO-13-722](#).

The Commissioner of FHA should combine stress test results for the forward mortgage and HECM portfolios, where possible, and report estimated MMI Fund-wide capital ratios for the stress scenarios examined. (Recommendation 1)

The Commissioner of FHA should develop specific objectives for stress tests of the MMI Fund and apply stress testing methods and scenarios consistent with those objectives. (Recommendation 2)

Agency Comments

We provided a draft of this report to HUD, the Federal Reserve, and FHFA for their review and comment. The Federal Reserve and FHFA had no comments. In its comments, reproduced in appendix IV, HUD agreed with our recommendations. HUD said that FHA's forthcoming annual actuarial reports and report to Congress on the MMI Fund would include stress test results for forward mortgages and HECMs, but HUD did not state whether the reports would address our recommendations. By analyzing and reporting stress test results on a fund-wide basis and defining the specific objectives of its stress tests, FHA would better understand the capital position of the MMI Fund as a whole under stressful conditions and have greater assurance that its stress testing methods and scenarios are targeted to risk-management needs.

HUD also said it was important to recognize the trade-offs between FHA's mission and insurance policy holders when considering financial soundness. HUD said it appreciated our report's statement that minimum capital requirements that are too high may limit FHA's ability to serve its mission and market role and recommended that we make this statement more prominent. While our report does contain that statement, it also states that a minimum capital requirement that is too low may result in FHA taking on too much risk and having an insufficient capital buffer to withstand an economic downturn without requiring supplemental funding. Accordingly, we added language to the introduction of the report noting the challenge FHA and Congress face in balancing the fund's financial self-sufficiency with FHA's role in facilitating mortgage credit to underserved borrowers and stabilizing the housing market during economic downturns.

As agreed with your offices, unless you publicly announce the contents of this report earlier, we plan no further distribution until 30 days from the report date. At that time, we will send copies to the appropriate

congressional committees, the Secretary of Housing and Urban Development, the Chair of the Board of Governors of the Federal Reserve System, the Director of the Federal Housing Finance Agency, and other interested parties. In addition, the report will be available at no charge on the GAO website at <http://www.gao.gov>.

If you or your staff have any questions about this report, please contact me at (202) 512-8678 or garcia Diaz@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made key contributions to this report are listed in appendix V.

A handwritten signature in black ink, appearing to read "Daniel Garcia-Diaz", with a horizontal line underneath.

Daniel Garcia-Diaz
Director, Financial Markets and Community Investment

Appendix I: Objectives, Scope, and Methodology

Our objectives were to examine (1) the types of information actuarial reviews and other assessments provide about the Mutual Mortgage Insurance Fund's (MMI Fund) financial condition, including its ability to remain self-sufficient; (2) the extent to which the capital requirement and stress testing practices for the MMI Fund are consistent with principles and practices underlying those of other financial institutions; and (3) key advantages and disadvantages of including both forward and Home Equity Conversion Mortgages (HECM) in the MMI Fund's capital assessment.

Information Provided by Reviews of the MMI Fund

To examine the types of information actuarial reviews and other assessments provide about the MMI Fund's financial condition, including its ability to remain self-sufficient, we reviewed actuarial reports of the fund prepared by a Federal Housing Administration (FHA) contractor and related FHA reports to Congress. We focused on reports for fiscal year 2009 (the first year HECMs were part of the MMI Fund) through fiscal year 2016 (the most recently completed report). Additionally, we reviewed FHA budget and financial documents containing assessments of the fund. Specifically, we reviewed the Department of Housing and Urban Development (HUD) appendix from the President's budgets for fiscal year 2011 through fiscal year 2018 (the most recent available) and FHA's audited financial statements for fiscal year 2011 through fiscal year 2016 (the most recent available). We also reviewed FHA documents and prior GAO reports describing the mechanisms used to provide supplemental resources to the fund, if necessary.

We determined the extent to which the actuarial, budgetary, and financial accounting reviews contained information pertinent to assessing the MMI Fund's financial condition, such as the amount of funds needed and available to cover expected net future costs on outstanding insurance, the amount of funds available to cover unexpected losses, and the projected performance of the MMI Fund under alternative economic scenarios. We compared the types of information available in the actuarial reviews with the types of information in the budgetary and financial accounting reviews of the fund, as well as in FHA's quarterly reports to Congress, focusing on information that could help inform whether the MMI Fund is likely to

remain self-sufficient. Additionally, we interviewed FHA headquarters officials about the content and interpretation of the various reviews of the fund.

To illustrate the similarities and differences between the MMI Fund's actuarial and budgetary reviews, we summarized information about the two reviews, including their purposes and the sources of their requirements (see app. II). In addition, we reviewed recent actuarial reports and HUD budget appendixes and spoke with FHA officials to understand their similarities and differences. We developed a hypothetical illustration of how certain components of the budgetary review are used in the actuarial review.

Capital Requirements and Stress Tests

To assess the extent to which the MMI Fund's capital requirement and FHA's stress testing approach are consistent with principles underlying such requirements for other financial institutions, we developed two evaluative frameworks and assessed requirements and practices for the MMI Fund against them. For the capital requirements framework, we reviewed publicly available documents on requirements and capital assessment practices from financial regulators and institutions, including the Bank for International Settlements, Fannie Mae and Freddie Mac (specifically, their capital requirements for private mortgage insurers), the Federal Deposit Insurance Corporation, and the Federal Housing Finance Agency (FHFA). For the stress testing framework, we reviewed articles on principles and practices from financial regulators and institutions, including the Bank for International Settlements, the Board of Governors of the Federal Reserve System (Federal Reserve), and the International Monetary Fund. We included in our frameworks key common elements in designing capital requirements and stress tests that could apply to the MMI Fund, assuming the fund would continue to operate under federal accounting standards and budgeting requirements.

In addition to FHA, we shared the draft frameworks with FHFA, the National Association of Insurance Commissioners, and the American Academy of Actuaries and interviewed officials from these organizations to obtain their input on the frameworks. We chose these organizations based on their expertise in financial assessments of housing finance and mortgage insurance institutions. We then reviewed publicly available reports and documents, including relevant statutory provisions and FHA's annual actuarial reviews and reports to Congress, to assess whether the

requirements and practices of the MMI Fund were consistent with our framework elements.

To provide additional perspective on stress tests of the MMI Fund, we compared variables in selected economic scenarios from the fiscal year 2016 actuarial review of FHA's forward mortgage portfolio with corresponding variables in one of the scenarios used by the Federal Reserve in its 2016 supervisory stress tests of large banking organizations (see app. III). Specifically, we graphed the projected paths of the house price index, 30-year fixed mortgage rate, and unemployment rate for the two most stressful MMI Fund scenarios—the Monte Carlo simulation path producing the lowest economic value for forward mortgages and the Moody's Analytics' protracted slump scenario—and the Federal Reserve's severely adverse scenario. We chose to highlight the worst simulation path and the Moody's Analytics protracted slump scenarios because they are generally the two most severe scenarios used in stress tests of the MMI Fund. The Federal Reserve's severely adverse scenario was the most analogous to the two MMI Fund scenarios and has been referenced in Fannie Mae's and Freddie Mac's financial requirements for private mortgage insurers. We analyzed the similarities and differences in the severity, duration, and timing of the three variables discussed above. To assess the reliability of FHA's data on its stress scenarios, we compared the data we received from the agency with published information in FHA's actuarial reviews. We determined the data were sufficiently reliable for the purposes of illustrating similarities and differences with the Federal Reserve's severely adverse scenario.

Consideration of Forward Mortgages and HECMs in Capital Assessment

To identify key advantages and disadvantages of including both forward mortgages and HECMs in the MMI Fund's capital assessment, we reviewed actuarial results for both portfolios from fiscal year 2009 through fiscal year 2016. Using information from the actuarial reviews, we calculated and compared the separate and combined capital ratios for forward mortgages and HECMs to determine the effect of including the reverse mortgage portfolio in the MMI Fund capital calculation, as well as the potential effects of holding the HECM portfolio to a separate capital requirement. We also reviewed discussions in FHA's annual reports to Congress describing the effect of including the forward mortgage and HECM portfolios in the same fund. In addition, we interviewed FHA officials and other industry participants and stakeholders, including the

National Reverse Mortgage Lenders Association, Mortgage Bankers Association, U.S. Mortgage Insurers, American Bankers Association, and the American Association of Retired Persons, about the advantages and disadvantages of jointly considering both portfolios in assessing the MMI Fund's capital ratio as well as of alternative approaches.

We conducted this performance audit from August 2016 to November 2017 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Appendix II: Mutual Mortgage Insurance Fund Budgetary and Actuarial Reviews

The budgetary and actuarial reviews of the Mutual Mortgage Insurance Fund (MMI Fund) serve different purposes, stem from different requirements, and are conducted by different entities. See table 5 for a summary of these two reviews of the fund.

Table 5: Overview of Budgetary and Actuarial Reviews

	Budgetary review	Actuarial review
Purpose	To estimate the credit subsidy costs of the mortgage insurance programs in the Mutual Mortgage Insurance Fund (MMI Fund) (initial estimates for new loan cohorts and reestimates for existing cohorts) and record the amount of funds available in the MMI Fund's financing and capital reserve accounts.	To estimate the economic value of the existing forward and reverse mortgage portfolios in the MMI Fund. The Federal Housing Administration (FHA) uses the combined economic values to calculate the fund's capital ratio (economic value divided by insurance-in-force) and assess compliance with the MMI Fund's statutory 2-percent capital requirement.
Source of requirement	Federal Credit Reform Act of 1990	Originally in the Omnibus Budget Reconciliation Act of 1990. Subsequently made a requirement in the Housing and Economic Recovery Act of 2008.
Who conducts it	FHA	Independent actuary
Where results of review are published	Department of Housing and Urban Development appendix to the President's budget.	Actuarial reports on the MMI Fund's forward and reverse mortgage portfolios and annual FHA reports to Congress.

Source: GAO. | GAO-18-92

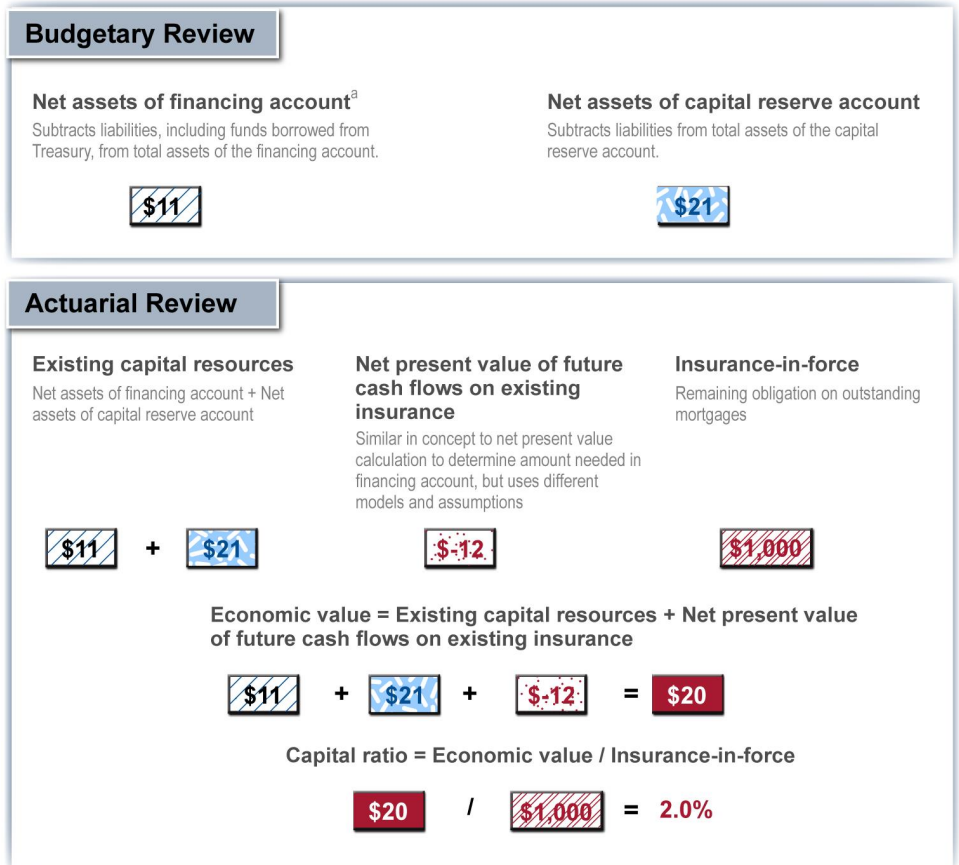
However, the two reviews share some concepts and numbers. For example, the actuarial analysis of the MMI Fund's economic value includes an existing capital resources component, which can be calculated from information on assets and liabilities presented in the budgetary review.¹ In addition, both reviews include a calculation of the present value of future cash flows on outstanding insurance, though the two reviews use different models and economic assumptions to perform

¹The information on assets and liabilities originates from the financial accounting review, but is carried over from and presented in a customized form in the President's budget.

these calculations.² Both reviews also provide estimates of the amount of resources the MMI Fund has, in excess of what is needed to cover estimated credit subsidy costs (that is, the net present value of expected future cash flows on outstanding insurance). Figure 3 provides a simplified, hypothetical illustration of the relationship between the MMI Fund's budgetary and actuarial reviews.

²For example, the budgetary review must use a unique discount rate for each loan cohort, which reflects the interest rate at the time the budget for the cohort was developed or when the underlying loans were disbursed. In contrast, the actuarial review uses a single discount rate across all cohorts. The different discount rates across the two reviews can result in substantially different results. For example, according to FHA's fiscal year 2014 report to Congress, applying budgetary discount rates to that year's actuarial review of the MMI Fund's forward mortgage portfolio would have resulted in an economic value of \$7.59 billion, compared with the actuarial assessment of \$5.93 billion—a difference of \$1.66 billion.

Figure 3: Hypothetical Illustration of Budgetary and Actuarial Review Components (dollars in billions)



Source: GAO. | GAO-18-92

Note: Similarly shaded boxes represent conceptually similar or identical figures.

^aUnder the Federal Credit Reform Act of 1990, the financing account must hold sufficient funds to cover the estimated credit subsidy cost of each loan guarantee. Since the Federal Housing Administration (FHA) collects the insurance premiums needed to cover these costs over time rather than immediately upon loan disbursement, the act authorizes FHA (as it does other federal credit agencies) to borrow the funds from the Department of the Treasury (Treasury). FHA pays back the borrowed funds to Treasury with interest using insurance premiums collected over time and proceeds from any downward reestimates in FHA's long-term insurance costs.

Appendix III: Comparison of Economic Scenarios Used in Mutual Mortgage Insurance Fund and Federal Reserve Supervisory Stress Tests

We compared selected economic scenarios used in stress tests of the Federal Housing Administration's (FHA) Mutual Mortgage Insurance Fund (MMI Fund) with the severely adverse scenario developed by the Board of Governors of the Federal Reserve System (Federal Reserve) for its supervisory stress tests of large banking institutions.¹ (Under the direction of the Federal Housing Finance Agency, the housing enterprises Fannie Mae and Freddie Mac incorporated the Federal Reserve scenario into financial criteria that private mortgage insurance companies must meet to be an approved insurer of mortgages acquired by the housing enterprises.)² Our analysis focused on scenarios used in the fiscal year

¹The Federal Reserve has two related supervisory programs that involve stress testing. First, the Dodd-Frank Wall Street Reform and Consumer Protection Act implements statutory company-run and supervisory stress test requirements, known as the Dodd-Frank Act Stress Tests (DFAST), for Federal Reserve-supervised banking institutions with more than \$10 billion in total consolidated assets. DFAST projects how banking institutions' capital levels would fare in hypothetical stressful economic and financial scenarios. Second, the Federal Reserve conducts a Comprehensive Capital Analysis and Review (CCAR), which uses DFAST information to assess the capital adequacy and capital planning processes for bank holding companies with total consolidated assets of \$50 billion or more. CCAR generally does not require stress tests in addition to those conducted under DFAST. For additional information on these programs, see GAO, *Federal Reserve: Additional Actions Could Help Ensure the Achievement of Stress Test Goals*, [GAO-17-48](#) (Washington, D.C.: Nov. 15, 2016).

²Fannie Mae and Freddie Mac are private, federally chartered companies that provide liquidity to the home mortgage market. In September 2008, they were placed into federal conservatorships. Under the direction of the Federal Housing Finance Agency, Fannie Mae and Freddie Mac issued major revisions to their *Private Mortgage Insurer Eligibility Requirements* (PMIER) in 2015 (effective for new applicants and existing approved insurers in April and December 2015, respectively). Among other things, the PMIERs require approved insurers to establish, maintain, and certify compliance with a capital plan that forecasts their future financial requirements, as determined under the PMIERs, based upon projections under both an expected scenario and a stress scenario consistent with the macroeconomic assumptions of the Federal Reserve's severely adverse scenario.

2016 actuarial review of the MMI Fund’s forward mortgage portfolio (the most recently completed review) and the Federal Reserve’s 2016 supervisory stress tests, because these scenarios all used projections of economic variables beginning in calendar year 2016. We examined similarities and differences in the severity, duration, and timing of these scenarios’ projections of three variables most pertinent to the MMI Fund’s economic value: single-family home prices, 30-year fixed mortgage interest rates, and unemployment rates.³ These comparisons should be treated as illustrative because the MMI Fund and Federal Reserve stress tests have different intended uses and time horizons. For example, the Federal Reserve stress scenarios last 3 years and one quarter, whereas the MMI Fund scenarios last nearly 12 years. In addition, because both the MMI Fund and Federal Reserve stress scenarios change from year to year, the similarities and differences we discuss are not representative of those that might be observed for other time periods.

The following analysis compares the projected quarterly paths of the three variables under two economic scenarios used in stress tests of FHA’s forward mortgage portfolio—the Monte Carlo simulation path producing the lowest economic value for forward mortgages (MMI Fund worst simulation path) and the modified Moody’s Analytics protracted slump scenario (MMI Fund protracted slump)—with the projected paths of the variables under the Federal Reserve’s severely adverse scenario.⁴ We chose to highlight these MMI Fund stress scenarios because they generally have been the two most adverse scenarios considered in the actuarial reviews and are therefore the most analogous to the Federal Reserve’s severely adverse scenario. The projections for the MMI Fund scenarios and the Federal Reserve scenario start 6 months apart (third

³Consistent with the more heterogeneous composition of bank portfolios compared with FHA’s mortgage insurance portfolio, the Federal Reserve stress scenarios use 28 macroeconomic and financial variables, including measures of equity prices and financial market volatility not directly relevant to the economic value of the MMI Fund. The Federal Reserve’s severely adverse scenario is informed by periods of severe economic conditions the United States has experienced since World War II.

⁴According to FHA officials, the variables constituting each Monte Carlo simulation path (house price index, mortgage interest rate, and unemployment rate) are designed to move in logically consistent ways. As a result, the simulation path producing the lowest economic value may not include the most adverse path for each individual variable. FHA’s actuarial contractor modified the Moody’s Analytics protracted slump scenario in a manner that made it more stressful. Specifically, while the original Moody’s Analytics scenario assumed a sharp decline in the house price index, followed by a rapid increase back to its pre-decline level, the modified version assumed a more gradual increase in the house price index after the initial decline.

quarter and first quarter of calendar year 2016, respectively). We treated the starting quarter of each scenario as the first quarter of the comparative analysis.

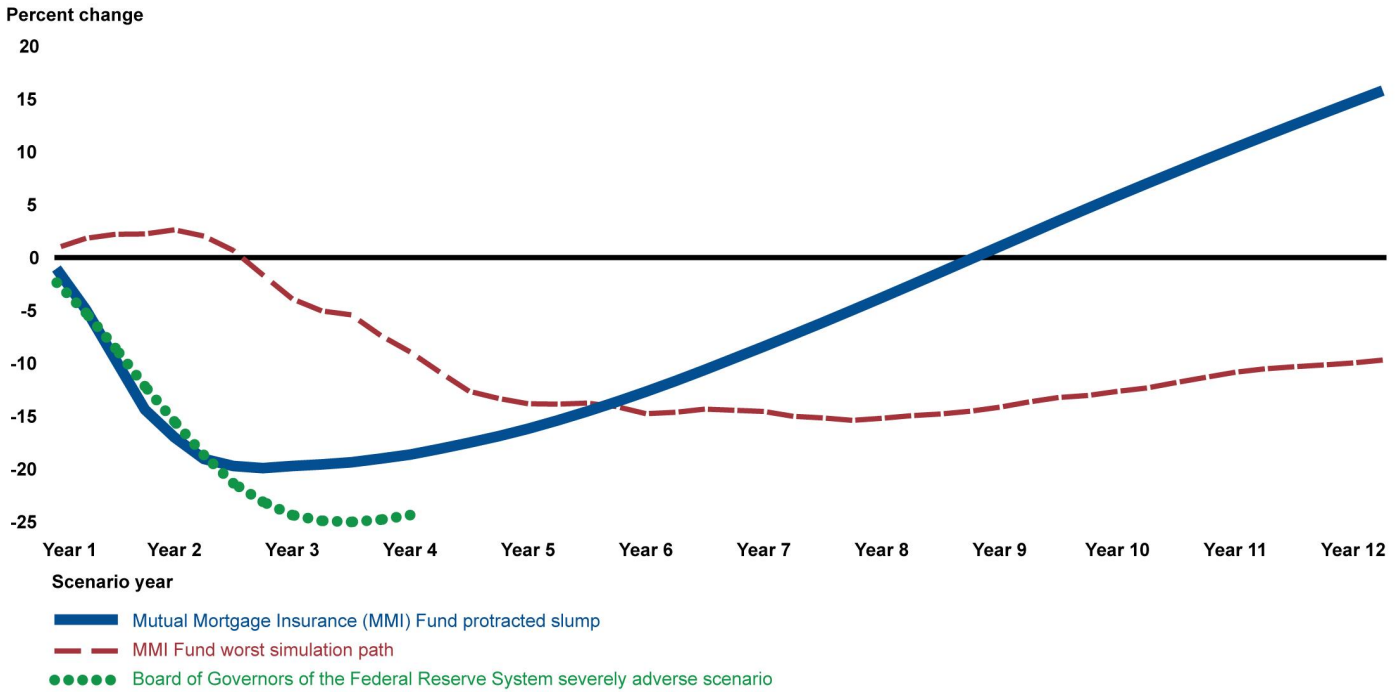
House Price Index

As shown in figure 4, the MMI Fund and Federal Reserve scenarios differ in terms of the severity, duration, and timing of projected changes in house prices (as measured by house price indexes).⁵ All other things being equal, falling house prices negatively affect the MMI Fund because they increase the number of mortgage foreclosures and the severity of insurance losses on those foreclosures.⁶ The MMI Fund protracted slump and Federal Reserve severely adverse scenarios assume similar sharp declines in house prices during the first 2 years—about negative 20 percent and negative 23 percent, respectively. However, under the MMI Fund protracted slump scenario, house prices begin to recover in the third year and rise steadily thereafter, ending 15 percent higher than they were at the start of the scenario. In contrast, under the Federal Reserve scenario, house prices decline about an additional 2 percentage points, then recover slightly before the scenario ends in the fourth year.

⁵The MMI Fund stress scenarios use projections of the Federal Housing Finance Agency's purchase-only house price index. This index is based on data from sales of the same single-family properties at different points in time (making it a repeat sales index) for properties whose mortgages have been purchased or securitized by the housing enterprises Fannie Mae and Freddie Mac. The Federal Reserve's stress tests use projections of CoreLogic's Home Price Index, a repeat sales index that is based on data from properties with enterprise- and nonenterprise-backed mortgages.

⁶Among other things, falling house prices may result in more borrowers with mortgage balances that exceed the value of their homes (negative equity position). In the event they cannot stay current on their mortgage payments, the negative equity position of these borrowers may limit their ability to avoid foreclosure by selling or refinancing their homes. Falling house prices also increase loss severity—the size of the loss relative to the insurance claim—because lower housing values reduce FHA's ability to offset claim payments with proceeds from the sale of foreclosed properties.

Figure 4: Projected Percentage Change in House Price Index under Selected MMI Fund Actuarial and Federal Reserve Supervisory Stress Test Scenarios Starting in 2016



Source: GAO analysis of Federal Housing Administration and Federal Reserve data. | GAO-18-92

Note: The MMI Fund scenarios are from stress tests of the fund's forward mortgage portfolio. The MMI Fund scenarios use projections of the Federal Housing Finance Agency's national purchase-only house price index. The Federal Reserve scenario uses projections of CoreLogic's national Home Price Index. Each trend line represents the projected percentage change in the house price index relative to the actual index level in the quarter preceding the stress period. The MMI Fund scenarios make projections for the third quarter of 2016 through the fourth quarter of 2027. The Federal Reserve scenario makes projections for the first quarter of 2016 through the first quarter of 2019.

The MMI Fund worst simulation path features a substantially different house price path than the other two scenarios. It shows a small initial increase in house prices over the first 2 years, before projecting an extended 6-year decline, resulting in a peak-to-trough drop of about 18 percent. Thereafter, house prices recover somewhat, but end up about 10 percent below their level at the start of the scenario.

Thirty-Year Mortgage Interest Rate

The projected path of 30-year fixed mortgage interest rates also differs among the three stress scenarios. Changes in mortgage interest rates can have varying effects on the MMI Fund. On the one hand, lower interest rates can negatively affect the fund by incentivizing borrowers to prepay their mortgages (for example, through refinancing), which reduces

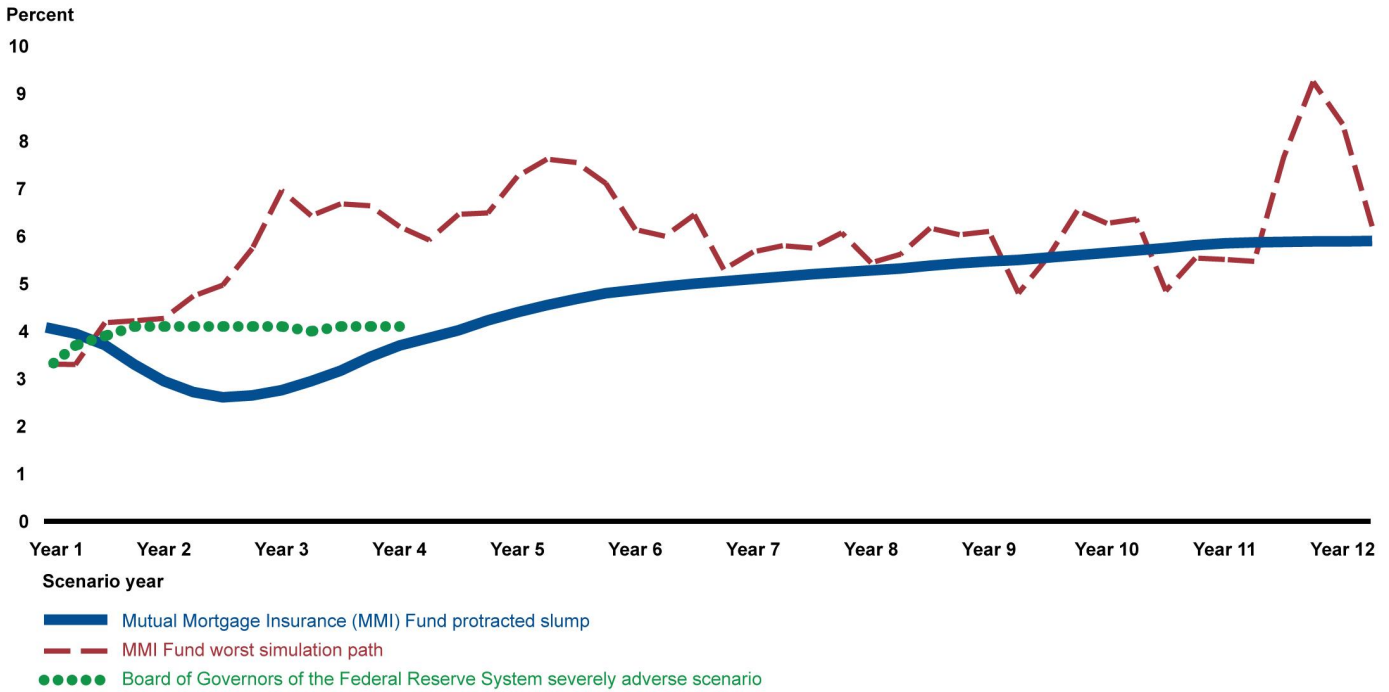
Appendix III: Comparison of Economic Scenarios Used in Mutual Mortgage Insurance Fund and Federal Reserve Supervisory Stress Tests

the fund's income from insurance premiums. On the other hand, if coupled with conditions that increase foreclosure risk (such as low house price growth), higher interest rates can negatively affect the fund by reducing prepayments, resulting in more mortgages remaining in the fund that could lead to foreclosures and insurance claims.

As shown in figure 5, the three scenarios exhibit differences in the severity and timing of interest rate changes and the overall volatility of the interest rate path.⁷ The mortgage interest rate under the Federal Reserve's severely adverse scenario increases by about 1 percentage point over the first year, then essentially levels off through the end of the scenario in the fourth year. In contrast, the MMI Fund protracted slump scenario projects an initial 1.5 percentage point decline in the interest rate over about the first 2 years, followed by an extended increase that leaves the interest rate almost 2 percentage points higher at the end of the 12-year scenario than it was at the start. The MMI Fund worst simulation path features the most dramatic interest rate changes of the three scenarios. It begins with a sharp increase of more than 3.5 percentage points over about the first 2 years, then assumes several up and down spikes over about the next 10 years, before ending with an interest rate about 3 percentage points higher than it was at the start of the scenario.

⁷The initial values of the three scenarios differ because of previously noted differences in the start dates of the MMI Fund and Federal Reserve scenarios and because we used the first projected value from each scenario as the starting point of our comparison.

Figure 5: Projected 30-Year Fixed Mortgage Interest Rate under Selected MMI Fund Actuarial and Federal Reserve Supervisory Stress Test Scenarios Starting in 2016



Source: GAO analysis of Federal Housing Administration and Federal Reserve data. | GAO-18-92

Note: The MMI Fund scenarios are from stress tests of the fund's forward mortgage portfolio. The MMI Fund scenarios make projections for the third quarter of 2016 through the fourth quarter of 2027. The Federal Reserve scenario makes projections for the first quarter of 2016 through the first quarter of 2019. The initial values of the three scenarios differ because of the differences in the scenarios' starting dates and because we used the first projected value from each scenario as the starting point of the comparison.

Unemployment Rate

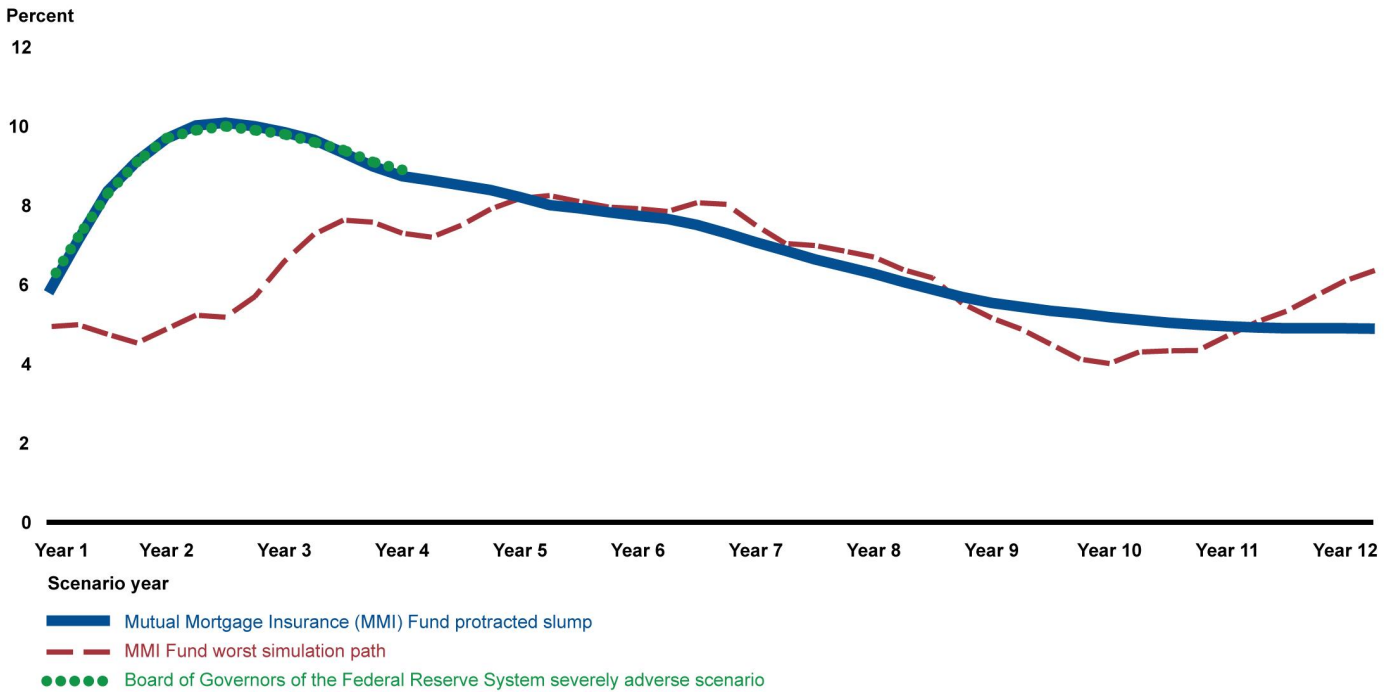
As shown in figure 6, all three scenarios feature a steep increase and subsequent decline in the unemployment rate, but the timing and duration of the changes differ.⁸ All other things being equal, increases in the unemployment rate adversely affect the MMI Fund because of the negative effect that job loss has on a borrower's ability to make monthly mortgage payments and avoid foreclosure. The unemployment rate under the Federal Reserve severely adverse scenario and the MMI Fund

⁸The initial values of the three scenarios differ because of previously noted differences in the start dates of the MMI Fund and Federal Reserve scenarios and because we used the first projected value from each scenario as the starting point of our comparison.

Appendix III: Comparison of Economic Scenarios Used in Mutual Mortgage Insurance Fund and Federal Reserve Supervisory Stress Tests

protracted slump scenario follows similar paths. Both start with nearly identical increases of about 4 percentage points within the first 2 years, followed by declines of roughly 1 percentage point over the subsequent six quarters, at which juncture the Federal Reserve scenario ends. In the longer MMI Fund protracted slump scenario, the unemployment rate continues to fall gradually through the 12th year, ending about 1 percentage point lower than it was at the beginning of the scenario. In contrast, the MMI Fund worst simulation path features a more gradual and less even increase in the unemployment rate—about a 3.25 percentage point rise over about the first 5 years. The unemployment rate then slides below the starting level by year 10, before rebounding past the starting level by the end of the scenario.


Figure 6: Projected Unemployment Rate under Selected MMI Fund Actuarial and Federal Reserve Supervisory Stress Test Scenarios Starting in 2016



Source: GAO analysis of Federal Housing Administration and Federal Reserve data. | GAO-18-92

Note: The MMI Fund scenarios are from stress tests of the fund's forward mortgage portfolio. The MMI Fund scenarios make projections for the third quarter of 2016 through the fourth quarter of 2027. The Federal Reserve scenario makes projections for the first quarter of 2016 through the first quarter of 2019. The initial values of the three scenarios differ because of the differences in the scenarios' starting dates and because we used the first projected value from each scenario as the starting point of the comparison.

Appendix IV: Comments from the Department of Housing and Urban Development

 U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
WASHINGTON, DC 20410-8000

ASSISTANT SECRETARY FOR HOUSING-
FEDERAL HOUSING COMMISSIONER

OCT 19 2017

Mr. Daniel Garcia-Diaz
Director
Financial Markets and Community Investment
Government Accountability Office
441 G Street, NW
Washington, DC 20548-0001

Dear Mr. Garcia-Diaz:

Thank you for the opportunity to respond to the Draft Report GAO-18-92 entitled “Federal Housing Administration: Capital Requirements and Stress Testing Practices Need Strengthening” received on September 28, 2017. We believe that it is important to recognize the trade-offs between FHA’s mission and other mutual policy holders when considering financial soundness. We appreciate GAO’s recognition that minimum capital requirements that are too high may limit FHA’s ability to serve the borrowers for which it was intended or to play a market stabilizing role and would recommend that GAO place this statement in a more prominent position in the report. The financial and mission aspects of FHA’s goals and requirements pose trade-offs that must be weighed by policymakers in setting the MMI Fund’s capital requirement.

Below is the response to the recommendations for FHA in the draft.

Recommendation #1:

The Commissioner of FHA should combine stress test results for the forward mortgage and HECM portfolios, where possible, and report estimated Fund-wide capital ratios for stress scenarios examined.

HUD Response:

FHA agrees with this recommendation. Stress test results for Forward and HECM mortgages will be included in FHA’s Annual Report and Actuarial Review to be issued in November 2017.

Recommendation #2:

The Commissioner of FHA should develop specific objectives for stress tests of the MMI Fund and apply testing methods and scenarios consistent with those objectives.

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**Appendix IV: Comments from the Department
of Housing and Urban Development**

HUD Response:

FHA agrees with this recommendation. Stress test results for Forward and HECM mortgages will be included in FHA's Annual Report and Actuarial Review to be issued in November 2017.

We appreciate the efforts of the GAO to review our work and progress to strengthen combined stress tests with specific objectives along with testing methodology and scenarios. FHA welcomes future recommendations that will support those efforts.

Sincerely,



Dana T. Wade
General Deputy Assistant Secretary-
Federal Housing Administration

Appendix V: GAO Contact and Staff Acknowledgments

GAO Contact

Daniel Garcia-Diaz, (202) 512-8678, GarciaDiazD@gao.gov

Staff Acknowledgments

In addition to the contact named above, Steven Westley (Assistant Director), Winnie Tsen (Analyst in Charge), Stephen Brown, Marcia Carlsen, William Chatlos, Robert Dacey, Emei Li, John McGrail, Angela Pun, Jennifer Schwartz, Jena Sinkfield, and Frank Todisco made key contributions to this report.

Appendix VI: Accessible Data

Data Tables

Data Table for Figure 1: Fiscal Year 2016 Forward Mortgage and HECM Portfolio Capital Ratios under Different Economic Scenarios

	Forward Mortgage	HECM
Baseline Monte Carlo average	3.28	-6.9
10th best path	4.17	3.07
25th best path	3.72	-0.51
25th worst path	2.93	-11.73
10th worst path	2.4	-17.77
Worst path	-0.87	-38.74
Moody's baseline	3.66	-6.1
Low interest rate scenario	2.93	-5.57
Moody's protracted slump	-3.3	-18.02
Range	-3.3 to 4.17	-38.74 to 3.07

Data Table for Figure 2: Forward Mortgage, HECM, and Combined Capital Ratios, Fiscal Years 2009–2016

	Forward Mortgage	Home Equity Conversion Mortgage (HECM)	Overall MMI Fund
2009	0.42	3.17	0.53
2010	0.59	-0.98	0.5
2011	0.12	1.99	0.24
2012	-1.28	-3.58	-1.44
2013	-0.72	7.5	-0.11
2014	0.56	-1.2	0.41
2015	1.63	6.44	2.07
2016	3.28	-6.9	2.32

Data Table for Figure 4: Projected Percentage Change in House Price Index under Selected MMI Fund Actuarial and Federal Reserve Supervisory Stress Test Scenarios Starting in 2016

	Moody's Mortgage Insurance Fund protracted slump	MMI worst simulation Path	Board of Governors of the Federal Reserve Severely Adverse scenario
Year 1, 1 st quarter	-1.05	0.9	-2.35
2 nd quarter	-4.93	1.82	-5.24

Appendix VI: Accessible Data

	Moody's Mortgage Insurance Fund protracted slump	MMI worst simulation Path	Board of Governors of the Federal Reserve Severely Adverse scenario
3 rd quarter	-9.66	2.2	-8.57
4 th quarter	-14.38	2.23	-12.18
Year 2, 1 st quarter	-17	2.62	-15.51
2 nd quarter	-19.05	2.03	-18.68
3 rd quarter	-19.72	0.67	-21.35
4 th quarter	-19.92	-1.64	-23.1
Year 3, 1 st quarter	-19.72	-3.91	-24.36
2 nd quarter	-19.57	-5.05	-24.9
3 rd quarter	-19.37	-5.42	-25.01
4 th quarter	-19.02	-7.37	-24.8
Year 4, 1 st quarter	-18.64	-8.93	-24.36
2 nd quarter	-18.1	-10.83	NA
3 rd quarter	-17.52	-12.65	NA
4 th quarter	-16.9	-13.33	NA
Year 5, 1 st quarter	-16.2	-13.83	NA
2 nd quarter	-15.41	-13.87	NA
3 rd quarter	-14.56	-13.77	NA
4 th quarter	-13.65	-14.1	NA
Year 6, 1 st quarter	-12.69	-14.77	NA
2 nd quarter	-11.68	-14.64	NA
3 rd quarter	-10.62	-14.34	NA
4 th quarter	-9.52	-14.45	NA
Year 7, 1 st quarter	-8.42	-14.56	NA
2 nd quarter	-7.29	-15.02	NA
3 rd quarter	-6.15	-15.17	NA
4 th quarter	-4.98	-15.4	NA
Year 8, 1 st quarter	-3.8	-15.21	NA
2 nd quarter	-2.6	-14.96	NA
3 rd quarter	-1.39	-14.8	NA
4 th quarter	-0.17	-14.54	NA
Year 9, 1 st quarter	1.04	-14.16	NA
2 nd quarter	2.25	-13.66	NA
3 rd quarter	3.47	-13.24	NA
4 th quarter	4.66	-13.05	NA
Year 10, 1 st quarter	5.84	-12.66	NA
2 nd quarter	7	-12.34	NA

	Moody's Mortgage Insurance Fund protracted slump	MMI worst simulation Path	Board of Governors of the Federal Reserve Severely Adverse scenario
3 rd quarter	8.14	-11.82	NA
4 th quarter	9.28	-11.33	NA
Year 11, 1 st quarter	10.39	-10.85	NA
2 nd quarter	11.49	-10.53	NA
3 rd quarter	12.58	-10.33	NA
4 th quarter	13.66	-10.16	NA
Year 12, 1 st quarter	14.73	-9.97	NA
2 nd quarter	15.79	-9.7	NA

Data Table for Figure 5: Projected 30-Year Fixed Mortgage Interest Rate under Selected MMI Fund Actuarial and Federal Reserve Supervisory Stress Test Scenarios Starting in 2016

	Moody's Mortgage Insurance Fund protracted slump	MMI worst simulation Path	Board of Governors of the Federal Reserve Severely Adverse scenario
Year 1, 1 st quarter	4.08	3.31	3.2
2 nd quarter	3.95	3.3	3.7
3 rd quarter	3.71	4.18	3.9
4 th quarter	3.3	4.22	4.1
Year 2, 1 st quarter	2.95	4.27	4.1
2 nd quarter	2.72	4.74	4.1
3 rd quarter	2.61	4.97	4.1
4 th quarter	2.65	5.74	4.1
Year 3, 1 st quarter	2.76	6.96	4.1
2 nd quarter	2.95	6.43	4
3 rd quarter	3.17	6.68	4.1
4 th quarter	3.46	6.64	4.1
Year 4, 1 st quarter	3.7	6.2	4.1
2 nd quarter	3.86	5.92	NA
3 rd quarter	4.02	6.46	NA
4 th quarter	4.23	6.49	NA
Year 5, 1 st quarter	4.4	7.26	NA
2 nd quarter	4.55	7.62	NA
3 rd quarter	4.68	7.55	NA
4 th quarter	4.8	7.11	NA

Appendix VI: Accessible Data

	Moody's Mortgage Insurance Fund protracted slump	MMI worst simulation Path	Board of Governors of the Federal Reserve Severely Adverse scenario
Year 6, 1 st quarter	4.87	6.14	NA
2 nd quarter	4.94	6	NA
3 rd quarter	5	6.45	NA
4 th quarter	5.05	5.3	NA
Year 7, 1 st quarter	5.1	5.67	NA
2 nd quarter	5.15	5.8	NA
3 rd quarter	5.2	5.75	NA
4 th quarter	5.24	6.07	NA
Year 8, 1 st quarter	5.28	5.44	NA
2 nd quarter	5.32	5.62	NA
3 rd quarter	5.38	6.17	NA
4 th quarter	5.43	6.03	NA
Year 9, 1 st quarter	5.47	6.1	NA
2 nd quarter	5.5	4.8	NA
3 rd quarter	5.55	5.56	NA
4 th quarter	5.6	6.54	NA
Year 10, 1 st quarter	5.65	6.27	NA
2 nd quarter	5.7	6.36	NA
3 rd quarter	5.75	4.85	NA
4 th quarter	5.81	5.54	NA
Year 11, 1 st quarter	5.85	5.51	NA
2 nd quarter	5.87	5.47	NA
3 rd quarter	5.88	7.66	NA
4 th quarter	5.89	9.25	NA
Year 12, 1 st quarter	5.89	8.36	NA
2 nd quarter	5.9	6.21	NA

Data Table for Figure 6: Projected Unemployment Rate under Selected MMI Fund Actuarial and Federal Reserve Supervisory Stress Test Scenarios Starting in 2016

	Moody's Mortgage Insurance Fund protracted slump	MMI worst simulation Path	Board of Governors of the Federal Reserve Severely Adverse scenario
Year 1, 1 st quarter	5.8	4.94	6
2 nd quarter	7.12	4.99	7.2
3 rd quarter	8.36	4.75	8.3
4 th quarter	9.12	4.53	9.1
Year 2, 1 st quarter	9.69	4.88	9.7
2 nd quarter	10.02	5.23	9.9
3 rd quarter	10.09	5.18	10
4 th quarter	10	5.7	9.9
Year 3, 1 st quarter	9.85	6.59	9.8
2 nd quarter	9.66	7.27	9.6
3 rd quarter	9.33	7.63	9.4
4 th quarter	8.99	7.58	9.1
Year 4, 1 st quarter	8.74	7.3	8.9
2 nd quarter	8.63	7.2	NA
3 rd quarter	8.51	7.5	NA
4 th quarter	8.39	7.91	NA
Year 5, 1 st quarter	8.21	8.18	NA
2 nd quarter	8.01	8.25	NA
3 rd quarter	7.93	8.1	NA
4 th quarter	7.83	7.96	NA
Year 6, 1 st quarter	7.74	7.92	NA
2 nd quarter	7.66	7.85	NA
3 rd quarter	7.51	8.07	NA
4 th quarter	7.3	8.03	NA
Year 7, 1 st quarter	7.07	7.5	NA
2 nd quarter	6.86	7.04	NA
3 rd quarter	6.64	6.99	NA
4 th quarter	6.46	6.85	NA

	Moody's Mortgage Insurance Fund protracted slump	MMI worst simulation Path	Board of Governors of the Federal Reserve Severely Adverse scenario
Year 8, 1 st quarter	6.28	6.7	NA
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3 rd quarter	5.88	6.17	NA
4 th quarter	5.69	5.53	NA
Year 9, 1 st quarter	5.54	5.16	NA
2 nd quarter	5.44	4.88	NA
3 rd quarter	5.34	4.5	NA
4 th quarter	5.27	4.12	NA
Year 10, 1 st quarter	5.18	4.01	NA
2 nd quarter	5.11	4.3	NA
3 rd quarter	5.04	4.33	NA
4 th quarter	4.99	4.34	NA
Year 11, 1 st quarter	4.95	4.71	NA
2 nd quarter	4.92	5.06	NA
3 rd quarter	4.9	5.33	NA
4 th quarter	4.9	5.72	NA
Year 12, 1 st quarter	4.9	6.1	NA
2 nd quarter	4.89	6.36	NA

Agency Comment Letter

Text of Appendix IV: Comments from the Department of Housing and Urban Development

Page 1

Mr. Daniel Garcia-Diaz Director

Financial Markets and Community Investment

Government Accountability Office 441 G Street, NW

Washington, DC 20548-0001

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Page 2

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Sincerely,

Dana T. Wade

General Deputy Assistant Secretary- Federal Housing Administration

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